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WASTEPAPER RECOVERY GUIDE FOR MILITARY INSTALLATIONS

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

WASTEPAPER RECOVERY GUIDE FOR MILITARY INSTALLATIONS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF ENGINEERING

in

ENVIRONMENTAL SCIENCE

BY

ROBERT FRANK OLFENBUTTEL

Norman, Oklahoma

1979

WATESPAPER RECOVERY GUIDE FOR
MILITARY INSTALLATIONS

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WASTEPAPER RECOVERY GUIDE FOR MILITARY INSTALLATIONS

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This study was concerned with developing a means of effectively (1) analyzing resource recovery potential at installations with differing operational environments, (2) planning low capital-intensive source separation and recovery programs, and (3) implementing those programs with minimum mission interference and maximum participation and effectiveness.

Information and data described in this Guide will assist installation engineers in cost-effectively analyzing and determining the recovery potential of high grade white ledger paper, computer paper and computer tab cards in office/commercial areas; determining optimum means of gathering, storing, processing and transporting separated materials; determining costs of operating and managing the source separation program; working with federal marketing organizations to determine market conditions and requirements; and making a decision on the feasibility of implementing source separation for recycling on their installation.

The study shows that effective source separation wastepaper recovery is a complicated process. Recovery of wastepaper for sale represents a business situation and must be planned, implemented and operated accordingly. In an era of limited fiscal availability, the selling of wastepaper products should be accomplished on an economically self-sufficient basis. If and until market demand grows substantially, it is doubtful that many installations will be able to implement economically successful multi-high grade wastepaper recovery programs.

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A final acknowledgement is extended to personnel who assisted the author during military installation waste materials recovery tests, to Jody Lee, Lori Evans and Lois Nichols for typing this manuscript, and to his wife, Ingrid, for extended patience and support during this research program.

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PREFACE

This report documents work performed during the period January 1976 to June 1979 by the Research and Development Directorate (formerly the Civil and Environmental Engineering Development Office), Air Force Engineering and Services Center, Tyndall Air Force Base, Florida 32403. Major Robert Olfenbuttel was the principal investigator.

This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS it will be available to the general public, including foreign nations.

This report has been reviewed and is approved for publication.

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SECTION I

OFFICE WASTEPAPER RECOVERY GUIDE

1.0 BACKGROUND

1.1 Military base managers, particularly the Civil Engineers, are increasingly faced with the task of "doing more with less." Budget restraints, reduced manpower and skill levels, and increased responsibilities in non-traditional functional areas combine to make it extremely difficult to effectively provide support to the primary mission of defense.

1.2 Two areas of growing concern are solid waste management and energy utilization, neither of which is independent of the other. The increased public concern for environmental protection, resource conservation and cost controls are well known and have been reflected in governmental legislation mandating significant changes in managing the support functions of the defense mission. In particular, the solid waste-related resource recovery Guidelines of the Environmental Protection Agency (EPA) make it mandatory for all Federal agencies to implement programs of waste material and energy recovery wherever recovery markets and economics make it practical to do so. Mandatory implementation dates are provided to insure compliance with the Guidelines.

1.3 The task of implementing these programs falls on the installation's Civil/Facility/Public Works Engineer. His/her most immediate requirement is to implement refuse "Source Separation" programs. Heretofore, guidance on "how" to effectively carry out all steps of the planning through implementation phases of source separation on a military installation was very limited. The growing data base on source separation programs in civilian office areas will aid installation managers, but translation of these experiences to the military base environment is difficult because of unique factors existent on-base that are not present in the civilian sectors. For example:

1.3.1 Buildings are seldom designed with waste management in mind; office population density is often higher than the area was designed for; disparate mission support functions often occur in the same building; janitorial functions are performed by military personnel, civilian contractor, both or neither (each employee does his/her own); and office-type activities are frequently spread out over an installation rather than encompassed in a few, multistory buildings.

1.3.2 As a result, storage space within buildings is difficult to find; transfer of paper in multistory buildings is hindered by lack of elevators; loading docks rarely exist; military custodial personnel turnover disrupts gathering continuity; different organizations within the same facility require many coordinators and extensive coordination support activities; extensive generation (at least 1 ton per month) will not occur in many buildings, and those will probably not be close to each other.

2.0 OBJECTIVE

2.1 Given the mandatory requirements for refuse materials recovery and the associated lack of installation-oriented comprehensive guidance, extensive research was conducted to develop a means of effectively (1) analyzing resource recovery potential at installations with differing operational environments, (2) planning low capital-intensive source separation and recovery programs and (3) implementing those programs with minimum mission interference and maximum participation and effectiveness.

2.2 Results of that research are reflected within this procedural guide/model. It will assist installation engineers in:

2.2.1 Cost effectively analyzing and determining the recovery potential of high grade white ledger paper, computer paper, and computer tab cards in office/commercial areas.

2.2.2 Determining optimum means of gathering, storing, processing and transporting separated materials.

2.2.3 Determining costs of operating and managing the source separation program.

2.2.4 Working with the Defense Property Disposal Office to determine market conditions and requirements.

2.2.5 Making a decision on the feasibility of implementing source separation for recycling on their installation.

2.3 This Guide does not address cardboard nor recovery of newspapers from family housing areas. Both of these materials must be considered under the federal Guidelines but experience has shown that available quantities on newspapers are too low to be considered worthwhile recapturing through an installation-only program; cardboard recovery is frequently accomplished wherever there are retail activities (such as Exchanges and Commissaries) but economical recovery from other installation activities is difficult to achieve because of low generation rates, high recovery costs and low, often uncertain markets. The same conditions apply to metal and glass beverage containers.

2.4 In using this Guide it is important to keep in mind that there is no way to engineer a successful program. Successful planning will require creative planning and simplified implementation. The success or failure of an implemented program will depend upon the soundness of marketing agreements, limited scope programs, and creativity, flexibility and astuteness of personnel managing/coordinating the program. Recovery of wastepaper for sale represents a business and must be planned, implemented and operated accordingly.

2.5 A review of high technology, state-of-the-art-energy recovery systems applicable to the military is included in Section XIII to provide perspective on this alternative area of resource recovery.

3.0 SUMMARIES AND CONCLUSIONS

3.1 High Grade Paper Recovery As An Alternate Resource Recovery Option

3.1.1 Recovering office waste materials represents a unique activity for DOD personnel because it involves committing resources to generate products to sell rather than products and services to support the defense mission. In addition, in an era of limited fiscal availability, the selling of these products should be accomplished on an economically self-sufficient basis.

3.1.2 As such, it is a business and must be run accordingly. To quote an experienced consultant in the field, "This is a business which must be run under tight controls because the price you receive for the product, at minimum, allows no room for inefficiency". Analyzing, planning, implementing and operating this "business" involves actions and commitments differing in scope and personnel attitude than the usual janitorial and refuse management activities of most military installations.

3.1.3 If and until market demand grows substantially, it is doubtful that many installations will be able to implement economically successful recovery programs involving all three high grade wastepapers of computer cards, computer printout paper and white ledger. Simple programs, devoted to high value computer cards only, hold the best potential for economic success. Paper conservation programs, in which wastepaper is reutilized in some manner on the installation before it is finally discarded into the trash stream, are growing in popularity and acceptance and represent a real alternative to more sophisticated source separation programs.

3.2 Historical Recycling Efforts and Existing DOD Policy

3.2.1 Initially the success of a limited number of installations with recycling programs was attributed to their unregulated flexibility and the aggressiveness of personnel who were able to locate markets on their own. These program managers had considerable leeway in obtaining personnel overhires and unauthorized equipment to support programs that were receiving high visibility and command interest.

3.2.2 Eventually, however, the competition for dwindling O&M resources, inability to recover costs, and uncertain markets for recovered materials posed significant obstacles to operating successful recycling programs. As a consequence, many programs failed.

3.2.3 The failure of many programs prompted the DOD in 1976 to make changes in funding, revenue and resource availability in order to effectively promote materials recycling in consonance with national goals. The most important changes made include:

3.2.3.1 The ability of installation recycling program authorities to receive net proceeds from the sale of the high grade wastepaper that can be used to first offset program expenses (except military labor) and secondly, to help fund energy conservation and environmental improvement projects with any remaining after-expense monies, up to 50,000 dollars per fiscal year.

3.2.3.2 Each program/operating agency can budget for the recycling program as part of its reimbursable program. This provision overcomes historical funding problems in that the installation Civil/Facility/Public Works Engineer does not have to utilize funds originally budgeted for other work efforts to cover program expenses (unless expenses exceed budgeted amounts). At the same time it should lessen cash flow pressures generated by the gap between expenditures and revenue receipts.

3.2.3.3 Installations should make extensive use of existing equipment since it is the intent of the source separation program to recover materials and dollars with minimum capital investment. New/additional equipment can be procured through direct funds appropriations normally available for equipment acquisition. If, however, the installation estimates that after-expense funds will cover the cost of a new piece of equipment and can be obligated <u>before</u> the next fiscal year, then purchase can be made from recycling program proceeds. Funds <u>cannot</u> be carried over from one year to the next, which means that there is no possibility of combining proceeds from more than one year to cover large capital investments.

3.2.3.4 Air Force policy is to implement recycling programs only if economic analysis shows them to be self-sustaining. However, any command or any base can support a non-self-sustaining program if they wish to direct fund it; in view of increasingly austere budgets such support of a non-mission essential program is not recommended.

3.3 <u>Recyclable Paper and Their Markets</u>

3.3.1 The price paid for paperstock varies according to the type of pulp in the paper, the level of contaminants, and the demand for paperstock. The demand for paperstock is dependent on finished paper product demand, and the availability and price of wood pulp. Merchandizing scrap paper in a manner advantageous to potential buyers is a key to improving its demand.

3.3.2 "High grade paper" is made up of more than one grade of paper, with differing specifications and value for each. In decreasing order of value these grades are computer tabulating cards, computer printout paper and other white ledger paper.

3.3.3 The highest revenues per ton can be derived from tabulating cards, computer printout (blue or green striped) and white bond paper, when segregated by grade in that order.

3.3.4 High grades maintain their market demand and level of prices longer than low grades during period of economic downturns.

3.3.5 There are many contaminants in the installation office waste stream which, in relatively small quantities, can significantly lower the value of selected wastepapers. Contaminants can include recyclable paper in a quantity of other paper that is not of the same grade. Quality control is therefore "extremely" important in wastepaper recovery programs.

3.3.6 The wastepaper/paperstock market is highly volatile and economic benefits may not always be possible. Installations hsould attempt to minimize their potential for losses by:

3.3.6.1 Concentrating on high value recyclables, and

3.3.6.2 Obtaining long term marketing arrangements with guaranteed minimum floor prices (DLA contracting regulations may preclude this from being a feasible option, however, see Section V).

3.3.7 Marketing requirements and demands may vary from region to region and nothing should be assumed about processing requirements and grade definitions until the local marketing activity (DPDO or, perhaps, the General Services Administration) has researched the market.

3.4 Marketability Requirements

3.4.1 Wastepaper is most marketable when it is:

3.4.1.1 Baled (in mill sizes of 600 plus pounds)

3.4.1.2 In continuous supply

3.4.1.3 Clean

3.4.1.4 Offered in large volume (railcar or truck load quantities)

3.4.1.5 High grade

3.4.2 Many buyers will accept mill sized boxed and banded wastepaper in lieu of mechanically produced bales.

3.4.3 All storage responsibility will be the installation's.

3.5 Mechanisms For Marketing Installation Recyclables

3.5.1 Most installations will market their recyclable material through the services of the Defense Property Disposal Offices (DPDO) of the Defense Logistics Agency. The DPDOs in turn respond to and are supported by defense property disposal regional offices and the Defense Property Disposal Service (DPDS) office in Battle Creek, Michigan.

3.5.2 During the feasibility determination stages of a potential program, the installation must coordinate with the servicing DPDO to determine (1) the availability of prospective buyers for the waste materials, and (2) the scope of the buyers' capabilities and product requirements. This coordination and consultation with the DPDO will increase the probability of properly scoping the program and obtaining a successful contract.

3.5.3 If and when a decision is made to implement a recovery program the installation will have to provide the DPDO with desired contractual requirements and supporting information, and a fund cite to which sales proceeds will be deposited for installation use on the recovery program. In the absence of actual costs, DPDS policy is that sales proceeds should be split such that 80 percent goes to the installation and the remaining 20 percent to the DLA to cover its sales and handling expenses. Hence, the installation will not receive all the projected sales revenues and must account for the DPDS commission in its economic analysis.

3.5.4 The most desirable type of contract for paper recovery is a term contract of 3-5 years duration, accompanied by an agreement by the buyer to pay a minimum guaranteed price, with higher prices tied to a sliding scale based upon a specified Industry Indicator or Official Board Market for a major city. Unfortunately, DLA contract regulations preclude practical incorporation of the minimum price requirement which means the installation is not protected against the situation where the market price falls below its break-even point for program support. Consequently, the risk of this happening must be considered during the DPDS market survey and the economic analysis. The installation can lower the risk by limiting the scope and associated costs of the program to those high grade categories with the most consistently reliable market performance, namely computer cards and printout paper, and minimizing processing requirements.

3.5.5 Experience has shown that installations often do not have the in-house resources to implement and operate an ongoing recycling program. Under these circumstances planners should consider use of a limited services contract, full-service contract, contracts with existing custodial or refuse contractors, or joint participation with other governmental or civilian organizations. The concept of employing a full-service contractor to handle all program design, implementation and material sales appear attractive but in reality installations may have difficulty obtaining full-service because of:

3.5.5.1 A lack of experienced contractors and an unwillingness of traditional recyclers to bid on such contracts because they do not readily accept or understand such contracts.

3.5.5.2 An unwillingness by buyers to commit themselves to full-service investments.

3.5.5.3 Unfavorable economics bid prices for the recovered waste materials will be significantly lower (perhaps 55 percent less) than those bid when the contract does not require a full-service arrangement.

3.5.6 Under circumstances in which DOD activities are located in General Services Administration (GSA) owned or leased facilities it may be more advantageous to contract through the GSA rather than DLA because:

3.5.6.1 The DOD organization can receive 100 percent of sales revenue received.

3.5.6.2 A minimum price guarantee can be put into the sales-service contract.

3.5.6.3 The chances of receiving more bids for sales contract may be greater with GSA than DLA because GSA "bid deposit" requirements appear to be considerably lower than those of the DLA.

3.5.7 Contracting with a community sponsored recycling authority if available, is listed as a desirable option by the DOD but it should always be accomplished on a competitive basis with other recycling businesses/ organizations.

3.6 Methods For Recovery Wastepaper withing A Building

3.6.1 Program planners must be flexible and imaginative in the way wastepaper can be effectively recovered from the various generating activities on an installation. They have to consider five basic operations involved in recovering the wastepaper.

3.6.1.1 Separation of paper and accumulation in a container in the generator's work area.

3.6.1.2 Transfer of the accumulated paper to an intermediate container.

3.6.1.3 Gathering recovered paper from the intermediate containers and transfer to a storage area.

3.6.1.4 Storage of the paper.

3.6.1.5 Collection of the stored paper and delivery to a processing/central storage area, or directly to a buyer.

3.6.2 The desk-top container system is the most effective method for recovering non-computer product wastepaper items. It promotes high employee participation and low contamination. Where computer products predominate it's more effective to store cards in their original boxes and stacked printouts in cardboard boxes or similar central-type containers. Where offices and/or desk tops are crowded or daily white ledger generation is high (e.g., the Accounting and Finance Travel Pay Section) it may be more advantageous to utilize higher capacity intermediate trays or central containers rather than desk-top holders.

3.6.3 Convenience to participants is critical for effective participation. Intermediate and central storage containers must be placed where they are highly visible and accessible, and near employee work and traffic patterns. However, care must be taken to not place them near other trash receptacles, vending machines, et. cetera since this will often lead to high contamination. If containers are placed in hallways or near building entrances clearly label all of them for Recycling and provide securable tops to discourage contamination from occasional deposition of lunch remains, beverage wastes and other unacceptable waste items.

3.6.4 Obtain approval of local fire protection personnel for placement, type of containers and necessary frequency of pickup. This has <u>not</u> been a known problem at any base at the time of this writing.

3.6.5 Removal of accumulated wastepaper must be done with maximum efficiency and effectiveness. The following guidelines should be used when setting up a system to gather paper within a facility.

3.6.5.1 "Convenience is sacred to the public:" The most successful source separation programs have been those that impose the least requirements on the personnel generating the wastepaper.

3.6.5.2 Continuity: Only use personnel to gather and store accumulated paper who will perform the function on a regular basis and are not subject to frequent replacement.

3.6.5.3 Collection reliability: Provide schedules of pickups and stick to them; nothing will defeat a recycling program faster than missing pickups and allowing waste to overflow containers.

3.6.5.4 Minimize labor requirements: Keep the number of wastepaper transfer operations to a minimum.

3.6.5.5 Use the right container for the job: Match containers to the physical limitations of the building, the wastepaper generated, and the personnel available to do the job. (For example, containers used for gathering and transferring paper in single-story buildings may be unwieldy or totally incompatible for use in multistory building without elevators.)

3.6.5.6 Contamination must always be dealt with: Particularly with recovery of white ledger paper other than computer printouts and cards. Screening for contaminants can be done by gathering personnel, but should not be done at the point of gathering unless there is no alternative.

3.6.6 From the standpoint of continuity, reliability, proper equipment and employee productivity it is wise to use contract custodial personnel for gathering wastepaper whenever they are available. It is highly likely that such support will not create additional costs because of time freed up from the reduced trash stream that the custodial personnel service. Do not use military custodial personnel, if possible, since continuity and reliability is threatened by frequent turnover of these employees in the trash management function.

3.6.7 It is advisable to use equipment already available on the installation in order to minimize costs.

3.7 On-Base Collection System

3.7.1 Ideally, a paper recovery program involves the gathering and storing of the waste material within a single building and its subsequent collection by a buyer or his agent. Unfortunately, most military installations are characterized by conditions that do not favor cost-effective, long-term recovery operations, particularly because of the need for an added cost, well-organized, well-managed multi-building collection system. Conditions necessitating a collection system include the following:

3.7.1.1 Low generation rate: As will be discussed in Section X, the generation of white ledger paper, per office-type worker, is low compared to civilian-type organizations within the non-DOD Federal structure (e.g., 0.25 pounds per person per day versus 0.51 as indicated by the EPA).

3.7.1.2 Lack of large, in-building populations: Aside from military-occupied buildings in Washington, D.C., most of DOD's work is carried out in one- to three-story buildings which translates into relatively low office populations per location.

3.7.1.3 Wide dispersal of buildings: It is not uncommon for most buildings of high paper recovery potential to be scattered over a wide area on military installations. This presents a challenge to implementing a recovery program because buyers prefer to pick up waste materials from one location point on an installation.

3.7.1.4 Lack of in-building storage area: Installation buildings rarely have central storage capabilities that will accommodate accumulation of wastepaper in sufficient quantities to attract buyer pickup from the buildings themselves. Use of balers to maximize available space will generally be non-cost-effective.

3.7.2 Under these conditions program planners must evaluate several alternatives for collecting and consolidating wastepaper in accordance with the requirements of buyers and the market in general. These alternatives should include tradeoffs between the categories of wastepaper present (e.g., tabulating cards, sorted white ledger, and/or computer printout paper only), and the amount of resources necessary to collect and process the materials. Systems for multiple paper category collection can be expensive and installations must always weigh those costs against less ambitious but perhaps more cost-effective programs (such as concentrating only on tabular card recovery).

3.7.3 Regardless of program scope, every collection system must be characterized by high reliability and continuity. Reliability means establishing a schedule of pickups and maintaining it; it means being able to handle unusual situations (such as paper surges) and having adequate backup resources during contingency situations. Continuity means avoiding frequent personnel turnover that can threaten effectiveness, efficiency and, therefore, the survival of a program. Experienced personnel are necessary for the program because of the many things they have to do and which take time to learn effectively; such "things" include knowing what they are required to pick up and where they must do it (without missing pickup locations), how to recognize and/or respond to unusual situations, and how to interact effectively with office personnel. No collection system should be set up if it fails to guarantee meeting these conditions.

3.7.4 It's important to have adequately sized equipment in "good" operating condition when operating a separate collection system. The alternatives for obtaining trucks to do the job are usually limited by cost, timing, and availability. It is important to have a backup vehicle identified to ensure that the reliability of the collection function is upheld whenever the primary vehicle is unavailable. It is not recommended that the base Civil Engineer commit his/her resources as backup equipment.

3.8 Paper Processing/Processing Center

3.8.1 Establishment of an installation wastepaper recovery program will usually be complicated and costly because of the need to have a central location to consolidate, process and store materials for sale. The scope of the centralization operation will depend upon the number of wastepaper categories collected, market requirements, and type of containers used for collection.

3.8.2 Buyers prefer wastepaper tightly packaged in either mechanically baled or containerized form. Mechanical baling can be effective but its costs frequently exceed the value received for the waste items.

3.8.3 Buyers prefer mill-sized "bales;" the minimum-sized bale is 600 pounds. Typical boxed (containerized) loads fall in the range of 1200-1500 pounds and provided an acceptable and less costly method of preparing wastepaper for sale than mechanical baling.

3.8.4 All materials must be screened for contamination. Many buyers prefer non-baled paper because it is not economically feasible to scan or check baled paper for contamination; the DPDO must investigate buyer preferences.

3.8.5 Do not obtain a baler simply because it is available from salvage. First ensure it can produce wastepaper bales in the size and weight required by the buyer and also meet applicable safety standards.

3.8.6 Labor will normally be the dominant cost factor and the processing center must be set up to maximize their productivity. This can be accomplished by:

3.8.6.1 Minimizing the number of wastepaper categories that must be collected and processed; restrict them to the highest value items.

3.8.6.2 Minimizing the contaminant level at the source of wastepaper generation.

3.8.6.3 Providing adequate space for each task and a smooth flow arrangement for the movement of the wastepaper from the time it's brought in for weighing to the time it is ready for transfer to storage awaiting site.

3.8.6.4 Training personnel and providing clearly defined job responsibilities. Each employee should be trained to take over other tasks if when necessary because of absences. Rotating personnel among the tasks will improve their proficiency and perhaps increase their interest and, therefore, motivation.

3.8.7 Do not use military personnel.

3.8.8 Hire permanent-type employees to promote continuity and reliability of operation. Ensure all personnel are physically and mentally able to accomplish all tasks in the center and on the collection routes.

3.9 Publicity and Education

3.9.1 At the time of this writing questions exist as to whether employee participation is "voluntary" or "mandatory." No official statements have been promulgated to clarify the question; however, the approaches to gaining employee participation should be the same regardless of whether it's voluntary or mandatory, i. e., the employee must be shown that there are sound economic and environmental reasons for recovering the paper and his/her cooperation is necessary to make the program work. They must understand and believe in the reasons for undertaking and maintaining the program.

3.9.2 Achieving employee awareness, concern and cooperation depends upon a well thought out, multilevel publicity and education campaign fundamentally based as follows:

3.9.2.1 The recovery program is intended to be a long-term, permanent operation.

3.9.2.1.1 In this regard, a commitment to implementing the program should only be made after a careful, realistic analysis of recoverable materials has been made, the mechanics and cost of recovery have been defined, and market analysis shows that the program can be self-sustaining over a reasonable period of time, three years as a minimum.

3.9.2.2 The program is being implemented for practical, not only philosophical reasons.

3.9.2.2.1 The program should be based upon installation-specific economic advantages and incentives, supplemented by "it's the right thing to do" or "nice to have" environmentally related goals. People will be more receptive to, and positively motivated by a program which pays for itself through installation cost avoidance and/or net dollar returns than they will by non-specific (though desirable) statements of environmental improvement; the economics and the installation-specific relationships make the program more tangible and therefore acceptable to personnel.

3.9.2.2.2 Under these motivational aspects it is also important to show employees that any funds available, after covering expenses, can be spent to implement energy conservation and environmental improvement projects on <u>their</u> installation.

3.9.2.3 Installation command personnel visibly demonstrate that they are committed to, and involved with the recovery effort.

3.9.2.4 Instructions to personnel are simply and clearly stated, oriented to each individual's working area (if unique) and provided/explained to them on a personal basis.

3.9.2.5 Program progress reports to employees are provided on a frequent, timely basis, particularly during the first year of operation.

3.9.2.6 Personal contact is maintained between program managers, building coordinators and the employee to ensure rapid feedback and resolution of problems, questions and education of new employees.

3.10 Determining Wastepaper Sources and Estimating Recovery

3.10.1 A systematic approach must be taken to efficiently and effectively identify potential buildings for recovery operations. Engineers/planners can utilize Real Property Inventory Codes, paper inventory turnover records, carefully conceived questionnaires to and follow-up surveys to obtain building characteristics and parameters that can be used to develop estimates of recoverable grades of wastepaper and plans for the mechanics of recovery.

3.10.2 EPA civilian-sector-derived generation planning factors are not directly applicable to military installations. Because of differing market values, generation and usage characteristics of <u>each</u> high <u>grade</u> wastepaper, program analysts need to consider generation and recovery estimates for each grade. Computer card and printout paper estimates can be best achieved using forms distribution and base service store inventory records, respectively. Other white ledger can usually be estimated by using the number of employees in the buildings and a generation rate of 0.25 pounds per person per day in buildings in which traditional military administrative-type activities are performed.

3.10.3 All estimates have to take into account a recovery factor composed of (1) the amount of wastepaper available for recovery after accounting for permanent filing, defense classified paper destruction and other diversions from normal disposal; and (2) the anticipated effectiveness of recovering the wastepaper available for recovery. Computer cards are the easiest material to recover, followed by computer printout paper and other white ledger wastepaper, respectively.

3.10.4 Buildings with less than 100 employees should not be considered in a recovery program unless they generate significant quantities of computer printout paper and/or cards ("significant" may have to be determined through economic analysis). For buildings generating white ledger wastepaper and computer products program planners should consider alternative plans for recovery, such as:

- Computer cards only
- Computer cards and printout paper only
- Computer printouts and white ledger
  - combined into one category , or
  - separate categories
- Computer printouts only
- All three grades

-- computer card category, plus

-- computer printouts and white ledger

--- combined into one category, or

--- a separate category

3.11 Economic Analysis

3.11.1 A comprehensive cost and benefit analysis is necessary to reach a decision on whether or not to implement a wastepaper recovery program through a source separation system. The analysis should be performed after the planning stage and should consider alternative approaches based on recovery of one, two or all three high grade wastepaper components (computer cards, computer printout paper and white ledger paper).

3.11.2 The analysis must be based on an accurate accounting of current waste gathering (janitorial), collection and disposal operations and reasonable estimates of the costs related to recovered wastepaper gathering, collection, processing and storage requirements, publicity/education and administrative costs. Benefits accruing from sales of material and cost avoidance will have to be estimated in order to determine if, on balance, the proposed program will be economically self-sustaining (an Air Force goal) or require subsidization.

3.11.3 The analysis should consider both contracted services (either full or partial service) and in-house requirements. Decisions will have to be made when or if fully allocated cost or actual costs are appropriate for the analysis.

3.11.3.1 Fully allocated costs after implementation of the waste paper recovery program are projected costs based on the theoretical requirement for labor, equipment and space.

3.11.3.2 On the other hand actual costs are estimates of actual budgetary changes that may be expected based on average costs experienced at EPA and other installation program study locations. For example, many organizations have found that the janitorial costs of gathering wastepaper within a building were offset or internalized by reduced trash handling costs resulting in no change in overall janitorial waste handling costs or incremental costs for gathering of recoverable material.

3.11.4 The analysis will have to cover cost and benefits over a multi-year period because (1) experience has shown that it is unrealistic to expect a program to be economically self-sufficent in 1 year (unless limited to collectiion of only computer cards); and (2) no program should be implemented unless the installation is committed to a long range effort. Three (3) years should be used, as a minimum.

3.11.5 Theoretically, implementation of a waste materials recovery program can lead to reductions in operational resources needed to store, gather, collect and dispose of the wastes. In practice, installations will find it difficult to achieve tangible cost savings because many of the waste management activities are relatively insensitive to small changes in waste flows; contracts may not be amenable to near term changes/cost effective renegotiation; systems are probably not optimally efficient and absorb changes with little real positive or negative impact and installation personnel may find it difficult to take actions necessary to actually achieve resource reduction requirements.

3.11.6 Whenever planners decide to incorporate costs avoidance in the economic analysis, they should (1) not include them in the first year's economics since such things do not happen instantaneously, and (2) the proposed actions leading to the cost avoidance condition must be carefully documented as part of the implementation and operation plan in order to promote their chances of actually being carried out.

3.11.7 Janitorial trash gathering operations and outdoor container removal present the most realistic potential cost avoidance areas. Cost avoidance for each area is directly related to the percentage of waste (weight basis) removed from the office.

3.11.8 In the area of outdoor container removal and refuse collection in general analysis of cost avoidance potential revealed the following:

3.11.8.1 The commercial and industrial compactible waste collection system on an installation can be mathematically modeled to assist in estimating the cost impact resulting from implementation of a waste materials recovery program.

3.11.8.2 Proper assessment of cost impact requires comprehensive quantitative characterization of the local waste management system.

3.11.8.3 The highest potential for cost avoidance arises when a decrease in refuse quantity can be accompanied by removal of a collection vehicle and crew.

3.11.8.4 Some potential for cost avoidance exists when the decreased refuse quantity reduces the number of containers to be unloaded. However, the probability of achieving actual cost savings is low because of uncertainty associated with crew productivity (total collection time may remain constant under changing conditions) and the unlikelihood that any "freed up" hours can be gainfully employed for cost-offsetting tasks. Optimized collection operations are relatively insensitive (in terms of cost reduction) to small changes in equipment capacities and operating problems.

3.11.8.5 Some potential exists for achieving cost avoidance through reduction of the number of the outdoor containers used in the system, but only if they are actually removed from operation and value is received for them.

3.11.8.6 Cost avoidance is not achieved instantaneously. Phase out of equipment and labor is a gradual process that accompanies the growth-to-stability stages of the waste recovery program. Subsequently, predicted cost avoidance should not be included as first year savings in the cost analysis accompanying the feasibility studies for the recovery program.

3.11.9 Example recovery related program factors have been gathered/ developed from various programs and are listed in Table 10 for assistance in planning and analysis of a high grade wastepaper recovery program.

3.12 Implementation Plans

3.12.1 Competent program planning and analysis takes considerable time. It must be accomplished in consonance with normal budgeting and contract preparation schedule requirements.

SECTION II

HISTORICAL AIR FORCE RECYCLING PROGRAMS

1.0 GENERAL

1.1 The Department of Defense (DOD) and the Air Force have always had waste recycling programs for industrial materials. They were organized primarily because they were cost effective and not necessarily because of environmental consequences. (Reference 1).

1.2 In 1971 the Air Force responded to the Resource Recovery Act of 1970 and Executive Order 11514, Environmental Quality, by selecting 14 installations to participate in a six month pilot project to determine if the Air Force could reduce the volume of municipal-type solid waste by recycling. The specific objectives were to:

1.2.1 Test the availability of markets for recycling glass, paper and metal.

1.2.2 Determine the impact in the family housing area and other base activities of segregating paper, glass, and metal from other refuse.

1.2.3 Determine the economic aspects of separate collection and sale of recyclable materials (Reference 2).

1.3 Guidance and Instructions for implementing the test programs were very general in order "to allow relative evaluation of any feasible program". Consequently, installation programs ranged from continuing their contract for removal of all trash to a complete base-wide recycling program (Reference 3).

1.4 The results of the pilot study and follow-on programs at other installations were not favorable. Restraints on marketing, revenue usage, equipment and manpower resources, and inconsistent markets denied success for all programs (except for computer tab cards) from an economics standpoint (although they were "successful" when viewed as an ecological "step in the right" direction). The following paragraphs address the problems inhibiting long term success for these programs and the steps taken by Congress and DoD officials to mitigate their underlying causes.

2.0 RESULTS AND PROBLEMS WITH HISTORICAL RECYCLING ATTEMPTS

2.1 Markets and Marketing

2.1.1 At most of the installations, regional and local offices of the Defense Supply Agency (now called Defense Logistics Agency) were not initially set up to handle and/or failed to take "aggressive" action to identify potential markets for recycled material. Consequently, individual program managers actively sought and were often successful in not only making sales during market low periods, but in also locating buyers paying higher prices per ton than those identified through the local Defense Surplus Sales Office (now called the Defense Property Disposal Office (DPDO)) (Reference 5-9).

2.1.2 The reliability of this approach to finding markets was slated for failure because of two important factors:

2.1.2.1. In the absence of local DPDO support, the burden of finding markets fell on local program managers. Consequently, the potential for success relied on the continuity of highly motivated, aggressive personnel who had time to devote to the effort. However, changeover in military personnel responsible for this activity often did not result in someone with the aforementioned characteristics and/or the time needed for the program could not compete for the time required for programs that were in direct support of the installation's mission functions. In short, there were usually insufficient manhours available to accomplish a marketing task that was not the installation's responsibility.

2.1.2.2. In 1974, AFM 91-11, Solid Waste Management was published and emphasized that marketing was the responsibility of the local DPDO. In addition, the Defense Property Disposal Service (DPDS) issued instructions to all its regional and local marketing offices, and to all installation commanders, that all property segregated from the trash and waste stream as recoverable for basic material context and sold for recycling purposes would be merchandized and sold solely through the appropriate DPDS channels. (Reference 10-12). In effect, non-DPDS personnel were specifically prohibited from seeking markets for recyclables.

2.1.3 Successful programs depend in part on a steady market for the reclaimed materials. As a consequence, fluctuations in market demands for waste materials took its toll on the initially successful and many follow-on programs.

2.1.3.1 Where once some programs were aggressively pursued by installation personnel, a decreased demand for waste materials in the '74-75 time frame led to a low priority for recycling. Subsequently, installation programs suffered from a lack of daily attention to maintaining contact with potential markets, monitoring collection and segregation procedures, and educating base personnel. When coupled with significant problems in obtaining sufficient funding resources for operations (See paragraph 2.4) many programs were terminated (except for low key efforts to recover computer tab cards and occasional Scout activities in the family housing areas). (Reference 13).

2.1.3.2 A fiscal year 76 (FY 76) survey of solid waste management practices within the Air Force reinforced the observed impact that market downturn had on the earlier programs. By FY 76 20 out of 38 installations that had implemented programs, also had terminated them. Lack of markets was a very obvious influence because, although almost all the installations had originally conducted waste material market studies before embarking on the program, 12 of the 20 installations stated that the DPDO was interested but unsuccessful in locating steady markets. On the other hand, of the 18 installations current in FY 76, 14 indicated that their programs were successful (from an economic and/or base citizen support standpoint) and that DPDO success in locating markets appeared to positively support those programs. (Reference 14).

2.1.4 The need to meet stringent market specifications for recycled materials also had a strong influence on recycling success or failure. Fully 75 percent of those installations that terminated programs reported that market constraints on material preparation before sale impeded the sale of these materials. One-half of the installations with successful active programs and one-half of those with unsuccessful active programs also encountered material preparation constraint problems. (Reference 15, 16).

2.2 Procedures

2.2.1 Some installation recycling programs required the materials that were collected in specialized vehicles be delivered in those vehicles without additional handling. However, DPDOs indicated that no material could be delivered in US Government trucks.

2.2.2 As a consequence, this procedure ruled out contracting with potential buyers who would buy recyclable materials only when delivered directly to their facility. (Reference 17, 18). The alternative was a separate transportation contract which would then further impede the economic feasibility of the recovery program.

2.3 Contracts

2.3.1 Bid deposits, performance bonds, and voluminous contracts required by the Defense Supply Agency (DSA) (because of Government regulations) discouraged potential buyers. For example:

2.3.1.1 The DSA Invitations for Bid (IFB) used the same formats and procedures that were used for selling all DoD-generated surplus personal property. Most of the small secondary material buyers were unwilling to enter into what they considered a restrictive government contract, nor would they pay the required 20 percent bid deposit. The rules of selling the materials essentially prohibited small business men from buying and handling the low value materials. When buyers were found, the price was usually much lower than what the aforementioned businesses offered.

2.3.1.2 Another problem with the IFBs was that of their language. The small busines buyer often had difficulty understanding the comprehensive IFB package and therefore was very reluctant to do business with the Government (Reference 19-22).

2.4 Funding

2.4.1 Most, if not all, installation recycling programs suffered from the lack of financial incentives. A lack of operating funds and revenues necessary to recover program equipment and labor costs stemmed from a number of important factors. Among them:

2.4.1.1 Some of the original test installations were not granted O&M funds to buy or rent equipment to initiate the test program in 1971-72. They failed.

2.4.1.2 Until the latter part of 1974, no accounting mechanism existed that allowed proceeds from sales to be returned directly to the installation. Ten percent of the sale proceeds went into the DPDS Sales Expenses Account, and the remainder was deposited in a Budget Clearing Suspense Account. Disbursements from this account went to the Commissary Surcharge and Non-Appropriated Funds in amounts reflecting sales of material from their activities, and to the General Fund managed by the Air Force Accounting and Finance Center (AFAFC). Theoretically, funds from the General Fund could be disbursed to supplement installation O&M funds, but in reality no system was established to accumulate recycle net proceeds. Therefore, installations received no monies from the revenues that could offset their expenditures. Coupled with a lack of authority to budget for recycling program expenses, the base civil engineer had little motivation to spend any of his O&M monies on recycling that were originally budgeted for his real property mission-support activities.

2.4.1.3 In the latter part of 1974 DoD Directive 6050.3 was published and authorized an installation to retain net proceeds from sales of recyclables recovered from the consumer waste stream (i.e., refuse generated from the military family housing areas and barracks). However, no authorization was granted for revenue sharing from non-appropriated fund activities (i.e., installation administrative offices). This increased authorization did little to alleviate local recycling problems because (1) no budgeting authority was granted, and (2) high value waste materials (computer products, white ledger paper, etc.) were only available in the appropriated fund waste stream. Installations could not gain sufficient monetary return from the consumer waste stream to maintain a viable, organized recovery program; the office building wastes were needed to "subsidize" the rest of the program. (Reference 23-27).

2.4.1.4 Congress and the President attempted to provide further financial incentive when it passed Public Law 93-552 in December 1974. This law, in effect, contradicted guidance in the new DoD Directive, which was subsequently rescinded in March 1975. Essentially, the law stated that ...

> proceeds from the sale of recyclable material shall be credited first, to the cost of collection, handling, and sale of the material including purchasing of equipment to be used for recycling purposes and second, to projects for environmental improvement and energy conservation at military camps, posts, and base establishing recycling programs in accordance with regulations approved by the Secretary of Defense. The amount expended for environmental improvement and energy conservation projects shall not exceed $50,000 per installation per annum. Any balances shall be returned to the Treasury as miscellaneous receipts....(Reference 28).

2.4.1.5 In December 1975, installations were given authorization to budget trash and waste recycling (TWR) programs on a reimbursable basis. Earlier in the year they were also permitted to include "high grade bond and other miscellaneous paper products" among the recyclable materials for which they were eligible for net proceeds from sales. However, they were not permitted to receive revenues on the high value computer tab cards and computer paper. The latter limitation was removed upon the promulgation of DoD Directive 4165.60 in October 1976. (Reference 29, 30).

2.4.1.6 Despite the new Public Law, no changes in revenue access and budgeting procedures occurred until the promulgation of DoD Directive 4165.60 in October 1976.

2.5 Manning

2.5.1 Manpower positions were not authorized, and existing manning was inadequate to support recycling programs. Positions could only be created if Air Force manning studies assessed a need for such support; however, authorities would not conduct the studies because of a significant instability in the total program. The instability stemmed from variations in market conditions, changing economic factors and fragmentation of fund dispersals (i.e., funds returned either to source generators or DSA).

2.5.2 Without authorized positions permanent manning was not possible. Subsequently, an installations need for additional help resulted in repeated temporary civilian employee overhires for 90 days at a time. The repeated renewal of the temporary arrangements for "quasi-permanent operations caused continuous management problems." (Reference 31). The funds for these overhires either came out of O&M funds budgeted for other functions or in the case of one MAJCOM (SAC), from funds dedicated to programs.

2.5.3 Another feature of the programs that caused their failure was "borrowing" personnel from other civil engineering functions. This amounted to a "rob Peter to pay Paul" situation: Personnel taken from in-house work functions to support the recycling program eventually had to be returned because the mission support suffered. When this was done, the recycling program suffered because austere funding limited hiring of temporary replacement personnel. In-house manning resources were simply inadequate to support both the mission and recycling activities. (Reference 32, 33).

2.6 Equipment

2.6.1 Equipment used in recycling programs was not authorized in appropriate tables of allowances. This led to obtaining vehicles from salvage; fabrication of special vehicles; and commercial leasing. The vehicles were needed to collect material from around the installation and bring it to the staging points where it could be picked up by buyers.

2.6.2 Although Air Force auditors believed that the use of such vehicles and the resulting costs should be allayed by negotiating with buyers to pick up the recyclable materials at their original disposal points, Air Staff personnel were reluctant to issue guidance for such equipment selections because the programs were still "voluntary" and in the "embryonic" stage. Declarations of specific equipments would therefore be premature. Plus, Air Force policy was to allow maximum latitude and flexibility to the base recycling program manager in order to ensure his best position in the market place. This flexibility extended to selection of the best method for collection and pickup (Reference 34).

2.7 Economics and Cost Analysis Studies

2.7.1 The fiscal year 76 (FY 76) survey of the solid waste practices at 119 Air Force non-radar site installations revealed that 81 of them did not have, and have not had, a recycling program involving non-DoD surplus property (i.e., materials from the consumer waste stream). Of the 81 installations, 54.0 percent reported that cost analysis showed that such a program was not feasible; 14.3 percent reported that cost analysis supported the concept but other factors denied implementation. The remaining 31.7 percent reported that they considered recycling but did not conduct a cost analysis to determine its viability.

2.7.2 Of 20 installations that implemented and then terminated their programs, 40 percent did not conduct cost analyses to determine economic feasibility. In addition, 2 out of 4 installations with current (FY 76) programs termed unsuccessful failed to conduct a cost analysis. Only 10 out of 18 current programs (FY 76) were described as being successful from an economics standpoint. (The other 8 included the 4 unsuccessful programs and 4 which were considered successful from the standpoint of the support given the program by base citizens, and not from a cost posture.

2.7.3 In essence, while economic viability appears to be a key factor in deciding to implement currently successful programs, deactivated programs appeared to be strongly influenced by the good public image that they were perceived to convey.

2.7.4 Air Force policy promulgated in 1975 stressed the need to conduct a cost analysis and "establish appropriate recycling programs where economically feasible." (Reference 35-37).

2.8 Cardboard Recycling

2.8.1 Most installation recycled cardboard comes from retail activities. The FY 76 survey of solid waste practices indicated that over one-half (54.6 percent) of the 119 installations surveyed recycle cardboard from their Base Exchanges and Commissaries. A small percentage (6.7 percent) recycle other wastes as well as cardboard from these activities. The remainder did not recycle cardboard. (Reference 38).

2.9 Paper Conservation

2.9.1 A number of installations place emphasis on reducing the amount of paper products that they have to buy rather than accumulating used paper for sale or salvage. Air Force regulations and command supplements (e.g., AFR 101 and AFC 9-2/SAC Sup 1) promote these paper conservation practices. (Reference 39).

2.9.2 The most frequent practice is to utilize the services of the installation's reproduction/printing plant to convert old computer listings to writing pads, memo pads and paper for inter-office correspondence. Obsolete forms, old communications and bond paper wastes have also been used effectively.

2.9.3 The scope of these paper conservation efforts range from providing occasional writing pads to complete elimination of some paper purchases. At least one installation purchased a Forms Bursting Machine, which prepared used computer printout paper for scratch pads and enabled the base to eliminate the need for purchasing these frequently used paper items. (Reference 40). This practice is so successful that at least one command (SAC) has taken action to authorize a bursting machine for each of its installations. (Reference 41).

2.9.4 Other installations frequently use the reverse side of computer maintenance printouts or reuse paper when checking out new computer programs. Typists routinely use the blank side of old forms, etc. to type drafts on. The list of current paper reuse practices goes on and on and illustrates that many installations have found effective means for reducing costs and conserving natural resources. (Reference 42, 43).

2.10 Summary

2.10.1 Initially the success of a limited number of installations with recycling programs was attributed to their unregulated flexibility and the aggressiveness of personnel who were able to locate markets on their own. These program managers had considerable leeway in obtaining personnel overhires and unauthorized equipment to support programs that were receiving high visibility and command interest.

2.10.2 Eventually, however, the competition for dwindling O&M resources, inability to recover costs, and uncertain markets for recovered materials posed significant obstacles to operating successful recycling programs. As a consequence, many programs failed for as one installation commander noted:

> In today's environment, where military managers are constrained to operating within increasingly austere budgets, programs which are neither "cost effective" nor "mission essential" are luxuries which should be eliminated. (Reference 44).

2.10.3 The failure of many programs prompted the DOD to make changes in funding, revenue and resource availability in order to effectively promote materials recycling in consonance with national goals.

2.10.4 Paper conservation programs have provided cost effective alternatives to more highly visible and complex waste materials recovery efforts.

3.0 DOD POLICY AND GUIDANCE ENHANCEMENT

3.1 DOD Directive 4165.60

3.1.1 In October 1976 DOD published Directive 4165.60, "Solid Waste

Management-collection, Disposal, Resource Recovery and Recycling Program." (Reprinted in Appendix A). This document added critical funding and revenue sharing provisions that were previously unavailable to military installation managers. Coupled with subsequent Air Force implementation directions the new provisions will improve the potential for operating base recycling programs on an effective basis.

3.2 Highlights of Policy Changes

3.2.1 Revenue Entitlement

3.2.1.1 Base recycling program authorities, usually base Civil Engineering, will receive net proceeds from the sale of high grade wastepaper generated by appropriate fund activities. This entitlement was prohibited by previous guidance and is meant to provide a financial incentive for installation authorities.

3.2.1.2 The net proceeds will be used first to reimburse expenses incurred in operating the resource recovery program and then to finance special projects up to $50,000 per installation per fiscal year for environmental improvement and energy conservation.

3.2.2 Budgeting

3.2.2.1 Each program/operating agency will budget for the trash and waste recycling (TWR) program as a part of its reimbursable program. The reimbursement budgeted should be sufficient to fund TWR proceeds, including those in excess of the TWR program expenses (i.e., free assets) which are returned to the operating agency (e.g., base Civl Engineering).

3.2.2.2 TWR expenses in excess of proceeds must be funded from within available direct funding authority. Sustained requirement for direct funds forms a basis for requesting an exception to mandatory participation in the TWR program.

3.2.2.3 This provision overcomes previous funding problems in that the base Civil Engineer does not have to utilize funds originally budgeted for other work efforts to cover program expenses (unless expenses exceed budgeted amounts). Concommitantly, it should lessen cash flow pressures generated by the gap between expenditures and revenue receipts.

3.2.3 Manning

3.2.3.1 Military personnel expense may not be reimbursed. However, hire of civilians and/or contractors to support the program are reimbursable from the net proceeds.

3.2.4 Equipment

3.2.4.1 Use of existing Government equipment is recommended. New/additional equipment should be procured through the appropriations (i.e. direct funds) normally available for equipment acquisition.

3.2.4.2 If, however, the installation estimates that after-expense funds will cover the cost of a new piece of equipment (such as a baler) and can be obligated <u>before</u> the next fiscal year, then purchase can be made from TWR proceeds. Funds <u>cannot</u> be carried over from one year to the next, which means that there is no possibility of combining proceeds from more than one year to cover large capital investments.

3.2.4.3 It is the intent of the source separation program to recover materials and dollars with minimum capital investment.

3.2.5 Cost Analysis

3.2.5.1 Air Force policy is to implement recycling programs only if economic analysis shows them to be self-sustaining.

3.2.5.2 However, any command or any base can support a non-self sustaining program if they wish to direct fund it. (Reference 45-47).

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SECTION III

RECYCLABLE PAPER AND THEIR MARKETS

1.0 INTRODUCTION

1.1 It is important for all installation project management personnel to understand what it is they are being asked to recycle before they attempt to analyze the potential for a program. "High grade office paper" is meaningful to marketing personnel, but to most employees "paper is paper" and the seemingly large quantities found in the wastebasket are often perceived as being equally recyclable and therefore, equally valuable.

1.2 In reality, there are many grades of wastepaper, each of which distinguishes the use of the paper as a secondary material (as opposed to a virgin material) for specific industry uses. The technology and economics involved with these user industries further define specifications within each wastepaper grade, all of which combine to establish values for the grades. Hence, although manila tabulating cards and letterhead paper are classified as "high grade", in reality they are two different grades with considerable differences in value because of user industry requirements and market demands. These grades are illustrated/ listed in Appendix B.

1.3 Consequently, the remainder of this section will describe types and use of wastepapers found on military installations and the value of discriminate wastepaper separation, and the risks inherent in recovery of waste materials which have a history of demand and price instability. The information does not represent an attempt to make program managers experts on marketing and/or to enable them to replace the DOD marketing authorities described in Section V of this report (recycling programs, in effect, are business operations and marketing responsibility must be left up to those authorities). However, program planners and managers should have this background information in order to understand the seemingly restrictive merchandizing/sale preparation requirements of most materials, and the value of segregating certain materials from others at their source.

2.0 DEFINITION AND USE OF PAPERSTOCK

2.1 Paper Stock

2.1.1 The paper industry produces products in three broad categories:

2.1.1.1 Paper: Newsprint, printing paper, tissue, kraft packaging, and other specialty papers.

2.1.1.2 Paperboard: Linerboard, corrugating medium (i.e. components of corrugated boxes), boxboard (both food and non-food board), chipboard, tube board, and specialty boards.

2.1.1.3 Construction Paper and Board: Roofing felt, insulation board, gypsum linerboard, and othr specialty products. (Reference 1).

2.1.2 In industry terms, wastepaper recycled for reuse is called "paperstock." Historically, it has been used primarily in the paperboard segment of industry which consumes nearly 70 percent of all wastepaper recycled in the United States. The paper and construction product segments accounted for approximately 19 and 11 percent of its use, respectively (Reference 2-4).

2.1.3 Corrugated cardboard has been the most important grade of paperstock in terms of volume. For example, in 1976 corrugated represented nearly 40 percent of the wastepaper tonnage recycled - more than twice the newspaper tonnage, which represented about 17 percent of total paperstock utilized by industry. (Reference 5).

2.1.4 On the other hand, high grades of wastepaper are considered more valuable in the marketplace than other paperstock because they can be used as a substitute for virgin fiber/woodpulp in the papermaking process; high grades essentially represent all the wastepaper used in the paper category of industry. Despite this, high grade paperstock has accounted for only approximately 7 percent of total raw material for paper production. (Reference 6-7).

2.1.5 General benchmarks for wastepaper use are as follows (Reference 8-10):

Product	Primary Wastepaper Type Used
Printing paper, tissue	High grade, e.g. discarded printing paper
Newsprint	Old newspapers
Linerboard, corrugating medium	Corrugated containers
Boxboard, chipboard	Corrugated containers, old newspapers, mixed paper, high grades
Construction paper and board	Mixed paper, old newspaper, corrugated containers, high grades
Insulation	Old newspapers

2.2 Paper/Board Mill Capabilities

2.2.1 Although there are numerous paper and paperboard mills located throughout the United States, many are not equpped to utilize available or potentially available paperstock. Processing equipment to repulp, refine and clean reclaimed fibers is significantly different from the pulping equipment used to process wood pulp (virgin) fibers. Many recycling mills are equipped to repulp reclaimed fibers only. Mills using primary fibers, such as round wood, chips and wood residues are not likely to be equipped to repulp wastepaper. This situation seems to be changing, however. For example, prompted by a need to expand during a period when the cost of expansion is rising "steeply," many linerboard mills in the south and northwest are finding that use of secondary fiber makes it possible to expand incrementally at "relatively low cost" by adding the processing equipment necessary to prepare paperstock for mill use (Reference 11-13).

2.2.2 A list of paper recycling plants in the continental United States (CONUS) as determined during a 1974-77 marketing survey by the Defense

Property Disposal Service (DPDS), is provided in Appendix C. The grade of scrap paper and level of consumption per plant was not determinable, any plant may use scrap paper as all or only a small portion of its raw material input (Reference 14).

2.3 Industry Paperstock/Wastepaper Guidelines

2.3.1 Grades:

2.3.1.1 To provide uniform guidance for buying wastepaper according to industry needs, wastepaper is classified and sold by grades. The value of each grade is established by specifications set by industry users, and by the demand for the material.

2.3.1.2 As part of the National Association of Recycling Industries (NARI), the Paperstock Institute of America list 47 generally used paperstock grades, with brief specifications for each in their circular PS-74, "Paper Stock Standards and Practices." (See Appendix B). The circular also list 26 specialty grades which normally will be of little interest to military recycling program managers.

2.3.2 Specifications:

2.3.2.1 Each grade of paperstock is defined by specifications which describe the acceptable forms of the wastepaper, and the percentage of certain contaminants which can be tolerated within the respective grades.

2.3.2.2 Descriptions of acceptable forms of paperstock range from commonly recognized paper such as newspaper and brown kraft bags, to paper that is defined in terms of the original fiber pulp, such as groundwood, sulphite and sulphate; they can also specify whether the product is bleached or unbleached.

2.3.2.3 Of critical importance to determining the marketability and value of wastepaper is the degree to which the material is free of contaminants. Anything other than the material tolerances specified in each grade is considered a contaminant. These material tolerances address the inherent presence or absence of contaminants e.g., clay, water-insoluble adhesives, and certain chemicals added to some paper or board products to give them "wet strength." They also consider the amount of contamination inherent in the paper's use (e.g. the commissary's food wrappers versus "cuttings" from a box plant).

2.3.2.4 In industry terms, material tolerances of contaminants include "outthrows" and "prohibitive materials," defined as follows:

2.3.2.4.1 "Outthrows: All papers that are so manufactured or treated or are in such a form as to be unsuitable for consumption as the grade specified."

2.3.2.4.2 "Prohibitive Materials: a) Any materials which by their presence in a packing of paperstock, in excess of the amount allowed, will make the packing unusable as the grade specified (b) Any materials that may be damaging to equipment." (Reference 15-17).

2.4 Applicable Military Paperstock Grades and Specifications

2.4.1 White Ledger:

2.4.1.1 High grade wastepapers (aside from tabulating cards described in paragraph 2.4.2, below) retrievable on military installations commonly include:

- Computer printout
- Forms and bond office paper
- Onion skin/letter-manifold white paper
- Plain (uncoated) bond copy paper.

. Reproduction/print plant cuttings and excess copies.

2.4.1.2 These wastepapers fit the "#1 sorted white ledger" grade of industry, which:

> Consists of printed or unprinted sheets, shavings, and cuttings of white sulphite or sulphate ledger, bond, writing and other papers which have a smiliar fiber and filler content. This grade must be free of treated, coated, padded, or heavily printed stock.
>
> Prohibitive materials - none permitted
>
> Total outthrows may not exceed - 2%

2.4.1.3 Typically, all white paper with black ink is high grade white ledger. The white sulphite ledger of the #1 sorted category includes lightweight office papers (bond, plain (uncoated) bond copy paper, and onion skin/manifold paper). The other kind of qualifying white ledger, the sulphates, consist of heavy white or colored papers most commonly used as mailing envelopes, business cards and report covers (Reference 18, 19).

2.4.1.4 Most office papers are sulphites; however, there are low grade office papers uses, such as the off-white scratch pads, that fit in the news or mixed paper categories because of "groundwood" content. These papers are classified as contaminants in high grade. (See description under paragraph 2.4.8, contaminants). (Reference 20, 21).

2.4.1.5 Other forms of white ledger include blue and green striped computer printouts and non-glossy pages of books and magazines. Usually, computer <u>printout paper</u> can be sold as a <u>higher value</u> wastepaper when it is kept separate from other white ledger. Items 44 and 46 in Figure 1 illustrate this difference (the annotated figures represent dollar per ton received from the items). Care must be taken, however, to not include impregnated, pressure sensitive multipart computer paper; as discussed in paragraph 2.4.8.3.10, it is a low value paper that is a contaminant when mixed with #1 sorted paperstock. Usually they are considered worthless, although some buyers will buy it as a colored ledger or mixed paper grade. (Reference 22 -25).

2.4.2 Tabulating Cards

2.4.2.1 Manila tabulating cards, or computer cards as they are commonly referred to, fit into the grade called "manila tabulating cards." This grade:

> Consists of printed manila - colored cards, predominately sulphite or sulphate, which have been manufactured for use in tabulating machines. This grade may contain manila - colored tabulating cards with tinted margins.

2.4.2.2 "Colored tabulating cards" is another grade. It:

> Consists of printed colored or manila cards, predominately sulphite or sulphate which have been manufactured for use in tabulating machines. Unbleached kraft cards are not acceptable.

2.4.2.3 Both of the above grades are further specified by the following limitations:

> Prohibitive materials - none permitted
>
> Total outthrows may not exceed - 1%
>
> (Reference 26)

2.4.3 Colored Ledger

2.4.3.1 Colored ledger such as manifold tissue paper used for file copies of correspondence, non-glossy report covers, flyers, memo forms, et. cetera can be sold as "#1 sorted colored ledger." This grade:

Consists of printed or unprinted sheets, shavings, and cuttings of colored or white sulphite or sulphate ledger, bond, writing, and other papers which have a similar fibre and filler content. This grade must be free of treated, coated, padded, or heavily printed stock.

2.4.3.2 Other specifications include:

Prohibitive materials - none permitted

Total outthrows may not exceed - 2%

2.4.4.2 Staging area/files depository paper would fall within this grade in an "as is" condition (i.e, without removal of the metal clips, rubber bands, brown kraft folders, etc).

2.4.5 Newspaper:

2.4.5.1 Collected newspapers would be graded as "#1-news," which "consists of baled newspapers containing less than 5% of other papers."

2.4.5.2 Other specifications include:

Prohibitive materials may not exceed - ½ of 1%

Total outthrows may not exceed - 2%

2.4.6 Corrugated Cardboard:

2.4.6.1 Corrugated cardboard from transporation and receiving areas and supply warehouses would be graded as "corrugated containers," which "consists of baled corrugated containers having liners of either jute or kraft."

2.4.6.2 Other Specifications Include:

Prohibitive materials may not exceed - 1%

Total outthrows may not exceed - 5%

(Reference 27)

2.4.7 Defense Logistics Agency (DLA) Paperstock Classifications:

2.4.7.1 As discussed in Section V, the Defense Logistics Agency through the Defense Property Disposal Service (DPDS) and its regional and local offices, will normally sell the paperstock recovered from military installations. When listing the material, the DPDS uses their own Handbook Scrap Classification List "SCL" Code that, when combined with a description of the waste material and its processed form, provides buyers with information similar to the paperstock grades.

2.4.7.2 The applicable Scrap Classification List "SCL" codes are listed in Table 1.

2.4.7.3 Figure 1 provides an example of an Invitation For Bid (IFB) that lists six different grades of paperstock recovered from Ft Lewis, Washington. Note how some items (e.g., 44, 46 and 47) have the same codes; however, the descriptions carefully disciminate the wastepaper materials. The IFB is distributed to potential buyers and it is their responsibility to inspect the paper before sale and make their own observations of the paperstock's quality. However, if the paperstock was recovered for sale through a long term contract, quality specifications would have been established and it would be the responsibility of the military installation to ensure that those quality specifications were met. (Reference 28-33).

2.4.7.4 Note the annotated dollars per ton for items 44-47 on Figure 1. They represent the actual monies per ton successfully bid for each of those items, and illustrate the significant differences in value between marketing mixed paperstock (item 47) and #1 standard white ledger grade materials (Items 44 and 46).

TABLE 1. DLA STANDARD WASTE AND SCRAP CLASSIFICATION LIST
(Scrap Classification List "SCL" Code)

SCL Code	Description
A01	Tabulating cards. Manila-colored (includes manila-colored cards with tinted edges) cards should be segregated and sold separately from other colored cards.
A02	Ledger. White ledger stock should be segregated from colored ledger stock.
A03	Newspaper. Offer for sale as "No. 1 News," consisting of clean waste newspaper.
A04	Books and magazines.
A05	Mixed paper. Free of any nonpaper substances that cannot be manufactured into paper or products by the process normally used for making paper. Obsolete forms with carbon inserts should be segregated and sold separately.
A06	Old corrugated and cardboard.

IFB 41-8194
IT HAS BEEN DETERMINED THAT THIS PROPERTY IS NO LONGER NEEDED
BY THE FEDERAL GOVERNMENT
SEE INSIDE FRONT COVER FOR NAME, ADDRESS, TELEPHONE NUMBER
OF PERSONS TO CONTACT FOR FURTHER INFORMATION AND OR
INSPECTION OF PROPERTY LISTED IN THIS IFB

ITEMS 42 THRU 68 ARE LOCATED AT FORT LEWIS, WA.

42. Tabulating cards, manila, scrap: Including some tinted edges.
Inside - Bldg 9744 - A01A*A - Loose in triwalls which are banded to 18 pallets included in weight and sale

16 Net Ton

43. Tabulating cards, colored, scrap: Mixed colors including manila.
Inside - Bldg 9744 - A01A*A - Loose in triwalls which are banded to 4 pallets included in the weight and sale

4 Net Ton

44. Paper, scrap: Including high grade computer print out paper.
Inside - Bldg 9744 - A02A*A - Loose in triwalls which are banded to 66 pallets included in the weight and sale

$ 96.10 40 Net Ton

45. Paper, Scrap: Consisting of newsprint.
Inside - Bldg 1210 - A03A*A - Banded to 65 pallets included in the weight and sale

$ 42.25 32 Net Ton

46. Paper, mixed, scrap: Including forms and bond paper.
Inside - Bldg 1210 - A02A*A - Loose in triwalls which are banded to 35 pallets included in the weight and sale

$ 44.97 13 Net Ton

47. Paper, mixed, scrap: Included envelopes, computer printouts, correspondence paper and carbon impregnated paper.
Inside - Bldg 1210 - A02A*A - Loose in triwalls which are banded to 106 pallets included in the weight and sale

$ 15.00 34 Net Ton

Figure 1. Excerpt from DPDS IFB

2.4.8 Contaminants and Their Impact:

2.4.8.1 As discussed in earlier paragraphs, paperstock value is a function not only of the underlying wastepaper and market demand, but also on the purity or freedom from contamination of the recovered material. Recovery program penalties can be quite severe if buyers have to lower their purchase price to a mixed grade equivalent in order to compensate for the extra processing needed to remove contaminants. They may even reject contaminated loads altogether. The following information illustrates the monetary penalties that can be suffered when high grade papers are mixed/contaminated with lower grade paperstock or other undesirable items.

2.4.8.1.1 The Environmental Protection Agency (EPA) has observed that a three percent increase in mixed paper led to a 90 percent decrease in value of original high grade wastepaper (Reference 34).

2.4.8.1.2 In the middle of 1976 the DLA was receiving $165-220 per ton for computer tab cards. When mixed with low grades of paper, the price dropped to $5-20 per ton thus, approximately $200 (or 90 percent) per ton was lost when the paper grades were mixed. (Reference 35).

2.4.8.1.3 In the middle of 1976, a non-profit, successful community recycling organization was able to sell computer printout paper for $140 per ton. The same buyer would pay only $25 per ton for the same paper when it had carbon paper mixed in with it (an 82 percent loss). (Reference 36).

2.4.8.1.4 An employee's lack of understanding regarding removal of contaminating items from colored ledger resulted in a 93 percent loss of revenue on an installation's sale of colored ledger; the loss resulted from the buyer's need to sort out the contaminants. (Reference 37).

2.4.8.2 In review of industry requirements and marketing histories, the following clearly emerges:

2.4.8.2.1 Uniformity in meeting material tolerance product quality is highly desired.

2.4.8.2.2 The more homogeneous the paperstock is, the more valuable it is. (i.e., don't mix tab cards and other grades together; the most value will be in selling the grades separately).

2.4.8.2.3 The lower the level of outside contaminants such as metal, dirt, et. cetera, the higher the value of the paperstock. (Reference 38).

2.4.8.3 Common contaminants to be avoided include the following:

2.4.8.3.1 Groundwood-Content Papers

2.4.8.3.1.1 "Groundwood" can be recognized by occasional light to dark brown slivers in a sheet of paper. It is particularly noticeable in newspapers since they utilize groundwood fiber, rather than pulped fiber. Groundwood is a contaminant in both white and colored ledger grades.

2.4.8.3.1.2 One reason that groundwood is undesirable, except for #1 News grade, insulation, etc, is because the fibers are formed through grinding of wood, rather than mixed with water in a hydrapulper to separate the fibers. The grinding action produces a shorter fiber than pulping does and this makes it less desirable for use in high value products that usually require long wood fibers in their production.

2.4.8.3.1.3 Another, perhaps more important reason for its undersirability in high grade paperstock is its inability to withstand deinking processes used on high grade wastepaper. Ink used on high grades are stronger than those used on groundwood-content papers. As a consequence, a strong deinking process is used with high grade paperstock which can dissolve up to 90 percent or more of the short groundwood fibers present in the process. Hence, high grade buyers cannot afford to buy paperstock with this fiber. (Reference 39).

2.4.8.3.1.4 Groundwood paper doesn't show up in only newspaper; it is also evident in off-white type colored writing pads, and in computer type printout paper that may be used in Aircraft Maintenance functions, et. cetera. Each installation will have to sample their office-type waste streams to identify possible usage of groundwood-content paper; a spot check may be insufficient since it may appear in one purchase of the original product and not another, even though the Federal Stock Number remains the same. (Reference 40).

2.4.8.3.2 Envelopes with windows not made of cellophane are contaminants.

2.4.8.3.3 Envelopes with water-insoluable adhesives are contaminants.

2.4.8.3.4 Books with bindings are glue intensive and are contaminants.

2.4.8.3.5 Magazines, particularly those with glossy pages, are high in clay content and are considered low grade.

2.4.8.3.6 Card stock has clay content and is considered low grade.

2.4.8.3.7 Rubberbands, tape and plastic clips are unacceptable.

2.4.8.3.8 Staples and paper clips are <u>acceptable</u> in minor amounts; essentially, these items don't "cook" and fall out of the repulping process, however, a ton of envelopes with paperclips on each is considered a contaminated load.

2.4.8.3.9 Carbon paper is a contaminant (this refers to the actual carbon sheet used to make copies, not the "carbon-copy" itself).

2.4.8.3.10 "Sensitized" copy paper, which is also called ink-impregnated-pressure-sensitive paper used to make copies without carbon paper is a contaminant in high grades. Usually used where copies of receipts are needed, (such as retail stores on-base) or in computer processing areas where multipart copies are needed, this paper may have little or no value as a paperstock.

2.4.8.3.11 Computer printouts with colors other than blue and green stripes are considered colored ledger only.

2.4.8.3.12 Computer printout paper with recycled paper content may be considered mixed or colored grade rather than high grade by some buyers.

2.4.8.3.13 Map paper treated to give it "wet strength" is a contaminant.

2.4.8.3.14 Blueprint paper made with Diazonium salts are considered low grade. In general, blueprint paper is accepted as colored ledger if it represents less than 20 percent of the whole amount being marketed.

2.4.8.3.15 Generally, any paper that is white (sulphite or sulphate) with other than black ink is considered colored ledger.

2.4.8.3.16 Shredded paper (produced from classified destruction action, etc.) that is less than ¼ inch in size is a contaminant. This also includes computer tab card "punchings" from data processing functions. Some paperstock buyers will not accept papers less than 3/8 inch in size. Essentially, the fiber length is too short to have any further value.

2.4.8.3.17 Cardboard or clipboard are contaminants in high grades. (This includes file folders).

2.4.8.3.18 Chemically loaded copy paper and gummed labels are contaminants. (Reference 41-49).

2.4.8.4 The American Paper Stock Institute publishes useful quality control aids, including a Handbook of Contaminants which gives actual samples of each contaminant generally found in wastepaper (Reference 50).

3.0 WASTEPAPER - A VOLATILE MARKET

3.1 Characteristics of the Market:

3.1.1 During World War II, approximately 35 percent of all paper consumed in the United States was eventually recycled. By the mid 1970's paperstock only accounted for a little over 20 percent of the fibrous raw material used in the production of paper and paperboard. This usage represented the lowest percentage of paperstock consumed in all developed countries. (Reference 51-53).

3.1.2 One of the most important reasons behind the drop and subsequent maintenance of a low level of usage is economics. During the past 20 years nearly all newly built paper mills were designed to process only virgin fibers; and they were usually located near or within their respective woodsheds in order to minimize transportation expenses. An important economic incentive behind the construction was, and remains, favorable tax treatment of virgin timber profits that is not available to wastepaper. Coupled with a transportation rate structure that historically favored virgin materials (in order to spur natural resource development and economic growth during the first half of the 1900's) and fluctuating demands for recycled paper products, many paper mills have found it economically infeasible to convert to facilities capable of utilizing paperstock. In addition, the mills distances from major wastepaper producing urban centers have discouraged conversion. (Reference 54-57).

3.1.3 Nontheless, there are many mills that can utilize secondary material, in whole or part, as reflected in the number of plants listed in Appendix C. As discussed in paragraph 2.2, there also appears to be a trend for more plants to expand their capacity at a relatively low cost by adding processing equipment necessary to prepare paperstock for mill use. The "tight" fiber supply situation of 1973 and early 1974 in particular, required many paper and paperboard mills to adjust their fiber preparation processes in order to utilize wastepaper as a basic fiber source rather than as a secondary or substitute fiber.

3.1.4 There are significant risks for organizations embarking on wasterpaper recovery programs. These risks stem from the historical volatility of the paperstock market which has exhibited significantly wide fluctuations in material demands and price.

3.1.4.1 Scrap paper is not an economic leader but follows the course of the economy. When the economy is healthy, the demand for paper products increases, and vice versa. Within this framework of paper production, wastepaper seems to extend the virgin fiber supplies of mills that have integrated paperstock processing equipment into their systems. Other mills use the paperstock as a primary feedstock for producing paper products demanded by the economy.

3.1.4.2 When the economy slows down it reduces paper product demand. This results in integrated mills cutting back on their secondary materials' use since economics requires that they utilize their major virgin resources in times of slack production. Similarily, mills heavily dependent upon paperstock will cut back on their supply demands because they have a lesser need for papermaking fibers as a whole. (Reference 58-61). Given this nature of its utilization, wastepaper is a marginal material that is "in demand only when virgin fiber is scarce and the first to go when final product demand diminishes." (Reference 62).

3.1.4.3 Another contributing factor to instability in market prices is the time lag involved in supplying wastepaper.

3.1.4.3.1 Unlike virgin pulpwood resources, wastepaper supply cannot be "simply turned on and off." It originates from the daily mainstreams of residential, commercial and industrial activities, which means that there is no implicit correlation between the rate of wastepaper generation and papermaker's demands (which is dictated by their product demand).

3.1.4.3.2 When paper demand drops, the wastepaper demand drops. On the other hand, if and when it rises rapidly, accompained by a similar demand for wastepaper, the latter may be in short supply because of the time lag inherent in restablishing generation networks, collection systems and recovery habits. All of this may be difficult to reachieve because of disenchantment resulting from the inability of former recycling programs to maintain themselves during low demand periods. By the time a program is restablished demand may have leveled off or even dropped. (Reference 63). Consequently, the market and price level upon a recycling program's inception (or re-inception) may be quite different than when initially conceived.

3.1.4.4 Inventory practices of paper mills can further aggrevate price instability. The mills usually retain less than a 30-day supply of wastepaper. "A 90-day supply, on the other hand, would remove a great deal of the cyclical urgency from adjustments in the incoming material flow." Whenever the element of urgency is removed from the supply-demand process, there is a better chance to improve price stability. (Reference 64).

3.1.4.5 Geography is also important to the availability of markets and prices. To some extent subsets of the aforementioned factors are regional in scope. Hence, an installation attempting to market a particular paperstock grade in the northeast will often not have the same market conditions in the northwest, even though the paperstock has the same characteristics and is available during the same time frame. A dramatic example of this market phenomena was observed in the early summer of 1978 when a Defense Property Disposal Office (DPDO) in Pennsylvania couldn't sell corrugated cardboard; at the same time, a DPDO in the state of Washington was able to sell its corrugated cardboard at 138 percent of the prevailing San Francisco market! The main difference in the regional capabilities was the overseas demand and availability of closely located shipping ports from which to transport the available cardboard to Pacific Ocean overseas customers. (Reference 65-67).

3.2 Market Behavior: 1973-78

3.2.1 The behavior of the paperstock market during the period 1973 - 1977 illustrates the impact of the aforementioned factors. (Reference Figures 2, 3 and 4).

3.2.1.1 In 1973 and 1974 the demand and prices for wastepaper rose significantly and was accompained by a growth of many recycling programs across the United States. By the fall of 1974 high and low grades were selling at their peaks. However, abetted by an economic recession of several months duration, the market "dried out" and within six to twelve months high grades had fallen as much as 50 percent in price and barely moved. Low grade prices fell

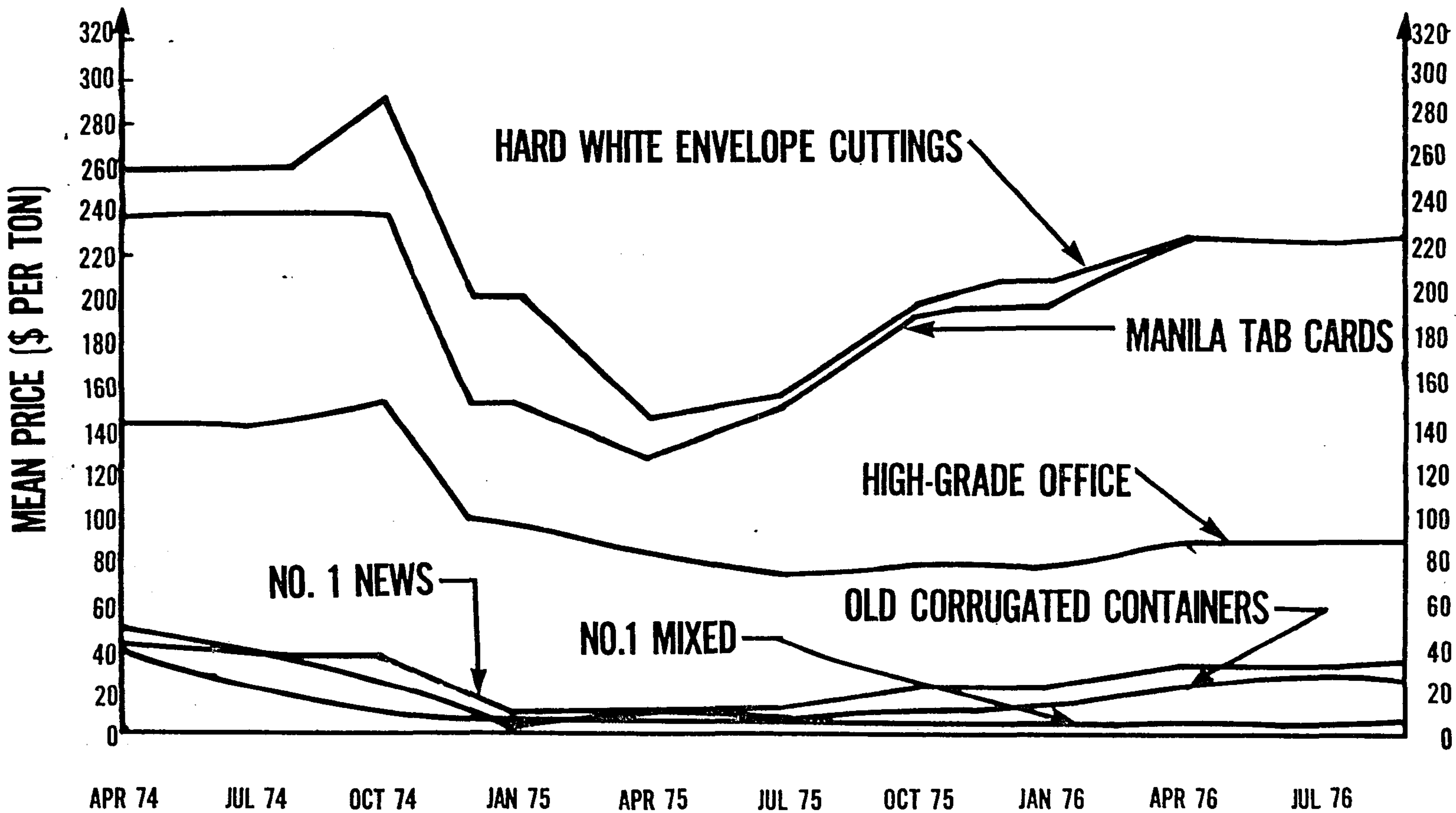

Figure 2 PRICE TRENDS FOR SPECIFIC PAPER GRADES 1974-1976

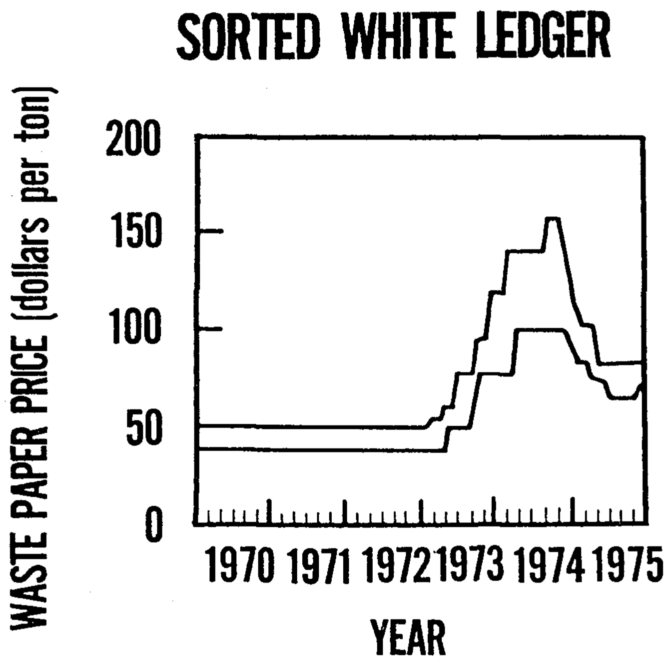

Figure 3. Sorted White Ledger Market Performance

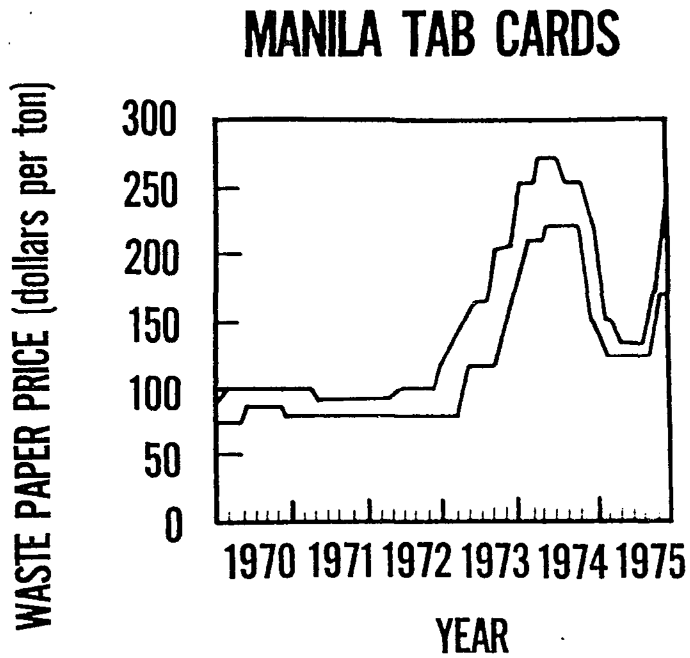

Figure 4. Manila Tab Card Market Performance

even more substantially and for close to a year could not be given away and often had to be dumped in the landfill. Overall, wastepaper utilization dropped 26 percent to its lowest point in decades. Many recycling programs that were unprotected by guaranteed markets closed down. (Reference 68-72).

3.2.1.2 In the last quarter of 1975, recycling mills picked up their consumption of paperstock by 14 percent over the last quarter of 1974. The increase was largely caused by the "upward trend in the economy" and the use of wastepaper inventories rather than reliance entirely on virgin resources by many integrated mills. (Reference 73). In addition, a growing demand for wastepaper overseas during this period made 1975 the second best in history for wastepaper exports. In consequences, market prices began to recover in certain grades.

3.2.1.3 Despite improvements in the economy in 1975-76, they were insufficient to improve the share of the market for recycled paper. A primary influence on lowered demand was the growth of surplus worldwide pulp inventories and the wide availability of pulp substitutes and roll pulp. Only the highest white ledger grades exhibited strength in market demand and prices. Newspaper also showed growth because of increased demand in the manufacture of new newsprint. (Reference 74-76).

3.2.1.4 The market for 1977 remained fairly stable for basically the same factors mentioned for 1976. Of significant note was the introduction of a new market factor which dramatically changed the demand and prices of old newspapers. The Presidential call for increased energy conservation, the severe winter of 1976-77 in the eastern United States, and possible retroactive tax credits for home insulation likely combined to increase the demand for building insulation. In response manufacturers of cellulose insulation doubled their demand for newspapers; consequently, the price rapidly escalated to around $85 per ton.

3.2.1.5 The demand continued to increase into 1978 and recycling organizations continued to grow in response. Then, somewhat typical of the boom and bust cycles of recycling, the demand dropped dramatically because of a shortage of boric acid used by most manufacturers to provide flame retardant protection to the insulation, and to slackened demand for the insulation itself. Hence, by September 1978 the price had dropped to $30 per ton, leaving waste paper dealers with unsold inventories and high storage costs, and environmental groups concerned that the "slump" would close recycling centers. (Reference 77-83).

3.2.1.6 In California, the experiences of a recycling program contractor illustrate how unique market dynamics can be on a regional basis.

3.2.1.6.1 The contractor was able to market computer printout paper (CPO) at a price significantly above high grade white ledger paper (WL). For example, in June 1978, he received $112 per ton for CPO, versus $53 per ton for WL. He was also able to increase the CPO tonnage by including white paper printed on one side, rather than putting it in with the lower value white ledger. However, his market softened, the mills tightened up on what they would accept and restricted him from including any more white paper as CPO. During this time the price of CPO rose slightly, but WL remained constant.

3.2.1.6.2 As the market softened, the contractor also experienced the phenomena of colored ledger exceeding the value of white ledger. This value-role reversal was attributed to the buyers in the region achieving "maximum exposure" with the white ledger; the flow of high grade white ledger paper reached the point where the market's capacity to handle greater flows decreased and the price for the paper reached an equilibrium level. Concurrently, colored ledger rose in value as the market attempted to meet those demands. (Reference 84-85).

3.3 <u>Price and Demand Stability - High Grades</u>

3.3.1 Reference Figure 2.

3.3.2 The 1974-77 market period showed that better grades maintained their demand and level of prices longer and continued to bring "reasonable" prices during the entire recession. Lower grades began their price slide earlier than higher grades and often couldn't be given away during the recession, necessitating landfill or other disposal means. (Reference 86, 87).

3.3.3 Computer tab cards and computer printout paper consistently outperformed other forms of paperstock.

4.0 LESSONS LEARNED

4.1 The following points are drawn from the preceeding discussions and are directly applicable to installation personnel given the task of planning and implementing (if economically feasible) a wastepaper/ paperstock recovery programs.

4.2 The price paid for paperstock varies according to the type of pulp in the paper, the level of contaminants, and the demand for paperstock. The demand for paperstock is dependent on finished paper product demand, and the availability and price of wood pulp. Merchandizing scrap paper in a manner advantageous to potential buyers is a key to improving its demand.

4.3. "High grade paper" is made up of more than one grade of paper, with differing specifications and value for each.

4.4 The highest revenues per ton can be derived from tabulating cards, computer printout (blue or green striped) and white bond paper, when segregated by grade in that order.

4.5 High grades maintain their market demand and level of prices longer than low grades during period of economic downturns.

4.6 There are many contaminants in the installation office waste stream which, in relatively small quantities, can significantly lower the value of selected wastepapers. Contaminants can include recyclable paper in a quantity of other paper that is not of the same grade. Quality control is therefore "extremely" important in wastepaper recovery programs.

4.7 The wastepaper/paperstock market is highly volatile and economic benefits may not always be possible. Installations should attempt to minimize their potential for losses by:

4.7.1 Concentrating on high value recyclables, and

4.7.2 Obtaining long term marketing arrangements with guaranteed minimum floor prices (DLA contracting regulations may preclude this from being a feasible option, however, see Section V).

4.8 Marketing requirements and demands may vary from region to region and nothing should be assumed about processing requirements and grade definitions until the local marketing activity (DPDO or, perhaps, the General Services Administration) has researched the market.

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SECTION IV

MARKETABILITY REQUIREMENTS

1.0 GENERAL

1.1 When planning to recover wastepaper it's important to be aware of the common and diverse buyer requirements which can directly affect the scope and operational nature of a recovery program. These include the degree of processing required, storage and transportation options, frequency of paperstock availability, et. cetera. Consequently, this section describes those requirements as derived from the experiences of the Defense Property Disposal Service (DPDS) and military installations in marketing their wastepaper items, both successfully and unsuccessfully.

2.0 RESULTS OF SURVEY

2.1 DPDS Survey:

2.1.1 During the period of late 1974 - early 1977, the DPDS surveyed approximately 230 United States paper companies to (1) determine the degree of interest the companies would have in direct sales from the DPDS to CONUS recycling plants by either term or one-time arrangements; and (2), to develop a composite of paper company characteristics that would enable DOD activities to improve the marketability of their scrap paper. Significant results are described below (Reference 1).

2.1.2 Scrap paper is most marketable when it is:

a. Baled.

b. A continuous supply.

c. Clean.

d. Offered in large volumes (rail car/truck loads).

e. High grade.

2.1.3 Desired length of time for term contracts:

a. Minimum seemed to be six months.

b. Most companies stated 12 months was preferable.

c. Many suggested 1-3 years.

2.1.4 Desired purchase amount:

a. Railcar or truck load quantities.

b. Approximately 20 net tons was the minimum for a single delivery.

c. Unlimited quantities was the volume commonly suggested for most grades of scrap paper.

2.1.5 Interest in direct purchases of scrap paper from DPDOs:

2.1.5.1 Eighty three (83) percent of the companies would be receptive to purchasing scrap paper directly from a DPDO. The remaining 17 percent said no.

2.1.5.2 Depending upon the grade of paper, all of the companies would purchase scrap paper within 100 miles of their location. As many as 71 percent expressed a willingness to buy the wastepaper from a DPDO that was more than 300 miles away.

2.1.6 Baler leasing and truck spotting:

2.1.6.1 A number of responders expressed a willingness to provide one or both of the functions if they were economically advantageous.

2.1.6.2 Approximately 53 percent of the companies would provide a baler to a Defense Property Disposal Office (DPDO) from which it was directly purchasing scrap paper. The remaining 47 percent responded that they wouldn't provide a baler.

2.1.6.3 Over half (56 percent) of the companies surveyed indicated that they would spot a truck trailer at a DPDO over an extended period of time for the purposes of loading scrap paper to be bought by them. Forty four percent indicated that they wouldn't do this.

2.1.7 Storage:

2.1.7.1 Every company responded that it was worthwhile (to them) for a DPDO to store certain types of scrap paper until specified quantities were accumulated.

2.1.8 Sorting and baling (direct purchases):

2.1.8.1 Every company would like the paper to be sorted and baled.

2.1.8.2 Only 53 percent would accept baled unsorted (mixed) paper.

2.1.8.3 Only 53 percent would accept paper that was sorted and loose.

2.1.8.4 Almost 75 percent would <u>not</u> accept loose unsorted paper.

2.1.9 Sorting, Loading and Transportation:

2.1.9.1 Over half (53 percent) of companies directly purchasing from a DPDO would <u>not</u> be responsible for sorting the scrap paper.

2.1.9.2 Almost 80 percent of these companies would <u>not</u> be responsible for loading the paper.

2.1.9.3 Almost all (95 percent) companies would accept responsibility for transporting the scrap paper from DPDOs to their facilities, when they directly purchased the paper.

2.1.10 Shredded paper:

2.1.10.1 No company which is interested in direct purchases of scrap paper requires it to be in a shredded form.

2.1.11 Long vs short term contracts (direct pruchasers):

2.1.11.1 Eighty one (81) percent of the companies would accept purchases based on either term or one time bid conditions.

2.1.11.2 Fourteen (14) percent would accept term sales only.

2.1.11.3 Only five percent would deal on a one time/ spot bid basis.

2.2 Notes on Baling

2.2.1 The preference of buyers for baled wastepaper is based on economics. It is cost effective to minimize shipping costs by maximizing the weight carried per railcar/trailer sized trucks per trip. At the mill, the baled paper facilities handling and maximizes available storage space, thereby minimizing operational and inventory costs.

2.2.1.1 Historically, baling has typically raised the market value within a range of $5 to $30 per ton.

2.2.1.2 Baling will likely attract buyers with substantial market capability who can pay higher prices than small scale firms. For example, in the northwest one installation's servicing DPDO reported that a buyer was available in a nearby community who would deal in lots of 100 pounds, if bundled, but would pay only a maximum of $10 per ton for all grades. On the other hand, the DPDO also reported that larger firms, not as closely located as the former, would deal only in lots of 20 tons or more and would pay substantially higher, grade-oriented prices such as $115 per ton of #1 white ledger and $151 per ton for computer printout paper. (The installation then had to determine if the available wastepapers were of sufficient quantity and rate of generation to warrant expenses for baling that could take advantage of the associated premium). (Reference 2-6).

2.2.1.3 Since an objective of baling is to maximize transportation shipments, failure to provide loads of specified tonnage will be penalized with lower prices. For example, the commissary cardboard baling program on an Air Force base in California encountered a problem related to inadequate capability of an existing baler; in essence, the baler could not compress bales down to a size sufficient to allow shipment of a buyer's requirements for 17-20 tons at a time. As a consequence, the installation's recycling program contractor experienced approximately 25 percent lost revenues on those shipment (Reference 7).

2.2.1.4 Baling must be done strictly in accordance with buyer specification (e.g. allowed level of contaminants) and also be strong enough to withstand handling throughout the processor-to-buyer-use cycle. If the specifications are not met or if a bale breaks, even during unloading at the buyers location, the buyer can reject the bales and the seller must absorb the processing and transportation costs and also arrange for the papers' disposal. Both of these situations occurred with a processor of wastepaper in Colorado, who collected from the military and other sources, baled the paper and shipped it by rail to a buyer; as a consequence, when added to the vagaries of an uncertain market the costs threatened to close down the processing operation and, with it, the possible shutdown of the military's recycling programs in this area. Only increased quality control by the generator over the purity of their wastepaper materials enabled the processor to continue operation (Reference 8).

2.2.2 Some contractors will pay a "premium" for baled paper if low contamination is guaranteed. However, many buyers are concerned with a possible loss of quality control with the process and prefer that the paper be stored in boxes, bins or on pallets that will allow scanning for contaminants prior to baling. Significantly, since most buyers prefer "mill size" bales, they will be satisfied and pay slightly less prices for boxed paper that meets mill size weights and is banded/strapped sufficiently to ensure integrity of storage throughout the handling cycle.

2.2.2.1 The minimum mill size is 600 pounds. However, most buyers prefer bales/boxes of 1000-1300 pounds each.

2.2.2.2 Mills that ship by truck prefer bales/boxes on pallets to facilitate handling and storage access. When shipping by railcar, pallets are not allowed because of space limitations; however, higher tonnages can be shipped per railcar than is possible with truck-trailers (although this is an advantage, the lack of pallets increases the potential for bale breakage during handling (by forklift), an occurrence which could offset some of the transportation cost advantages). (Reference 9-13).

2.3 Shipping Loads

2.3.1 Following are typical shipping loads/requirements for paperstock as determined through analysis of installation marketing experiences and market surveys (Reference 14-18).

2.3.1.1 High grade:

Bales: 800-1000 pounds
Loose boxed: 1200-1500 pounds
Minimum load: 30,000 pounds
Acceptable contamination level: 2 percent

2.2.3.2 Corrugated:

Bales: 800-1000 pounds
Minimum load: 30,000 pounds
Acceptable contamination level: 2 percent

2.2.3.3 Newsprint:

Bales: 800-1000 pounds
Pallet: 2400 pounds, maximum
Minimum load: 30,000 pounds
Acceptable contamination level: 2 percent

2.3.2 As intimated above, buyers prefer single item shipments rather than railcar/truck-trailer loads of mixed wastepaper items. For example, a buyer of both computer tab cards and #1 sorted white ledger prefers that he be shipped the tab cards separate from the white ledger, and in specified loads. Failure to keep the loads separate will probably result in a penalty reduction of value received.

2.3.2.1 As an example, during the first year of a recycling test program at Vandenberg Air Force Base CA, the recycling contractor experienced cash flow problems stemming from a slow rate of wastepaper capture that did not accumulate fast enough to cover program expenses. In response to this problem the contractor shipped 20-ton mixed grade lots to his buyer, instead of single item lots, in order to generate income.

2.3.2.2 As a result, the contractor (and indirectly the Air Force) lost $6 per ton of the high grade paper collected from the installation (Reference 19, 20).

2.4 Notes on Storage

2.4.1 The DPDS survey results, summarized in paragraph 2.1 above, leaves no doubt that buyers prefer paperstock generators to assume storage responsibility. From the buyer's viewpoint, this method will promote conditions for establishing acceptable loads of single item material, and minimize his inventory costs.

2.4.2 The storage responsibility poses a real problem for many installations since they seem to commonly lack the space needed to store the paperstock in the quantities required by industry. Although the DPDO area is often looked upon as being the ideal storage location, in reality this fails to mature as a productive concept since DPDO's seem to suffer from the same space shortages as the host installations. In wrestling with the problem some installations have attempted to find buyers who would pick up wastepaper from a number of collection points around the installation, hoping thereby to spread the storage burden into smaller units; however, industry response has invariably been to reject any proposal that requires more than one, or possibly two, pickup points on an installation. (Even if a buyer would accept this proposal, it is doubtful that the installation could maintain a sustained high level of quality control, and consistently and cost effectively process the wastepaper according to specifications) (Reference 21-23).

3.0 Summary

1.1 Wastepaper is most marketable when it is:

1.1.1 Baled (in mill sizes)

1.1.2 In continuous supply

1.1.3 Clean

1.1.4 Offered in large volume (railcar or truck load quantities)

1.1.5 High grade

1.2 Many buyers will accept mill sized boxed and banded wastepaper in lieu of mechanically produced bales.

1.3 All storage responsiblity will be the installation's.

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SECTION V

MECHANISMS FOR MARKETING INSTALLATION RECYCLABLES

1.0 THE DEFENSE LOGISTICS AGENCY (DLA) ROLE

1.1 Organization

1.1.1 Most military installations will market their recyclable material through the assistance of the DLA, which is charged with managing the marketing and sales policy for DOD disposal of salable items. With a sales contracting authority governed by legislative authority, it services the DOD in a manner similar to the General Services Administration (GSA), which serves non-DOD Federal government agencies. Its scope is worldwide.

1.1.2 DLA headquarters in Washington DC is concerned primarily with policy. Responsibility for the operation of the property sales disposal system is given to the Defense Property Disposal Service (DPDS) in Battle Creek MI. Within the DPDS there are three regional offices, called Defense Property Disposal Regions (DPDRs), located in Ogden UT, Memphis TN, and Columbus OH. Each DPDR supports military installations, within an assigned geographical area, through local Defense Property Disposal Offices (DPDOs). Figure 5 provides an organization breakout of the DLA system. (Reference 1).

1.2 Responsibilities

1.2.1 The DPDS is responsible for market analysis and contract administration as follows:

1.2.1.1 Determines the market availability for recyclable commodities contained in the trash and waste stream generated by DOD component activities, as well as determining their potential market value and the length of market demand for the materials.

1.2.1.2 Provides market data identified above to the appropriate DPDR-Chief of Sales and DOD component activity.

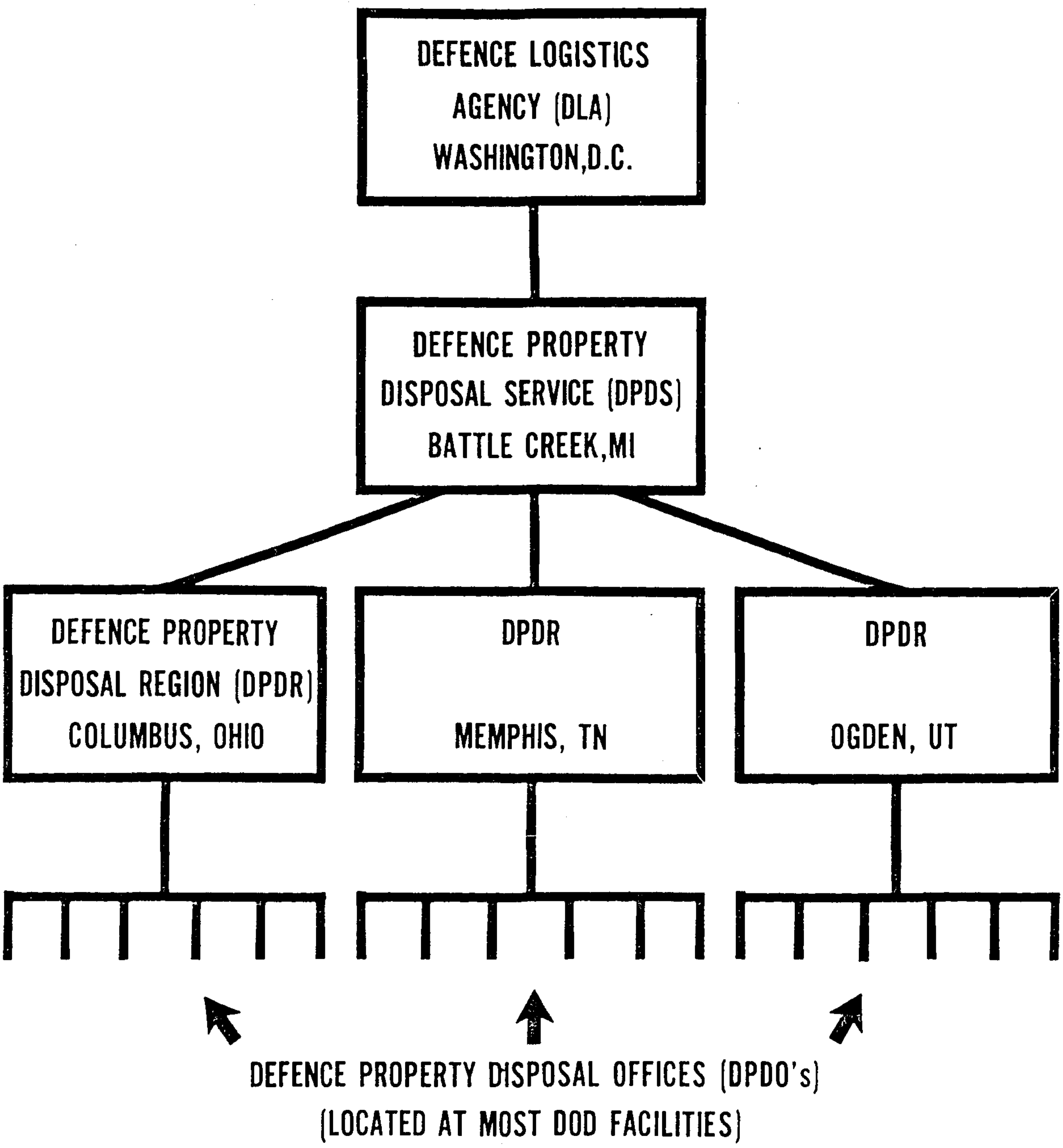

Figure 5. The Defense Logistics Agency

1.2.1.3 Initiates and maintains continuing market research on commodities for which no current markets are available.

1.2.1.4 Furnishes information on nonsalable property, as markets are developed, to the respective DPDR-Sales Chief for proper action.

1.2.1.5 Conducts necessary sales and provides contract administration for marketable materials recovered from the solid waste.

1.2.1.6 Budgets and conducts financial planning consistent with the provisions of current DOD recycling related directives and mission requirements.

1.2.1.7 Maintains data on sales proceeds and expenses incurred in the recycling program.

1.2.2 The DPDRs conduct sales, provide contract administration and financial accounting, and assist DPDOs. They:

1.2.2.1 Evaluate the impact of DOD recycling-related directives on existing term contracts and coordinate contract cancellations as required with appropriate generating activities.

1.2.2.2 Examine potential generation data transmitted by the DPDOs and assure that the most cost-effective method of sale is used.

1.2.2.3 Transmit potential generation data and availability of local markets to DPDs.

1.2.2.4 Conduct sales and provide contract administration for all recyclable material recovered from the trash and waste reported for sale by DOD component activities and in accordance with applicable directives.

1.2.2.5 Maintain data on quantities, proceeds and cost of sales resulting from the DOD Solid Waste Management Resource Recovery and Recycling Program and transmit data to DPDS on a quarterly basis.

1.2.2.6 Report prompty to DPDS any significant changes to property generations and market availability.

1.2.2.7 Deposit net proceeds from sale to the account specified by the reporting/generating activity.

1.2.3 DPDOs serve as the local point of contact for military installations. In support of recycling programs they will:

1.2.3.1 Initiate correspondence to each activity supported, requesting identification of existing trash and waste service contracts and identification of estimated quantities of potentially recoverable materials in the trash and waste stream, including but not limited to paper (by types). DPDOs will provide this information to the respective DPDR.

1.2.3.2 Provide advice and assistance to each activity supported as may be required to expedite host implementation of DOD recycling related directives. DPDO will not physically receive, store or process material recovered by the supported activity. (See exception, paragraph 1.4.3).

1.2.3.3 DPDO will inform the generating activites of the conditions under which the activity may be reimbursed net proceeds from the sale of material recovered from the trash and waste stream. In order to receive reimbursement, the installation must provide DPDO with a fund cite to which proceeds will be deposited and operate the entire program with the exception of the sales portion. In the absence of actual costs, the proceeds should be split 80 percent to the installation and 20 percent to the disposal Budget Clearing Account. In situations where all program functions cannot be done by the installation and it request DPDO assistance, proceeds distribution is negotiable (e.g., reference paragraph 1.4).

1.2.3.4 Coordinate, to the maximum extent possible, sale of property by all activites supported, to ensure optimum sales results and maximum proceeds.

1.2.3.5 Provide liaison between supported activities and DPDR/DPDS on all requests for marketing/sales assistance.

1.2.3.6 DPDOs will report promptly to the Region any significant change to the generations of recovered materials. An increase or decrease of 50 percent is considered significant. (Reference 2,3).

1.3 Contracts

1.3.1 DPDR/DPDOs traditionally have used both Term (one year or greater) and one-time Sealed Bid sales to dispose of recyclable waste items. The advent of increased Federal emphasis on recycling, coupled with limited installation resources to effect recycling programs, has expanded their role to seeking "full service" source separation contracts when requested by an installation. The full service contract includes the traditional sales contract for high grade paper plus requirements for the contractor to provide services for the implementation and operation of a source separation program. (Reference 4-7).

1.3.2 Use of One-time Sealed Bid Sales

1.3.2.1 The amount of storage space available to DPDOs has historically influenced the type of sales method used to market recyclable commodities whereas term contracts have been used to periodically remove materials that are bulky, hard to store, and/or susceptible to spoilage. One-time sales have been used where materials did not present these storage problems. For example:

1.3.2.1.1 One-time sales have been favored whenever items require long periods to generate sufficient quantities, such as glass, and storage presents no problem with respect to deterioration.

1.3.2.1.1 They've been used extensively whenever a material, such as computer tabulating cards, take up little space and can easily be protected in storage. DPDO/DPDRs found that advertising tab cards on a one-time Sealed Bid Sale brought a much better return than term sales (Reference 8, 9). (Since computer tab cards have traditionally held a good market position, even during economic downturns (reference discussion in Section IV of this report) there appear to be two associated reasons for using one-time bid sales rather than term: (1) installation generation rates of tab cards are usually not high enough to (2) allow accumulation of trailer-truck sized loads (20 tons, preferred by buyers), frequently enough to make traditional one-year term contracts worthwhile).

1.3.2.2 There have been other factors that persuaded DPDOs to recommend use of one-time bids for installation recovered recyclables. One of these factors has been the uncertainty of wastepaper supply. As discussed in Section II, installation managers typically suffered from a lack of authority to apply sufficient resources to ensure survivability of their recycling programs; nor did they have sufficient guidance to adequately predict quantities of recyclables available in their wastestream. Combined with sporadic recycling efforts by organizations such as the Boy Scouts, these factors created an unpredictable supply of wastepaper that made it difficult, if not impossible to effect worthwhile term contracts (Reference 10, 11, 12).

1.3.2.3 Another problem that has discouraged at least one DPDO in the past from pursuing term contracts, has been the failure of a contractor, under term conditions, to pick up materials when agreed to. This problem appears related to localized conditions, the wide fluctuations of the market, and the lack of experienced, small wastepaper buyers. In the case of the Letterkanny DPDO, Pennsylvania, their term buyer picked up "everything he could" when market prices were depressed; his warehouse was full and he could not store anymore paper. As a consequence, a significant storage problem occurred at the DPDO because of wastepaper accumulation and an inability to sell the commodities to other buyers because of the existing contract. (Reference 13, 14). (It's easier for a contractor to break a Government contract than it is for the Government!). This example illustrates a reason why some DPDO's are reluctant to manage storage of recyclables, even when space is available (which is infrequent), and to utilize term sales agreements. However, as further discussed below, term sales are recommended because these type of problems can be potentially avoided through improved recycle program planning and more stringent implementation decision criteria.

1.3.3 Use of Term Sealed Bid Sales

1.3.3.1 Experience by private firms, municipalities, and other organizations presently or formerly involved with recycling indicates that term contracts of 3-5 years duration, accompanied by relatively constant volume, are highly desirable. Coupled with the term contract should be an agreement by the buyer to pay a minimum guaranteed price, with higher prices tied to a sliding scale based upon a specified Industry Indicator or Official Board Market for a major city (such as the Chicago Market, San Francisco Market, etc). Hence, when the market is high the buyer will pay more, and conversely, less when the market is low. The guaranteed minimum price protects the generating activity in case the market price falls below its break-even point for program support. (Reference 15-20).

1.3.3.2 The most compelling argument for such contracts viz a viz one-time sales are guaranteed markets for the materials during periods of low demand and prices, and consequently, a sharing of the risks by both seller and buyer. Additionally, such contracts provide a foundation on which reasonable estimates of long-term program economic viability can be made. Without this foundation, an installation (considering a recycling program broader in scope than recovery of only the market-reliable computer tabulating cards) cannot obtain credible estimates of market income and, therefore, cannot conduct a cost analysis from which best possible decisions can be made. No installation should look upon a recycling program as a short-term (3-year absolute minimum) venture; it should be either a program with a future or no program at all; as described in Section II, failure to make decisions based upon reliable economics, versus emotional rationale, significantly minimizes the potential for success on a continuing basis and thereby maximizes the probability of wasting scarce manpower, material and monetary resources.

1.3.3.3 Within the DOD, the majority of material in the Resource Recovery Recycling Program will be offered by the DLA Term Sale method. Historically, these have been one-year contracts. However, the Defense Property Disposal Region can authorize contracts for a three-year period of time; if necessary, the DPDS can authorize a five-year contract, such as the one used to provide corrugated waste materials from Camp LeJeune North Carolina to a county-sponsored sheltered workshop for handicapped personnel. (Reference 21, 22).

1.3.3.4 DLA uses an "Escalator Clause" (sliding scale) in its Term Sale Invitation for Bid [IFB]. Figure 6 provides an example (see Item 41).

However, current rules governing DLA sales contracts preclude effective use of a guaranteed minimum price requirement. While such a requirement can be incorporated within the IFB, it serves no useful purpose because every Term Sale contract contains a "Termination Clause" that allows either party (DOD or buyer) to terminate their contract upon upon 30 days written notice. Consequently, if and until this particular requirement is modified to allow effective use of a guaranteed minimum price, no installation will have a reliable basis for forecasting potential program economics. (Reference 23-25).

1.3.4 Passive Bids vs Negotiated Bids

1.3.4.1 An ability to sell a product rather than passively seek bids is desirable when attempting to contract for wastepaper purchases. It is particularly useful when a wastepaper generator wants to contract for lower value items as well as more desirable materials; for example, if a potential buyer wants the high value items (e.g. computer cards), you can negotiate to sell it to him if he also agrees to take less desirable items. (Reference 26).

1.3.4.2 Desirable as the negotiation feature is, it is not a practical marketing tool of the DPDS. The Federal Property Act gives DPDS the authority to negotiate sales; however, a caveat on this authority is that if property has a fair market value in excess of $1,000, "a statement of the circumstances must be transmitted to the appropriate committee of Congress in advance of such disposal." The $1,000 negotiation limit applies to the cumulative value of the contract (i.e., total sales contract price.) (Reference 27, 28).

1.3.4.3 Consequently, the DPDS uses formal competitive bids. This procedure reinforces earlier observations that an installation should address only high value wastepaper recovery and not be overly concerned with trying to achieve maximum waste material recovery; the latter will rarely be cost effective because sales revenues and cost avoidance through diversion of the materials from the normal solid waste collection and disposal operation will rarely offset additional costs incurred for collection, processing and sale of the recovered materials. (See Section XI).

Term IFB 27-8175
RETURN TO DPDR COLUMBUS
SALE OF GOVERNMENT PROPERTY - ITEM BID PAGE - SEALED BID

ITEM NO	ARTICLES FOR SALE	QUANTITY (No of Units)	UNIT OF MEASURE	PRICE BID PER UNIT	TOTAL PRICE BID DOLLARS CTS	ITEM NO
	<u>IT HAS BEEN DETERMINED THAT THIS PROPERTY IS NO LONGER NEEDED BY THE FEDERAL GOVERNMENT</u>					
	FOR ITEM 40 THE CONTRACT PERIOD IS 1 JULY 1978 THRU 31 DECEMBER 1978.					
	ITEM 40 IS LOCATED AT DMA TOPOGRAPHIC CENTER, WASHINGTON, DC					
40.	MAPS, OBSOLETE: Baled on skids. Est 1800 lbs per skid Inside Following Articles apply: BE: Scrap Warranty BF: Manner of Scrapping BG: Right of Inspection	75	NET TON	______	______	40.
	ITEM 41 IS LOCATED AT NAVAL SUPPLY CENTER, FACILITIES DIVISION, NORFOLK, VIRGINIA					
41.	PAPER, SCRAP: Percentage of total generation is estimated as follows: 20% - Corrugated paper including whole and broken boxes, liner and inserts. 12% - Mixed clean paper including office paper, computer listings, publications, manuals, obsolete forms and some hard covers with staples and paper clips. 60% - Waste basket material including office paper, and tabluating cards with foreign matter including carbon paper, glass, metal, food, wood, cigarettes and ashes. 8% - Tabluating cards, various colors, striped and plain. Est. 90 net ton monthly generations. Inside - SCT A05-Bldgs. W-143, X-132, LF-18, LP-20, V-28, V-88, SP-238 and W-104. Following Articles Apply: BA: Bid and Deposit Evaluation BB: Bid Price Determination	1080	NET TON	The price which the bidder agrees to pay per net ton is ______ percent of the Chicago Market for "No. 1 Mixed Paper" (DO NOT SHOW DOLLAR AMOUNT)		41.

Figure 6. Example of Escalator Clause (Sliding Scale) Used in DLA IFB

1.3.5 IFB - Baling and Non-Baling Options

1.3.5.1 As described in Section IV, buyers of wastepaper frequently prefer it in baled form, and will pay more for it in this form than in a "loose" condition. To determine if potential buyers will provide a baler and/or prefer baled paper, installations can request the DPDO to query the market to obtain data such as prices, material preparation requirements, method of offer, etc., at the time they provide the DPDO with estimated generations of property.

1.3.5.2 The installation can also request that Invitation for Bids [IFB] ask potential buyers to price two options: (1) paper that is baled, and (2) paper that is stored in a loose form. Once the contract is in effect it will be for either baled or loose, not for both forms within the same item. The information concerning condition should be provided to the DPDO, to be placed in the item description of the IFB, before the distribution to potential buyers. (Reference 29, 30).

1.3.6 Regional Collection and Sales

1.3.6.1 Some installations may not generate sufficient quantities of wastepaper to interest distant buyers. However, DPDR/DPDO may be able to overcome this problem by contracting for collection and sale from more than one military installation in a region.

1.3.6.1.1 The most viable means to attract potential buyers and increase market value would be for the installations to collect, prepare, segregate and store the material at one of the installations, such as has been historically accomplished by the Letterkenny Army Depot DPDO in Chambersberg, Pennsylvania. In this procedure each installation must provide actual weight of property by commodity, with a fund cite code on each turn-in document to the nearest DPDO. After sale of the material, the applicable DPDR/DPDO will provide reimbursement to each installation in accordance with the data on the turn-in documents. (Reference 31-33).

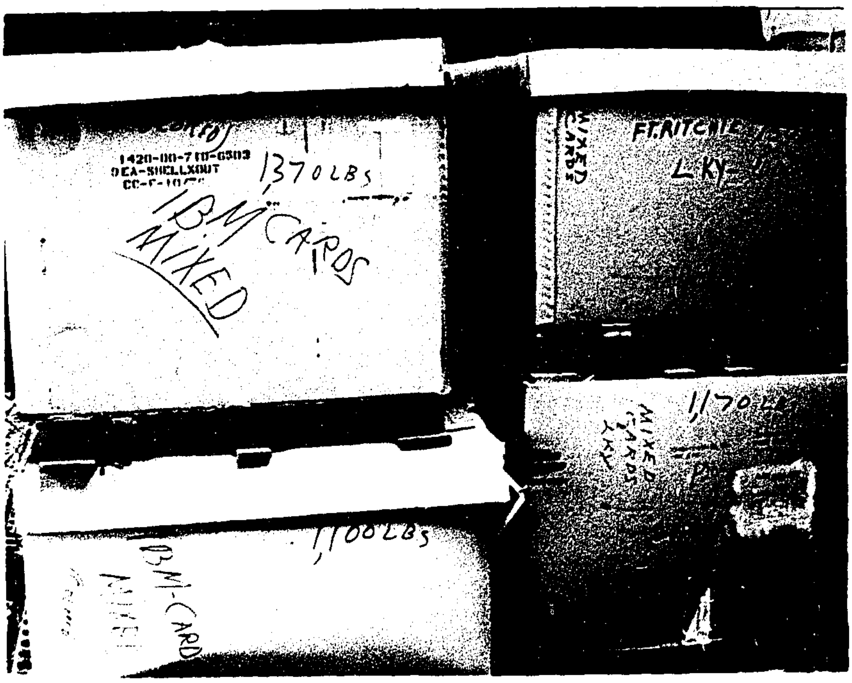

Figure 7. Example of Multiple Installation Contribution Accounting-Letterkenny Army Depot

1.3.6.1.2 As an alternative to the one-collection point in a region approach described above, DPDR/DPDO may be able to obtain a contract that would cover a multiple number of installations. These installations would report their waste property to the designated DPDO, who in turn would consolidate turn-in documents (data as previously described above) and advertise the material in a single line item in the IFB (if a one-time sealed bid method is used). In this manner each installation would have a single pickup point per installation. In offering material in this manner, however, DPDS believes that there are "strong possibilities" that no bids will be received because of the following: "Transportation costs, the radius a contractor must travel to each installation, the number of pickup points at each installation if not consolidated to one each per installation, and the preparation at each installation (if different at each base) and quantity generated." (Reference 34). All of these factors taken alone or in combination, may also tend to inhibit use of the Term Contract, which is preferable to the one-time bid.

1.3.6.2 When a DPDO services more than one generating activity, the only means of making reimbursement for waste material is manually. Consequently, each installation must ensure that turn-in documents provide all data that the DPDO needs to maintain accurate accounting records. (Reference 35, 36). Procedure and problems experienced by one DPDO (Letterkenny) illustrate the process:

1.3.6.2.1 The Letterkenny DPDO receives wastepaper items from a number of installations, processes, prepares and stores them for sale. To account for each installation's contribution, the DPDO fills palletized boxes until one installation's delivery runs out. This quantity is then weighed and recorded on the box itself (See Figure 7. Boxes with incomplete loads are then filled with wastepaper from another installation, reweighed, recorded and stored; the entire process is continued for all installations.

1.3.6.2.2 Letterkenny's accounting task is made more difficult by the failure of the installations to keep track of their respective quantities when delivered; i.e., recyclables are not invoiced. This creates an administrative burden on the DPDO since it must then send a list of received materials every week to the respective Base Facilities Engineer, who in turn makes out a DD Form 1348-1, "DOD Single Line Item Release/Receipt Document" for DPDO and installation records. Timely and efficient accounting of the materials would be increased by increased installation attention to proper invoicing; without it, DPDO has no choice but to charge installations for the administrative tasks, which thereby lowers the installation's reimburement sales share. (Reference 37).

1.3.7 Maximum Number of Buyer Pickup Points

1.3.7.1 Buyers prefer to keep waste material pickup points to an "absolute minimum," preferably to <u>one</u> pickup point on an installation. (Reference 38, 39).

1.3.8 Full Service vs Straight Sales Contracts

1.3.8.1 Experience has shown that installations often do not have the in-house resources to implement and operate an on-going recycling program. Under these circumstances, they have the following options for management and sales of the programs:

1.3.8.1.1 "Limited Services Contract," under which the installation directly employs the contractor to perform specific implementation and operational services. Sales of recovered materials are then conducted by the DPDS (or in some cases by the General Services Administration; see Section V, paragraph 2.0).

1.3.8.1.2 "Full-Service Contract," under which an installation requires a contractor to provide a full range of design and program installation services. In addition, the contractor also buys the recovered material viz a viz use of a separate sales contract.

1.3.8.1.3 Contracts with existing custodial or refuse contractors, etc, that allow them to collect and dispose of recyclable materials in return for lowered cost of their services. The extent of their system responsibilities and off-setting costs are determined by negotiation between the installation and the contractor(s). (See Section V, paragraph 3.0).

1.3.8.1.4 Joint participation with other Federal agencies, local authorities, the civilian community and voluntary organizations. This will usually include use of the limited or full-service options, and may include (under special conditions) separate contracting of the latter between the installation and a community sponsored recycling authority (see Section V, paragraph 4.0). (Reference 40-46).

1.3.8.2 Limited Services Contract

1.3.8.2.1 Use of a contractor to provide program assistance, without sales responsibility, can include any or all of the following services:

1.3.8.2.1.1 Economic analysis and program feasibility study.

1.3.8.2.1.2 Program design and installation, including equipment and assistance in identifying markets (although the DPDS and/or GSA are ultimately responsible for the latter, within the DOD).

1.3.8.2.1.3 Continued program monitoring.

1.3.8.2.1.4 Education and training of installation personnel.

1.3.8.2.1.5 Initial and on-going program publicity.

1.3.8.2.2 The advantage of such services may be professional assistance and efficiently designed programs. A significant drawback to this option may be lack of qualified, experienced contractors, and cost. (Reference 47-49).

1.3.8.3 Full-Services Contract

1.3.8.3.1 A full-service contract can include all of the responsibilities listed for the Limited Services Contract, plus an agreement by the contractor to buy the recovered waste materials. The cost of the equipment and services provided is included in the net prices paid by the buyer.

1.3.8.3.2 Ideally, the Full-Service arrangement should provide a means by which an installation can implement a wastepaper recovery program with minimal use of limited resources; having one contractor accomplish everything from "A-Z" is attractive, as is avoidance of significant direct costs incurred for equipment and operating requirements.

1.3.8.3.3 In reality, installations may have difficulties obtaining full-services because of a number of important factors. Among these:

1.3.8.3.3.1 A lack of experienced contractors; full-service contracts are not readily accepted/understood by traditional recyclers with the result that few of these are willing and/or able to bid on such contracts. (Reference 50-53).

1.3.8.3.3.2 An unwillingness by buyers to commit themselves to full-service investments, and to minimum price guarantees. For example, GSA has been disappointed nationwide because of a lack of competitive bids for full-service contracts; a significant contribution to the problem appears to be the reluctance of many potential buyers to invest in and furnish the equipment and services needed for a full-service arrangement. This reluctance stems from both inexperience in providing the desired services, plus the costs involved; for example, a recycling test run at Vandenberg Air Force Base by a successful, community sponsored recycling organization indicated that start-up and development costs will be "too high," within current recycling economics, to "attract competent resource recovery contractors." (Reference 54, 55).

1.3.8.3.4 In addition to problems finding a full-service contractor, installations may also be discouraged by the economics of this option. As stated above, the services and equipment incur expenses on the contractor that must be reflected in the bid price for the recovered waste materials; the resulting prices can then be significantly lower (perhaps 55 percent less) than those bid when the contract does not require a full-service arrangement. For one installation the price reduction was estimated as 55 percent. In another example, GSA in Denver, Colorado obtained a higher price for "mixed paper" bought by a one-year, sales-only contractor than they did for "high grade" paper sold to a three-year, full-service contractor. This experience reflected the conclusions of a 1978 Comptroller General analysis that straight sales contracts viz a viz full-service arrangements "will generally yield higher revenue after initial startup costs are recovered." (Reference 56-58). Under these circumstances, the installation must judge whether a full-service contract offers an "optimal," cost-effective program, or whether "best prices" should be obtained by either shifting services and equipment responsibilities to themselves, a separate contractor, or by reducing the scope of the originally planned program to the recovery of high grade computer paper wastes (that do not require the magnitude of resources investment associated with bond ledger recovery, etc).

1.3.8.3.5 Although GSA has promoted the full-service concept, the Defense Logistics Agency's (DLA) responsibilities have been historically limited to sales contracts. In 1978, the DLA "agreed to try to effect full-service source sepration contracts when requested by the Air Force" (or any of the military services). (Reference 59). The installation must show it to be in "best interest of the Government. An economic analysis must be prepared by the installation indicating that the full-service contract is more economical to them and DOD, and submit their analysis thru command channels." (Reference 60).

1.3.8.3.6 In pursuing full-service contracts through the DPDS, an installation should consider:

1.3.8.3.6.1 Whether a minimum price guarantee is possible with a full-service contract without having to include the Escape/Termination Clause required in a straight sales contract. If this is not possible, the contract and associated program should not be pursued, unless it is limited to market-stable, very high value computer wastepaper products whose market histories offer reliability in forecasting long-term incomes.

1.3.8.3.6.2 Whether a full-service contract offers a more optimum arrangement than higher-revenue-producing straight sales contracts that require separate service and equipment investments either through contract or in-house, or a combination of the two. If it is optimal, the installation should provide supporting information to the DPDO as a supplement to the economic analysis required.

1.3.9 Information Required for the IFB

1.3.9.1 Depending upon the scope of the recovery program, an installation should coordinate with its servicing DPDO on contractual requirements and supporting information, to be included in the IFB, such as the following:

- Scope and term of the contract

- Description, grade and location of wastepaper to be sold

- Estimated quantities of potentially recovered materials, by type/grade. (DPDS contracts allow quantities to vary ± 50 percent from the estimate without effecting the contract's validity).

- Preparation and delivery procedures

- Storage capabilities and minimum shipment quantities

- Services and equipment to be provided by the contractor

- Services and equipment to be provided by the facility

- Pricing mechanism for establishing billing prices.

- Example of price billing computational procedures.

- Any special sale items and conditions, such as estimated collection schedules and recycling program requirements and responsibilities.

1.3.9.2 It is important to remember that many of these elements should be discussed with the DPDO prior to final formulation of recycling program plans and initiation of the IFB. The primary reasons for this preliminary coordination, as discussed previously, is to determine (1) the availability of prospective buyers for the waste materials, and (2) the scope of their capabilities and product requirements. Experience shows that one buyer may be more restrictive or more lenient than another buyer for the same product, and it is a waste of resources to draw up a program that will not accommodate the requirements of the marketplace. Preliminary DPDO coordination and consultation will probably not answer all questions raised, but it will increase the probability of properly scoping the program and obtaining a successful contract.

(Reference 61-63). The following examples illustrate (1) the differences in product demand that can occur between two buyers in the same region, (2) the difference that 60-70 miles in generation points can make on the willingness of a contractor to purchase paper, and (3) the possibility of being misled by potential contractors during the preliminary DPDO investigation.

1.3.9.2.1 An agency in Denver, Colorado had a full-service contractor who apparently was satisfied with the 4 percent contamination level he found in the recovered paper. For reasons not clear, this contractor apparently subcontracted to another smaller-scale buyer who immediately found the wastepaper unacceptable because his examination revealed a 32 percent contamination! Obviously this dramatic change was cause for consternation. Investigation of why there was so much difference between buyer acceptance centered around possible removal of some wastepaper items (outthrows) unacceptable to the new buyer, and reliability of his acid test (supposedly using Floroglutinol) for ground wood determination. (Groundwood was unacceptable). The resolution of the problem is unknown but it provides an example, perhaps one of extreme, of potential difficulties in determining the requirements of the marketplace when making decisions on program viability. (Reference 64).

1.3.9.2.2 The ability and willingness of a buyer to buy the same grade paper with similar contamination levels can also be affected by relatively short distances between generation areas and market behavior. For example, in one western city, a buyer was very satisfied with #1 mixed paper (mostly white) received from buildings in his local area. He was, however, dissatisfied with #1 mixed paper produced in another city, approximately 70 miles away, and often rejected the loads he received. The reason given for the disparity was economics:

In the outlying city, paper received from Federal agency generators was baled by an intermediary company and shipped by railcar to the buyer; contamination was difficult to detect in the baled paper until it was broken down for use, and when it was found, which was frequent, the buyer often rejected it on the grounds of excessive contamination. The reason for rejection apparently was his inability to afford additonal processing labor for sorting out the contaminants, and also pay for the baling and railhaul costs. On the other hand, in the local area the buyer picked up unbaled paper and used additional inexpensive labor to remove contaminants even if beyond specifications, upgrade the paper and make a profit. Although not proven, use of this labor apparently also gave the contractor additional flexibility in dealing with his markets; when the market was low and paper volume high, the contractor could still afford to pick out the highest value paper, whereas he would reject the railshipped mixed paper of similar specifications. Although contamination limits were supposed to be the same at the two generating areas, the local area appeared to have more latitude because of the absence of transportation and baling costs; only after tightened quality control at the source of generation (through use of custodial personnel and increased educational efforts) were the distant generators able to provide a mixed paper grade of sufficient quality for consistent acceptance. (Reference 65, 66).

1.3.9.2.3 DPDO's and their headquarter units have learned to cautiously evaluate prospective buyers' stated intentions during preliminary market investigations. For example, in an effort to promote increased wastepaper recycling and obtain higher revenues, the servicing DPDO of Offutt AFB, Nebraska attempted to seek markets and services beyond the locally depressed market area (there was only one buyer in town, who apparently was able to use this situation, plus long distances from any other markets, to monopolize and depress the market to his considerable advantage). In this survey, the DPDO located a firm in Kansas City, Missouri, 200 miles away, which indicated that it was very interested in buying Offutt's wastepaper, would be willing to leave a trailer on-base for collection, and would pay a price substantially above the then-current revenue being received from the local buyer. However, when the IFB went out the firm failed to respond and Offutt was forced to delay their planned program expansion until some time in the future; the local firm's bid on the new IFB was higher than previously, but well below the point where the installation could economically expand the program.
(Reference 67).

1.3.9.3 In addition to the IFB contractual elements, the installation must also provide the DPDO with a <u>fund cite</u> to which sales proceeds will be deposited for installation use on the recovery program, excepting the share of proceeds for defense property disposal sales expense. (See paragraph 1.4). (Reference 68, 69).

Method of Sale	Preparing Property Listings at the DPDO for Input to the DPDR	Mailing of the Property Listings the DPDR	Preparing Sales at the DPDR for Input to DPDS	Mailing of Repros to DPDS	In-House DPDS Processing for Input to Commercial Printers
Centrally Reproduced Sealed Bid, Auction, Sealed Bid-Term, Spot Bid	30 days 30 days	3 days 3 days	30 days 30 days	3 days 3 days	7 days 7 days
Local Auction Spot Bid	30 days 30 days	3 days 3 days	30 days 30 days	—— ——	—— ——
Locally Reproduced Sealed Bid, Sealed Bid-Term	30 days	3 days	30 days	——	——

Figure 8. Processing Sales of Defense Surplus Property

Method of Sale	Mailing Repros To Commercial Printers	Printing of the IFBs	Mailing of the Printed IFBS From Commercial Printer to Prospective Bidders	Inspection Period	Removal Period	Average Number of Days Involved
Centrally Reproduced Sealed Bid, Auction, Sealed Bid-Term, Spot Bid	3 days 3 days	5 days 5 days	3 days 3 days	21 days 30 days	30 days 30 days	135 days 144 days
Local Auction, Spot Bid	____ ____	5 days 5 days	3 days 3 days	5 days 10 days	5 days 5 days	81 days 86 days
Locally Reproduced Sealed Bid, Sealed Bid-Term	____	5 days	3 days	7 days	30 days	108 days

Figure 8. Processing Sales of Defense Surplus Property (Concluded)

1.3.10 Time Frames for Processing Sales Contracts and the Importance of Maintaining Proper Cash Flow in the System

1.3.10.1 It's important for installations to take into account the amount of time required by the DLA/DPDS system to process a contract, from receipt of the installation-provided information to contract award meterial packup and receipt of revenue. Figure 8 provides time fram information for the sales process. (Reference 70). As indicated by the schedule, approximately 90-100 days are required to "let" a contract, whether for term or one-time bid sales.

1.3.10.2 There are at least three good reasons to take these time frames into account. First, to insure that implementation of the waste recovery program is consistent with the moment when a sales and/or service contract can be placed into effect; secondly, to insure that cash flow planning is commensurate with anticipated revenue receipts and expense disbursements; and thirdly, to minimize storage space requirements as much as possible.

1.3.10.3 Accurate coordination of implementation and contract actions is obvious. What isn't so obvious, yet critically important, is the relationship between the sales contract and the cash flow requirements of the recycling program, and the storage space requirement. These critical relationships are reviewed in the following paragraphs.

1.3.10.3.1 The policy of the Air Force is to operate a recycling program if it is self-supporting (through sales revenue reimbursement and/or cost avoidance); however, any command or installation can support a nonself-sustaining program if they wish to direct fund it. The authorization to do the latter is important because experience at Vandenberg Air Force Base, California and other locations indicate that it may be <u>unrealistic</u> to expect a program to break even during the first year of operation because of start-up expenses, equipment purchases and lead times incurred in bringing the program up to the desired level of waste material generation. (Reference 71-74).

1.3.10.3.2 Expenses during the fiscal year may include, among other things, one or more of the following elements: Equipment purchase (such as desk-top holders, storage bins); non-military personnel services (such as using a separate contract for services to collect and process waste materials, or custodial assistance in collecting wastepaper, or directly hired manpower to assist the program, etc). If a contract is concluded with a non-profit Government organization, such as occurred at Vandenberg AFB, the Air Force may be asked to provide a substantial part of the contract fee during the first couple of months of the contract, in order to assist the organization in overcoming traditionally burdensome start-up costs that could exceed their initial capital and cash flow capability without the availability of such "upfront" money. (Reference 75).

1.3.10.3.3 Given expenses such as these, the program manager must know the schedules for both disbursements and revenue receipts; in other words, he/she must be able to predict and maintain an accurate account of the program's cash flow. If projected disbursements will not be covered by projected revenues during the budgeted period, then the installation can make decisions to somehow alter the program to achieve a balanced financial position, or drop the planned program, or seek additional support from direct funds (viz a viz reimbursable accounts) to make up the estimated deficiency between expenses and income/cost avoidance.

1.3.10.3.4 In order to both project the schedule of income and enhance the capability to dynamically monitor a program's financial progress, it is necessary to know and cope with at least two factors that effect the receipt of funds from the DPDS system:

- One, the time it takes to achieve an award and pickup of recovered materials, and

- Two, the time it takes for revenue from the sale of the materials to be available for installation use after the sale is effected.

1.3.10.3.5 In the first matter, the three-plus months it takes to achieve an award of contract provides a yardstick to measure against the time it takes to build up the necessary quantity for sale. An installation should not wait until the quantity of material is available before notifying the DPDO to seek a contract; instead it should predict the time it will take to accumulate a recyclable item and submit the sales request to the DPDO ahead of time such that the time required to process the contract equals the time necessary to build up the waste material inventory to the salable level. This procedure can be eliminated, however, by seeking a term contract rather than one-time bid sales. With the term contract, only one contractual process time period will occur during any given period of contract (one year, three years, five years, etc.).

1.3.10.3.6 Knowledge of the contractual process period is only one part of the information needed to "stay on top" of the financial situation. The other part is knowing how long it will take the installation's share of revenue to be deposited for its use at the Accounting and Finance Office. Although the elapsed time from sale to receipt of revenue may vary from one geographical region to another, the experience from recycling at Ft Sill, Oklahoma and Ft Lewis, Washington indicates that elapsed times are 2-3 months (Reference 76, 77). Hence, program planners and managers must also include these time elements in predicting revenue schedules in addition to the times it takes to generate sufficient materials and process a sales contract.

1.3.10.3.7 A final point in this discussion concerns storage space for the waste materials ready for sale. As discussed in previous sections of this report, storage space is extremely difficult to find on most installations. Consequently, installations with this problem must pay special attention to their ability to meet the frequency and size of material pickups desired by buyers; and they must use their knowledge of generation rates, contractual process and material removal times to ensure that the contractor picks up the materials before their accumulation exceeds existing storage capacity. As indicated by Figure 8 a 30-day removal period is common with DPDS contracts. This may be shortened under specific contract terms to periods of 10 days or less; even with this reduced period, however, in reality some contractors exceed the limits. (Reference 78).

1.3.11 Privacy Act and Similar Protective Provisions

1.3.11.1 Protection of privacy act-related information on computer waste products should be no problem for installations because of a Defense Privacy Board Decision Memoranda quoted below (Reference 79, 80):

Term IFB 27-8175
CONDITIONS OF SALE - SEALED BID-TERM (Continued)

Applies to Item 40*.
ARTICLE BE: SCRAP WARRANTY. The Purchaser warrants and certifies to the United States Government that this property will be scrapped as elsewhere provided for in this Invitation. The Purchaser further represents, warrants and certifies that he is purchasing the property as scrap and that he will use it only as scrap and that he will not attempt to resell the property until the scrapping has been accomplished. Notwithstanding any other provision of the contract to the contrary, title to the property shall not vest in the Purchaser until the scrapping has been accomplished in accordance with the terms of this Invitation for Bids. Should the Purchaser fail for any reason to complete the scrapping within 30 days after removal of the property, or such additional time as may be granted by the Contracting Officer, and furnish the Contracting Officer a certificate to the effect that such scrapping has been accomplished, the Government shall have the right to repossess the property, charging the Purchaser with all costs incurred by the Government in repossessing and reselling the property including any direct loss on account of the resale. At the time of taking delivery the Purchaser must advise the Contracting Officer where scrapping will be accomplished at some place within the Continental United States. The Contracting Officer, or the Property Disposal Officer, shall have the right of on-site inspection to verify that scrapping is accomplished.

Applies to Item 40.
ARTICLE BF: MANNER OF SCRAPPING. Property shall be scrapped by pulping, shredding, or other equally complete manner which precludes any recognition or reconstruction of the items.

Applies to Item 40.
ARTICLE BG: RIGHT OF INSPECTION. The Government reserves the right to conduct inspection as it deems necessary to assure the scrapping of purchased material. Such inspection shall be without prior notice to the Purchaser and shall be at such time and with such frequency as is deemed necessary by the Government.

Applies to Item 40.
GG. Skids or bales of obsolete maps received as a part of this contract by the purchaser from the DMA Topographic Center will be wrapped and banded with steel strapping by the Government. Each skid or bale will bear a unique identification number. The purchaser guarantees that: (1) All maps received from DMA Topographic Center will be disposed of by pulping, shredding, or other equally complete means of destruction. (2) The banded skids or bales of maps will be shipped directly to the mill by motor freight or trailer. (3) The mill is notified of skid number applicable to the vehicle and the identification numbers of each skid or bale of maps contained in the shipment. (4) A report of destruction will be obtained from the mill identifying the specific skids or bales of maps that have been processed, the date completed and the method of processing used, i.e., pulped, shredded or other method. The Purchaser will furnish this information to the Sales Contracting Officer and a copy to DMA Topographic Center, ATTN: 27300 Logistic Office, 6500 Brooks Lane, Washington, DC 20315.

* Refer to Figure 6 for description of Item 40.

Figure 9. Example of Clauses for Protection of Sensitive Information, DPDS IFB

COMPUTER COARDS AND PRINTOUTS NEED NOT BE DEPERSONALIZED BEFORE DISPOSAL. A massive release for disposal of computer cards and printouts is not a disclosure of personal information which would be precluded by the Privacy Act. In view of the volume of the "records" and the coding of information it is impossible to pinpoint any comprehensible information about a specific individual. Therefore such computer products may be turned over to Defense Disposal offices for disposal, sale as scrap, or recycling, as appropriate, as was done prior to the enactment of the Privacy Act, without deleting the names or other individual identifying data.

1.3.11.2 Protection of other wastepapers containing Privacy Act and/or For Official Use Only information can be best achieved by tearing or shredding the material into pieces at the point of generation (e.g.; a person's desk) to the point where the record content is destroyed, and then placing it in the containers used for recovering the recyclable material. This was done at Vandenberg AFB, Tyndall AFB, and other locations with no adverse impact on the recycling program (in fact "shredded" paper promotes tighter/better baling of wastepaper when this option is used; people have to tear up the paper anyway when they put it into the trash receptable, so a recycling program really shouldn't add any burden to these personnel if a recycling container is conveniently located in the work areas where this type of wastepaper is generated). (Reference 81-84).

1.3.11.3 Where wastepapers cannot be protected as described above, the DPDS IFB and contract can include provisions requiring the purchaser to guarantee a complete destruction of the material through pulping, incinerating, shredding or "equally complete means of destruction." Figure 9 provides an example of how the IFB can be written in this regard. (Reference 85).

1.3.11.4 Organizations that destroy wastepapers by means of a pulping process will not find a market for it because the desired paper fibers are destroyed by the process. (Reference 86).

1.4 Installation-DPDO Revenue Sharing

1.4.1 In the absence of actual costs, DPDS policy is that sales proceeds should be split such that 80 percent goes to the generating activity and the remaining 20 percent to Budget Clearing Account 97-F3860.5191, "Proceeds for sale of scrap, salvage or surplus materials, Defense Logistics Agency." The 20 percent is used to cover DPDS system sales and handling commission expenses. (Reference 87, 88).

1.4.2 This revenue sharing is <u>negotiable</u>, however, in situations where the installation does some of the collection and sorting activities but is "not willing or able to do the entire process and requests the DPDO's assistance." (Reference 89) Hence, installations should investigate the extent to which their servicing DPDO can provide additional assistance and determine if the additional services will be economically beneficial to the recycling program. For example, although their capabilities are not generally available at most DPDOs, the Letterkenny Army Depot DPDO has offered contributing installations services to receive, process and sell wastepaper material in return for 55 percent of the sales proceeds. In these situations, the DPDO must coordinate the negotiated terms through its chain of command before reaching final agreement on the revenue split. (Reference 90-92).

1.4.3 As discussed previously, storage space for recovered material is frequently difficult to find. Where it is available, the DPDO can request funds, if necessary, beyond the traditional 20 percent fee for any additional expenses they incur. (Reference 93).

1.5 <u>DLA Role in Regional/Civilian-Installation Resource Recovery Programs</u>

1.5.1 DOD Directive 4160.65, Oct 4, 1976, Solid Waste Management-Collection, Disposal, Resource Recovery and Recycling Program, has caused confusion at some installations with respect to whether the DLA/ DPDS system needs to be involved when refuse resource recovery is accomplished through "Participation in a joint or regional resource recovery program operated by the civilian community." (Reference 94, 95)

1.5.2 To clarify this area with regard to source separation programs, DLA/DPDS has taken the following position:

DOD components may opt to establish resource recovery programs that provide for separate or joint participation in programs operated by other Federal agencies, local authorities, the civilian community and voluntary organizations. The Directive also provides that returns for property sold may be in the form of lower costs for contractual services; in which case the DPDO would not be involved. However, excluding cases where Military Exchanges and Commissaries salvage and dispose of their recoverable resources, all property generated from the DOD trash and waste stream that results in sales revenues shall be processed through the servicing DPDO. Notwithstanding, DLA has granted special requests for waiver, in a few instances, for test purposes.

(Reference 96).

1.5.3 A recycling test program was conducted at Vandenberg AFB, California, under these conditions. However, a non-test, follow-on full-service contract was effected between the installation itself and the regionally sponsored recycling authority, without involvement of DPDS. Hence, on a case-by-case basis, the DPDS may allow installations to directly contract with full-service, civilian-community sponsored buyers if it is in the best interest of the Government. (See also Section V, paragraph 3.0 and Appendix F).

1.6 If Difficulties Arise with the Local DPDO:

1.6.1 The installation should request their command headquarters to coordinate the problems with the DPDR office responsible for the installation involved. (Reference 97)

1.7 Example DLA Partial Full-Service Contract (See Appendix D)

2.0 THE GENERAL SERVICES ADMINISTRATION (GSA) ROLE

2.1 General Comments

2.1.1 Although the DLA has the prime responsibility for disposing of salable waste items, circumstances may exist under which it is more advantageous for DOD elements to contract through the General Services Administration (GSA) for desired services and sales. These circumstances primarily include situations in which DOD activities are located in GSA owned or leased facilities, rather than on a military installation. The Pentagon and other DOD occupied buildings in the Washington, D.C. area are examples of this relationship as is Headquarters Aerospace Defense Command (ADCOM) in Colorado Springs, Colorado.

2.1.2 Using GSA may provide some advantages for the DOD, to wit:

2.1.2.1 The military organization charged with program responsibility is eligible to receive 100 percent of sales revenue received, rather than paying a commission as is the case with the DLA.

2.1.2.2 A minimum price guarantee can be put into the sales-service contract whereas this is not practical with DLA contracts that must include an Escape/Termination Clause.

2.1.2.3 The chances of receiving more bids for sales contracts may be greater with GSA than is possible with DLA because GSA "bid deposit" requirements appear to be considerably lower than DLA.

2.1.2.3.1 DLA usually requires a bid deposit of 20 percent of the estimated total contract price on sales not exceeding one year; for sales exceeding one year's duration, the bid deposit is computed at 20 percent of the estimated total price estimated for one year's removal of the salable property.

2.1.2.3.2 GSA may require a nominal bid deposit, not based upon percentages, or no bid deposit at all.

2.1.2.3.3 As discussed in Section II, paragraph 2.3.1.1, the DLA requirement for a 20 percent bid deposit often discourages potential buyers because of an unwillingness or inability to commit funds before a contract is achieved and/or revenues are available to cover them.

2.1.2.4 GSA manages service contracts for their buildings, which means that they are in the best position to centralize and facilitate management of custodial and/or refuse collection services needed to complement full-service/sales operations. (Although it may be desirable for a full-service contractor to be responsible for handling and coordinating the movement of wastepaper within a building, it is not a realistic expectation; it is essentially a Government responsibility).

2.1.3 Despite the natural temptation to want to give the entire wastepaper recovery program over to GSA because of their capabilities, the military organizations occupying the facilities must take an active role in the implementation and continuance of recovery programs. It is very important that organizational leadership support the program through direction and example. Similarly, it is critically important that a Program Manager be designated and given sufficient authority to coordinate DOD-GSA-contractor activities during all phases of the program to help make in-house changes that will benefit recovery operation, to help resolve problems caused by in-house practices (e.g., contamination) and in effect be given time and authority to exercise effective stewardship of the wastepaper recovery program in his/her facility or area of responsibility. (Reference 98-103).

2.2 A copy of pertinent sections from a GSA full-service contract is reproduced in Appendix E.

3.0 COST AVOIDANCE SERVICE CONTRACTS

3.1 As indicated in Section V, paragraph 1.3.8.1.3, installations may be able to effect a recyclable waste material recovery program by contracting with custodial or refuse contractors to pick up and sell the recyclables in return for lower costs of their basic services. However, historical experiences with this method have been scarce, usually address corrugated cardboard, and have produced mixed results.

3.2 Regular refuse collection and disposal contractors will normally avoid recovery contracts because of the market risks involved, unless they are written in a way such as indicated in Figure 10. Under the contract provisions illustrated in that Figure, the contractor pays the Air Force a specified percentage (25 percent) of the market price received by the contractor, if and when he sells the cardboard. This arrangement at Lowry Air Force Base, Colorado, has proven to be a "strong" one and has kept the installation's cardboard disposal costs down; however, experience at another Air Force installation, in the same relative geographical area, with a similar arrangement, has not proven to be as successful and reinforces previously stated observations that markets and contractor capabilities can vary significantly from one installation area to another. (Reference 104-108).

Name of Offeror or Contractor:
AURORA TRASH, INC

ITEM NO.	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	S71298				
0001	Nonpersonal services to pick up and dispose dispose of waste cardboard from Base Commissary, Bldg 640. Disposal site to be at the contractor's discretion (off base). The cardboard will be stored in 40 cubic yard containers with an interlocking stationary hydraulic compactor unit. A special vehicle compatible to the unit is required to transport the cardboard. The compactor unit is owned and furnished by the Government.	144	LD	$40.00	$5,760.00

Service is to begin 1 October 1977 and continue through 30 September 1978.

Providing the contractor finds a market for this waste cardboard, the Government will receive credit reflecting 25 percent of market price received for sales of cardboard.

FOR INFORMATION CALL: Mr Carl Hall
Bldg 312
Phone 394-2968/3754

Copies of all weight tickets, signed by driver and credit vouchers for sale of cardboard shall be forwarded to addressee as shown in Block 14 of DD 1155, Order for Supplies or Services.

Figure 10. Example of Nonpersonal Services Cost Avoidance Contract - Cardboard Disposal

3.3 The specific contractual arrangement described in Figure 10 is not recommended for use with office-generated wastepapers. A more sophisticated contract containing a minimum cost avoidance guarantee is essential for planning and decision making. The chances of obtaining such a contract are minimal. An additional obstacle to obtaining a long-term cost avoidance agreement is the historic inability of many installations to effect multiyear, basic refuse or custodial contracts, because of the inability of many contractors to perform satisfactorily during their first, and essentially final year of operation.

4.0 DIRECT CONTRACTING WITH COMMUNITY SPONSORED RECYCLING AUTHORITY

4.1 Direct contracting between an installation and a regionally-sponsored recycling authority has been accomplished at Vandenberg Air Force Base, California. It grew out of a test program in which the DLA granted a waiver to its right to sell Government owned waste materials in order to determine the efficacy of a military installation directly working with a civilian community sponsored recycling authority offering a full-service arrangement. When the test was completed, the installation awarded a follow-on contract to the same recycling authority.

4.2 Pertinent provisions of the contracts awarded by Vandenberg AFB are included as Appendix F. The following are notable provisions of the documents:

4.2.1 Government Furnished Equipment [GFE] and Services

4.2.1.1 The Air Force provided buildings for processing the recovered materials and storing them until shipment. The contractor is provided "reasonable amounts" of utilities.

4.2.1.1.1 It should be noted however, that the Air Force had to spend approximately $2400 over 16 months in order to repair and maintain the facilities and ensure that they were adequate for contractor use; these expenses were absorbed under base Civil Engineering direct operational and maintenance funding, and not charged to the recycling program. Costs such as these must be anticipated and included in economic feasibility studies. (Reference 109).

4.2.1.1.2 An installation must also ensure that GFE is available when agreed to. Failure to do so may provide a basis for the contractor to take action against the Government, particularly, if it delays start-up oeprations. The contractor at Vandenberg experienced delays in this regard because of a failure of an existing occupant to vacate the designated area, and a related problem of inadequate priority given to repairing the facilities in time to meet the contracted start-up date. Fortunately, the contractor was flexible enough to work around these problems, but they did add to his start-up costs and thereby aggravated his cash-flow problems. (Reference 110-113).

4.2.1.2 The Air Force originally provided one Government one and one-half ($1\frac{1}{2}$) ton truck to the contractor, plus an agreement to supply an alternate vehicle to maintain continuity of the program if and when the original truck encountered repairs that made it unavailable for program use. Various problems were encountered with the vehicle GFE and lessons were learned as follows:

4.2.1.2.1 The base Civil Engineer provided the truck out of his inventory/service fleet. At turnover, the condition of the truck was described as in "working order." Subsequently, the truck developed numerous, significant mechanical problems which put it temporarily out of commission on a number of occasions and required substitution by Vandenberg authorities, usually out of the base Civil Engineer's vehicle fleet. The frequency of repair tended to disrupt the continuity of the recycling program, created a real problem in meeting Civil Engineering mission support requirements (caused by removal of their truck for substitution), strained installation-contractor relationships, and required budgeting of significant contractor expenses for vehicle repair and maintenance. The situation was further aggravated by delays in repair caused by the contractor needing to obtain this service off base.

4.2.1.2.2 Although not required during formulation of the original contract, the contractor requested an additional vehicle from the Air Force. He subsequently received a one-ton truck out of salvage, through the efforts of base Civil Engineering personnel. The truck was described as being "not in operating condition" at the time of turnover to the contractor and required his expenditure of $400-500 to put it into shape." This truck also frequently broke down and tended to disrupt the program. Contractor personnel sometimes had to use their own personal vehicles for collecting materials.

4.2.1.2.3 Both vehicles were apparently needed to support the widely scoped activities of the recycling program, and neither could adequately substitute for the other. Without a backup vehicle, the contractor found it difficult to remove a truck for the routine maintenance (that had to be accomplished off base because the contractor could not afford the resources to conduct a maintenance and repair function on base). This led to further problems with the conditions of the trucks, particularly with respect to appearance and conformance with applicable safety requirements. (Reference 114-122).

4.2.1.2.4 Lessons learned from the experiences include:

- The Air Force can provide a contractor with an Air Force vehicle(s) that is assigned to an active installation organization. (This was an apparent, but temporary, legal question encountered during negotiations of the original contract).

- Providing a truck out of an active organization's vehicle fleet can adversely impact on that organization's ability to maintain required mission support activity if it is required to provide a substitute vehicle when the original vehicle is unavailable. (This provision was removed from the post-test Vandenberg AFB recycling contract).

- Use of salvaged vehicles and "under-utilized," old, active inventory vehicles should be avoided unless high repair and maintenance costs can be justified by revenue and/or cost-avoidance savings.

- Negotiation and contract awards should ensure that properly sized and suitably equipped vehicles are available to backup on-line vehicles during their downtime periods.

- On-line and anticipated backup vehicle requirements and costs must be considered in an economic feasibility study;

impact on mission support capabilities must also be described during such a study.

4.2.1.3 The Air Force was required to provide the contractor with a platform scale, although this was not a GFE item in the original contract. All possible pieces of needed equipment and their availability should be resolved before contract award in order to accurately assess the economic impact of the proposed recycling program. The cost of equipment, such as the scale ($2075.00 including transportation), could make a significant difference in determining whether or not a program should be implemented.

4.2.2 A "Revenue Sharing" provision can be incorporated in a nonpersonal services contract.

4.2.3 The Government <u>can</u> provide a significant portion (at least half) of its contracted payments for services during the first month of a full-service related contract. This "up front" money can alleviate contractor cash flow problems caused by: (1) Initial capitalization for investments and equipment; (2) Start-up costs; and (3) Operating costs incurred while waiting until there are adequate recyclables to sell.

4.2.4 Long-term, multiyear nonpersonal services contracts are only possible under fixed-fee arrangement. Contracts with desirable features based upon conditional terms (such as minimum tonnage criteria, percentage of market revenue sharing, etc) cannot be awarded unless the prospective contractors and the Government agree to an arrangement under which the contract is for one year with options to renew. (Reference 123).

4.2.5 Participation of Government contractors, occupying installation facilities, in a proposed recycling program cannot be automatically assumed. An agreement to participate must be obtained from these contractors <u>before</u> recycling contractual agreements are finalized. Failure to do so may delay program progress, inhibit achievement of estimated generation levels, and generally disrupt operation of the program. (See also Section X, paragraph 3.5). (Reference 124).

4.3 The base-regional approach utilized at Vandenberg AFB may be difficult to duplicate elsewhere. Applicability will be dependent upon the following variables. (Reference 125-127).

4.3.1 Availability of a successful regional recycling organization which is adequately staffed and responsive to DOD needs and requirements, which can assist in start-up operations and sales of materials.

4.3.2 The cost, if any, of such services.

4.3.3 The ability to contract for service and sales directly between the installation and the recycling authority.

4.3.4 Good communication channels between installation personnel and regional/local organizations.

4.3.5 Feasibility analysis.

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125. Watters, September 1977, p. 13.

126. SCS <u>Review Of Source Separation</u>, p. 69.

127. Personal Observations.

SECTION VI

METHODS FOR SEPARATING, GATHERING AND STORING WASTEPAPER WITHIN A BUILDING

1.0 APPROACHES TO SOURCE SEPARATION

1.1 General Description

1.1.1 Program planners must be prepared to be flexible and imaginative in the way wastepaper can be effectively recovered from the various generating activities on an installation. The configuration of a building, the number of people working in an area, the function(s) being performed and the category (ies) of wastepaper being generated bear directly on the method and combination of methods that must be used to maximize recovery and minimize adverse impact on work routines.

1.1.2 Recovery of wastepaper from within a facility essentially encompasses five basic operations.

1.1.2.1 Separation of paper and accumulation in a container in the generator's work area.

1.1.2.2 Transfer of the accumulated paper to an intermediate container.

1.1.2.3 Gathering recovered paper from the intermediate containers and transfer to a storage area.

1.1.2.4 Storage of the paper.

1.1.2.5 Collection of the stored paper and delivery to a processing/central storage area, or directly to a buyer.

1.1.3 Several approaches have been used by private and Governmental organizations for separating and gathering wastepaper. The most prominent approaches include the following:

1.1.3.1 Desk-Top: Every employee working at a desk is provided a small container that is used for temporarily storing separated paper at his/her desk credenza or other convenient location. The paper can then be gathered in a variety of ways, depending upon various system factors. The non-recyclable portion of the solid waste generated is deposited into waste-baskets and collected in a conventional manner by contractor and/or military custodial personnel.

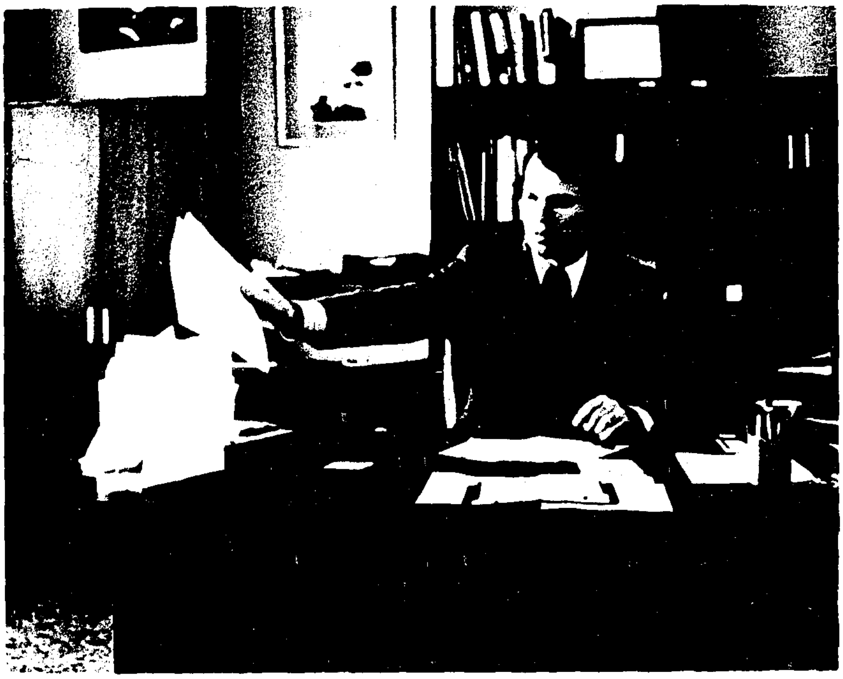
1.1.3.2 Central Container: Desk employees separate paper and accumulate it in a receptacle of their own choosing (e.g., desk drawer, "in-out" basket). Each employee then carries his/her accumulated paper to a centrally located container for gathering by custodial or other designated recycling program personnel. All other solid waste is deposited in wastebaskets and handled in a conventional manner. Central containers are also used in work areas that are not desk oriented and where large quantities of recyclable paper are generated (such as computer processing rooms, Accounting and Finance counter areas, Reproduction/ Printing Shops, etc.).

1.1.3.3 Dual Basket: Each employee is provided two waste-baskets, one for recyclable paper and the other for remaining solid wastes. Custodial personnel separately or simultaneously collect the contents of each container. (Reference 1).

1.2 <u>Desk-Top System</u>

1.2.1 Analysis of source separation tests at Vandenberg and Tyndall Air Force Bases confirmed that the Environmental Protection Agency (EPA) recommended desk-top container system is the most effective method for recovering high-grade wastepaper, particularly for noncomputer product wastepaper items. This effectiveness, defined in terms of high employee participation and low contamination levels, appears to be based on these "subtle" yet highly important characteristics.

1.2.1.1 The container is kept off of the floor, which minimizes confusion as to which container to place recyclable paper. Potential for confusion always exists when using a dual wastebasket system.



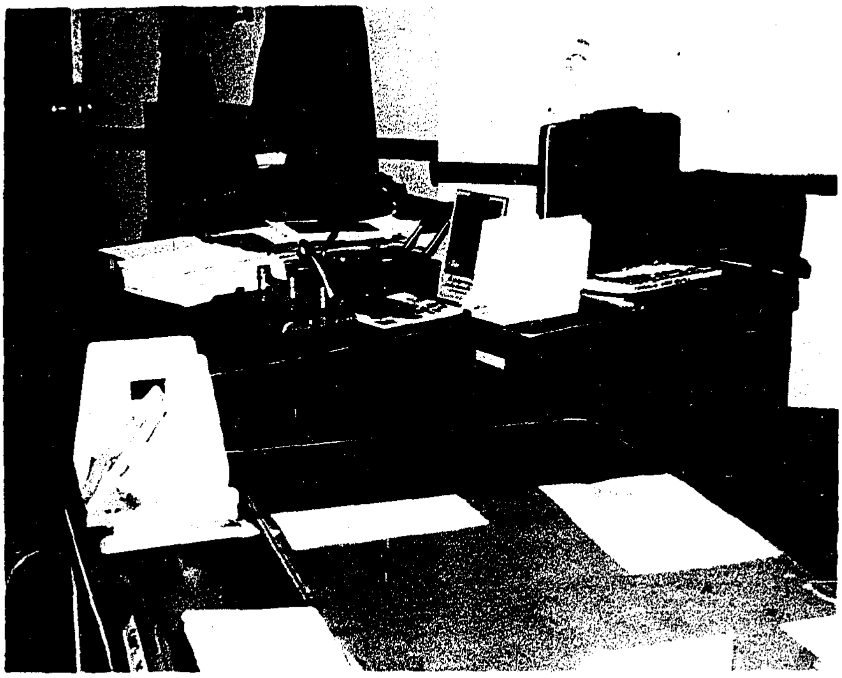


Figure 11. Use of Desk-Top Containers

1.2.1.2 When high-grade paper is placed in a desk-top container rather than thrown into a wastebasket it lends a sense of value to the item rather than giving it the connotation of waste. Obviously, this promotes a positive attitude for participation.

1.2.1.3 It is more convenient to place separated paper into a desk-top container rather than into a wastebasket on the floor or a central container. Use of the small, accessible container quickly becomes habitual.

1.2.1.4 The narrow vertical design of the desk-top container minimizes the potential for contamination since waste items such as apple cores, coffee cups and beverage containers can't be placed in them. Colored paper can also be spotted easily if inadvertently placed there. EPA studies showed that desk-top programs separating white paper only had an average post-employee contamination level of 3 percent vs 9 and 8 percent for dual basket and central container programs, respectively.

1.2.1.5 The vertical design of the desk-top container also minimizes the amount of desk space required while it maximizes storage capacity. Depending upon employee work habits and function, the container can store from a three-day to three-week accumulation of recovered paper.

1.2.1.6 The accumulation of high-grade wastepaper provides a convenient source of scrap paper and an opportunity to retrieve memos and other notes that are inadvertently thrown away. Both of these advantages build and reinforce a positive attitude toward the recycling program. (Reference 2-5).

1.2.2 The traditional desk-top system requires employees to (1) separate the paper and accumulate it in a desk-top container, and (2) to transfer the paper to central containers.

1.2.2.1 There are situations where an alternate method of storage and transfer are desirable in order to avoid problems with crowded desk tops, crowded office space, and/or poor stacking of paper in central containers (when stacking is desired). An innovative system of using a cardboard tray in place of or in combination with a desk-top container was tested for effectiveness during recovery tests at Vandenberg and Tyndall Air Force Bases.

1.2.2.2 The tray was used as an "intermediate" container at these installations. Instead of placing central containers in each office area, the trays were distributed to workers at a ratio of one tray to every 5-6 employees, who also were given their own desk-top containers. In some confined desk-oriented work areas one tray was used by several people in place of the desk-top receptacle. Within the office the trays are conveniently located (e.g., on table tops, low bookcases, etc.) where workers can empty their desk-top containers into them whenever it's convenient to do so (see Figure 12). Once the tray is filled it is brought by an employee to a mobile, metal storage bin or other large capacity storage container serving the floor or hallway of the office workers involved.

1.2.2.2.1 At Vandenberg AFB, the metal bins open from the side (they're bins originally designed for a food caterer), which requires stacking of recovered paper in order to maximize the available storage space. Empty trays are stored within or on top of the bins. When a tray is filled and brought to the bin, it is stacked within it and an empty tray is withdrawn to replace the full one. As will be described in paragraph 1.2.2.3, problems exist with this particular method and the side loading bin is not recommended for storage of any paper except computer printouts and boxed cards.

1.2.2.2.2 On Tyndall AFB, the intermediate trays were distributed in a manner similar to the Vandenberg AFB operation. A major change was made, however, in that cardboard boxes were used as a floor or hallway storage device, rather than a metal bin. Designated personnel brought the trays to a nearby storage area, emptied the trays into the boxes and returned with the same tray. This method was highly effective in terms of paper recovery, very low contamination (less than 1 percent) and employee acceptance.

1.2.2.3 There are pros and cons to use of an "intermediate" tray system.

1.2.2.3.1 The original concept of recovery and processing wastepapers at Vandenberg AFB required the paper to be as preserved in a "square order," which meant keeping the paper stacked throughout the recovery process. By doing so, the contractor believed that it would facilitate manual palletizing of the paper, thereby keeping labor costs to a minimum and

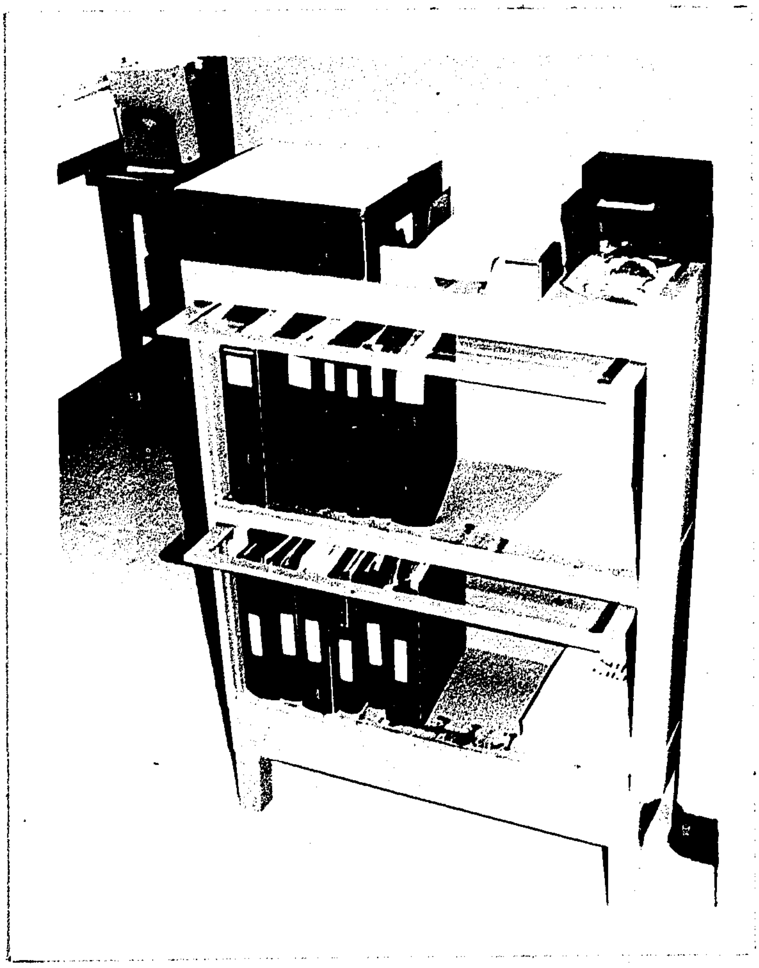
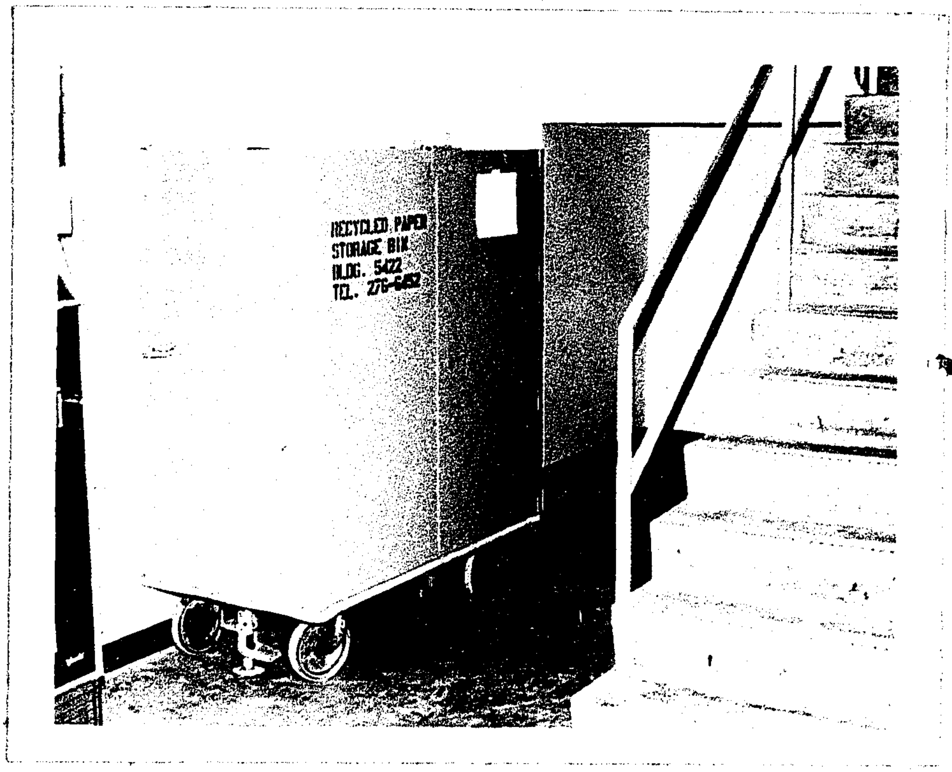


Figure 12. Use of Intermediate Tray in Crowded Office Area (container is top left on bookcase)



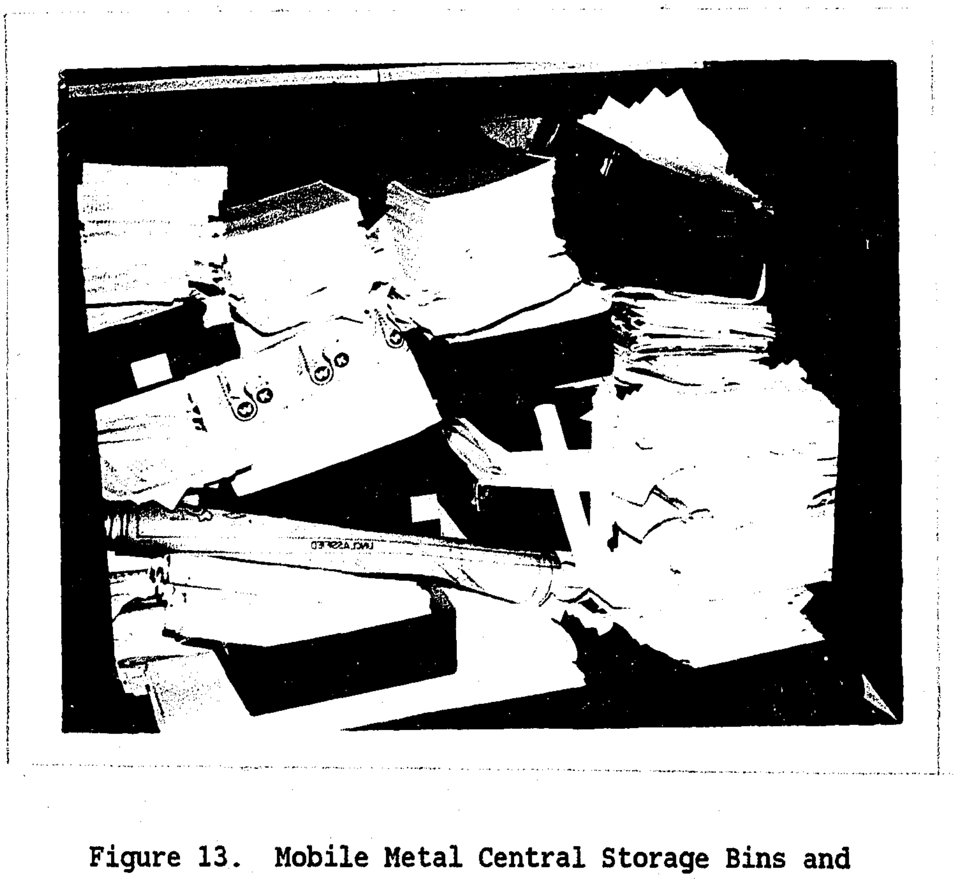


Figure 13. Mobile Metal Central Storage Bins and Intermediate Tray Storage Problem-Vandenberg AFB

enable the program to realize the optimum benefit from the value-added obtained from palletizing (value-added was estimated as $20 more per ton than loosely stored paper).

1.2.2.3.2 Experience with using the tray-to-side loading storage bin method showed that practical and difficult-to-solve problems arise which preclude recommending the system elsewhere. Primary among these problems is an inability to obtain adequate stacking, and a tendency to develop a poor housekeeping appearance. For example, people tend to dump the stacked paper, not fill the trays full enough, or fill them too high. All of these things happen together and result in a non-stratified pile of assorted papers. This often leads to a cluttering of the area from loose paper and empty trays that can't be stored in the bins, and aren't stored neatly on top, either. This creates a negative experience for some employees and discourages and delays collection personnel who have to spend extra time removing the pile of wastepapers and cleaning up the area. It is also difficult to find office personnel who can be motivated and/or find adequate time to monitor the bin areas. The best use for these type of bins are computer printout paper and tabulating cards (in boxes) which stack well.

1.2.2.3.3 When used without the need to stack them in a storage container, the trays are useful, effective devices for moving separated paper out of offices and into large storage containers. Almost 70 percent of the building program coordinators surveyed at Tyndall AFB indicated that the trays were useful and posed "no problem" within their working areas. The trays were not useful in areas where a large volume of computer printout wastepaper is generated, nor in work areas that generate quantities of other recoverable paper such that it requires daily or more frequent emptying of the containers (they hold from 10-20 pounds each).

1.2.2.3.4 Both desk-top containers and intermediate trays generate personal affection and uses by some employees. Without meaningful, diplomatic monitoring by building/area program coordinators, many people like to adapt their desk-top container to use as bookends or standing files, and some employees find it convenient to use the trays for their exclusive use, rather than sharing it with others. These problems can be effecively resolved through persuasion and/or providing more containers and trays for those personnel without the devices. (Reference 6-9).

USE IT AGAIN SAM

RECYCLE

Questions: Call X5228/
2496

Recycle White Paper:

- Tablets, reports (w.o. glue bindings)
- Letterhead paper, tissue copies
- Xerox, other bond copies
- Forms, computer paper
- Manila-colored tab cards

Note: Staples are OK.

Discard

- Newspapers, glossy paper (e.g., magazines)
- Solid colored writing, report and copy papers
- Carbon and carbon-backed paper
- Cardboard, blueprints
- Envelopes, gummed labels, coated copies
- Rubberbands, paper clips

Reverse Side

Figure 14. Desk-Top Container Labels

1.3 Description and Recommended Locations for Desk-Top and Tray Containers.

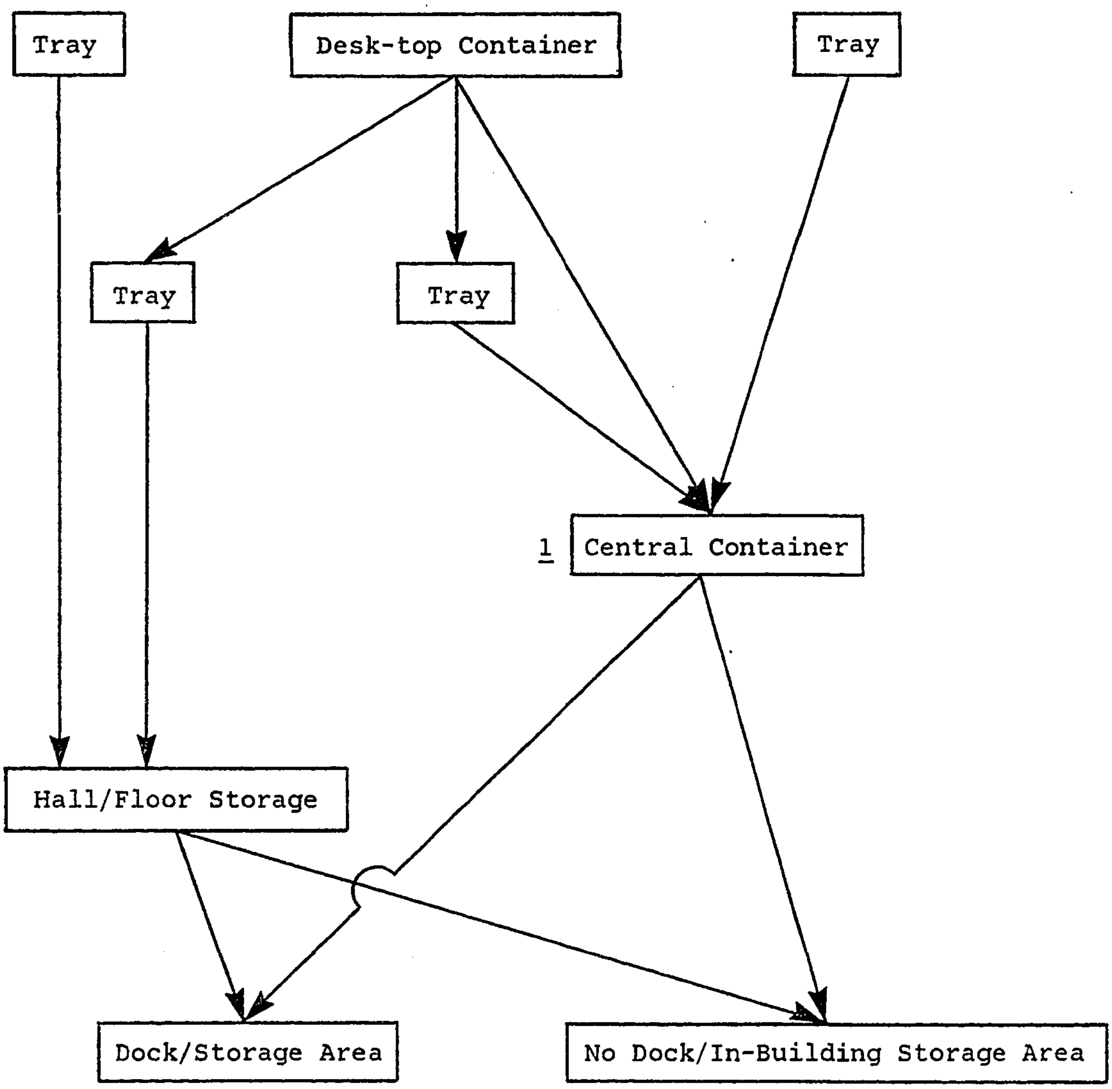
1.3.1 Desk-top containers are usually made of plastic, solid in color (white is the least expensive) and are designed to hold accumulated paper vertically. They may be made of one piece, although most consist of two sections joined together. They measure approximately 4 inches wide by 8 inches long with the two sides approximately 6-7 inches high. They are desirable because of their stability, small size and large paper-holding capacity. They may be available from local office supply stores; however, they may be available for less money through the GSA Federal supply schedule under stock code 7520 (a typical stock number used for requisitioning these containers is 7520-P-25-40-11, where "11" designates the color white).

1.3.2 The trays may be made of cardboard. No common type/ source has been used; the trays utilized at Vandenberg AFB were surplus sliding cardboard drawers originally designed for use in field transport files. The trays employed at Tyndall AFB were obtained from a local office supply store. They are packaged flat, are easily assembled and are durable. They should be large enough to hold ledger-sized paper, or approximately 15 inches long, 10 inches wide and 4 inches high. The local stock number used to procure the trays at Tyndall was: 8135-P-1510.

1.3.3 Both the desk-top and tray containers should have labels or other markings on them relating to their recycling function. Figure (14) illustrates desk-top container labels successfully used at Tyndall AFB and other locations. A bumper-type sticker obtained from the EPA and available through GSA proved useful for identifying the trays (and central containers). Reference Section IX for more complete guidance on labeling and methods for identifying/ promoting recycling opportunities.

1.3.4 As discussed in Section IX, it is recommended that the containers be personally handed to each employee by building program coordinators.

1.3.5 Desk-top containers should be given to each employee with a desk, unless the worker believes a tray would be more desirable because of crowded working conditions and/or large daily generation of wastepaper (ledger,



Note 1: Also useful, by itself, in high volume areas.

Figure 15. In-Building Wastepaper Retrieval System Options

computer printout or both) that would make it impractical to use the container. For the latter situation, use a central container in the working area. (Example locations might include areas of the Accounting and Finance Office (Travel Pay Section), the Work Order Section in Base Civil Engineering, Base Supply offices, etc.).

1.3.6 In Controlled Access areas, particularly where duties routinely involve classified material, it is advisable to avoid recycling; if personnel in these areas want to participate and are confident that there will be no risk of security breach, they can use the containers and should deliver the wastepaper to centally located, large storage capacity containers outside the controlled area. (Reference 10, 11).

1.3.7 In addition to their use in crowded office areas, trays are useful in large office areas. By placing central storage containers near entrances/exits to the office complex and using trays as an "intermediate" storage device, crowding within the office area with central containers is avoided, convenience to the worker is increased, and time and effort employed in gathering the centally stored paper is less than would be spent if gathering personnel had to enter and maneuver their collection equipment throughout the office areas.

2.0 GATHERING AND STORAGE

2.1 Central and Hallway-Type Containers

2.1.1 As indicated by Figure (15) there are various methods and combination of methods for recovering wastepaper within a building. Common to these methods is the use of either a central container or hallway storage device.

2.1.2 Location

2.1.2.1 A central storage container should be placed wherever it is convenient to employees and to personnel responsible for removing its contents. These locations will be dictated by the category of paper recovered, quantity of paper generated, office space configurations, et. cetera.

2.1.2.2 The following are recommended container locations:

- Centrally located in work areas (should be able to serve 15 to 25 desk-oriented employees).

- Immediately inside the entrance to an office complex (minimizes interference with office activities).

- On top of tables or low bookcases (maximizes their accessibility and visibility).

- In high wastepaper generation areas (such as computer processing rooms, Reproduction/Printing Shop areas).

2.1.2.3 Central containers can also be placed in hallways if office space/configuration preclude placement in accordance with the aforementioned recommendations. Do not place the containers in the following areas:

- In the presence of safes and areas where defense classified material is handled.

- In areas in which there are no regular receptacles for waste (e.g., in entrance areas to conference rooms; it invites deposit of contaminating wastes).

- Near vending machines (high potential for contamination).

- Next to cigarette "butt" cans (fire potential).

2.1.2.4 In some office areas, it may be more convenient for employees to transfer their accumulated paper directly into storage containers that service an entire hallway connected area and/or floor of the building. Under these circumstances the container should be conveniently located near entrances/exits, including elevators if they exist.

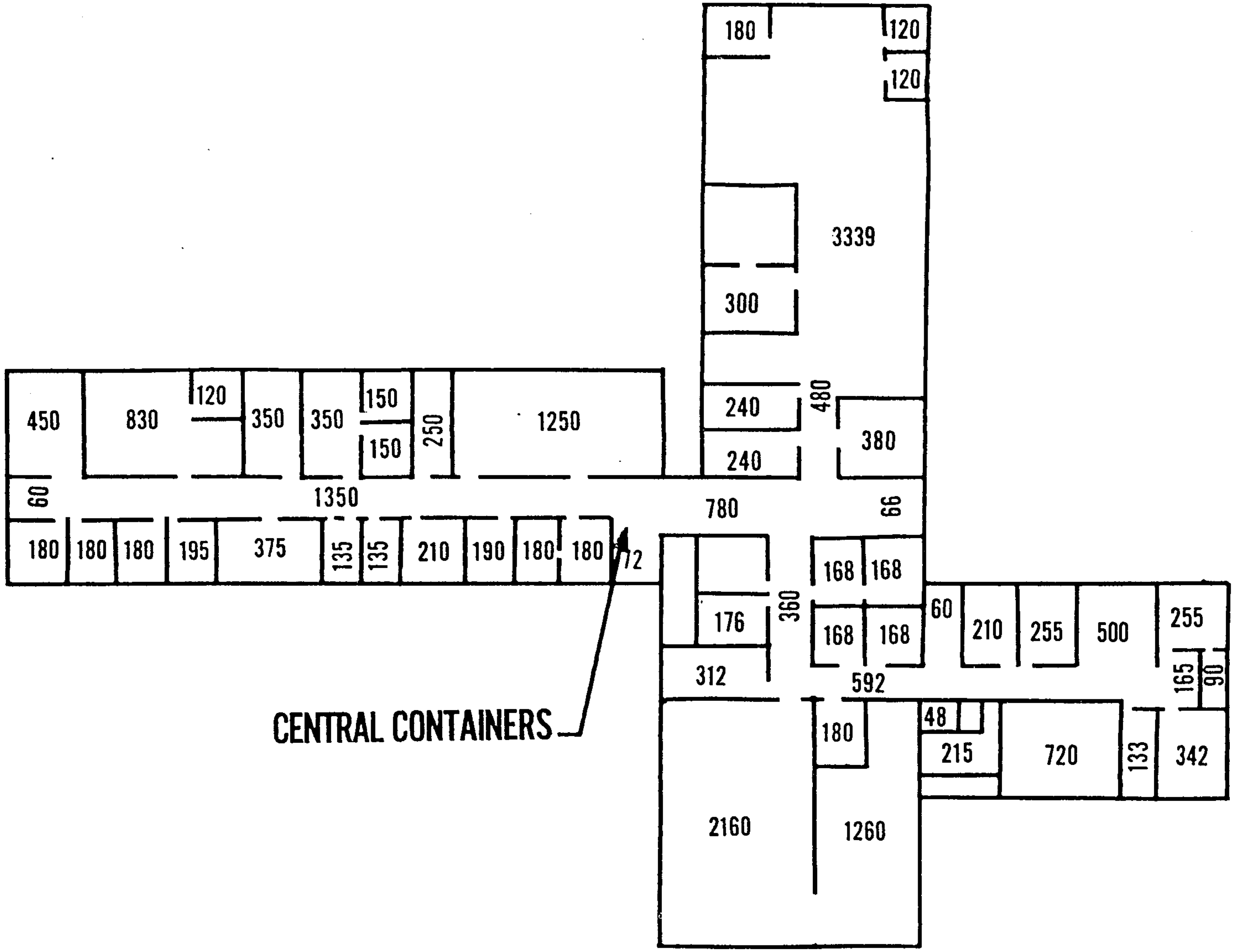


Figure 16. Example Location of Central Hallway Containers

2.1.2.5 Obtain approval of local fire protection personnel for placement, type of containers and necessary frequency of pickup. This has not been a known problem at any base at the time of this writing.

2.1.3 Characteristics

2.1.3.1 Capacity

2.1.3.1.1 For containers that must fit on top of or under tables and desks, a 1.5 foot long by 1.0 foot wide by 1.0 foot high (1.5 cubic feet) container works very well. This equates to approximately 40 pounds of loosely stacked white ledger paper. Larger sized containers can also be used, but loads beyond 40-50 pounds should be avoided for safety in lifting. (Reference 12).

2.1.3.1.2 For areas of high wastepaper generation it will often be advantageous to utilize fiber barrels or mobile carts that can handle up to 200 pounds of paper (approximately 60 gallon-sized containers); capacity beyond this should be avoided because of handling difficulties.

2.1.3.2 Durability and Availability

2.1.3.2.1 Implementation of a wastepaper recovery program should be done on the basis that the program is a permanent one. Consequently, it's important that all equipment used be able to bear reasonable handling wear and tear without frequent, costly replacement.

2.1.3.2.2 Used corrugated cardboard boxes can be used if they are reliably and sufficently available at no cost. They are particularly useful in areas that generate waste computer printouts. The boxes that originally contained the new paper can also serve as containers for the discarded paper. Drawbacks to the use of these boxes in office areas include the need for extra storage space and handling of the empty cartons. In addition, frequent turnover of the containers creates a problem in insuring that replacements are properly marked and labeled as recycling program receptacles.

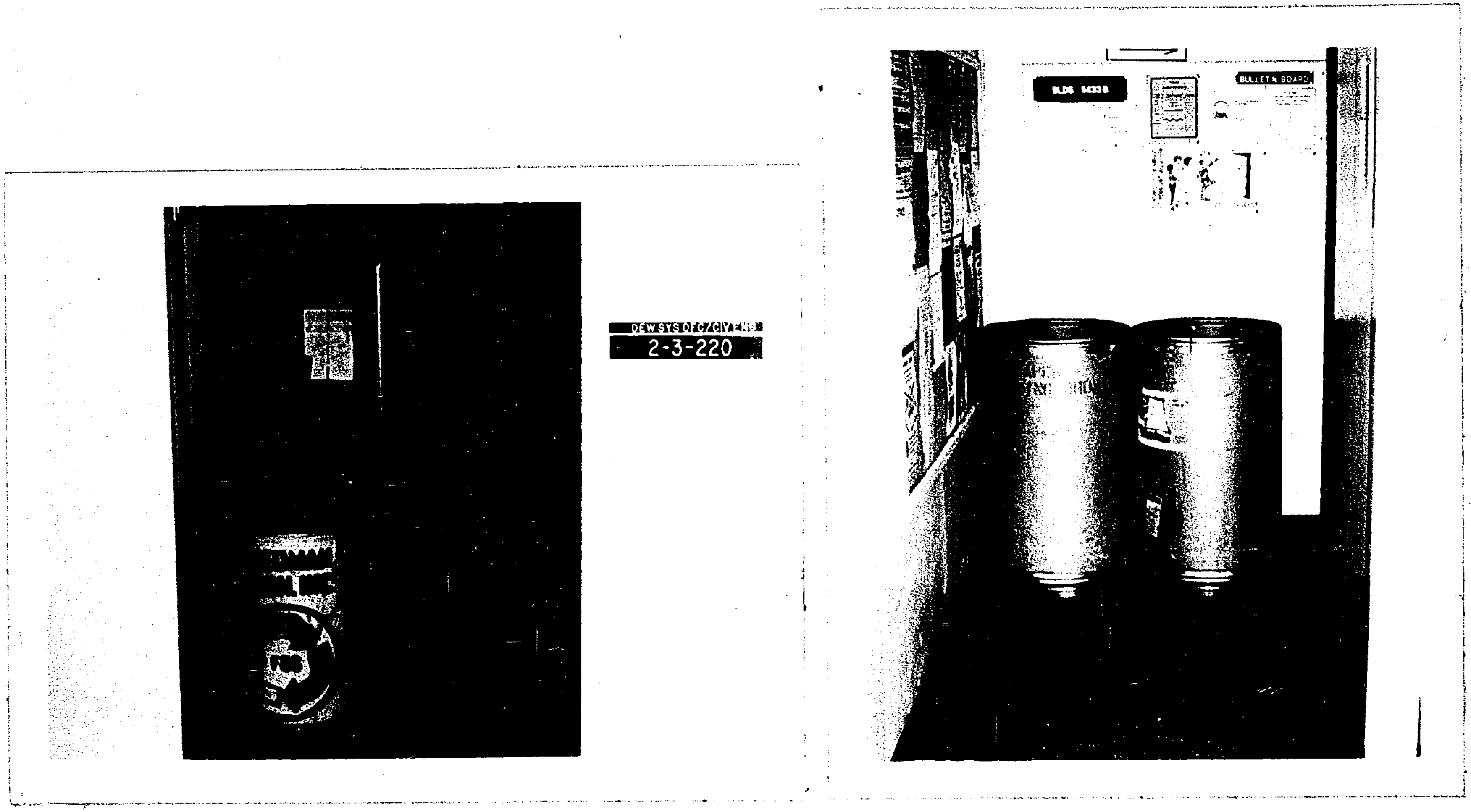


Figure 17. Typical Central Storage Containers and Locations
(note lack of securable tops)

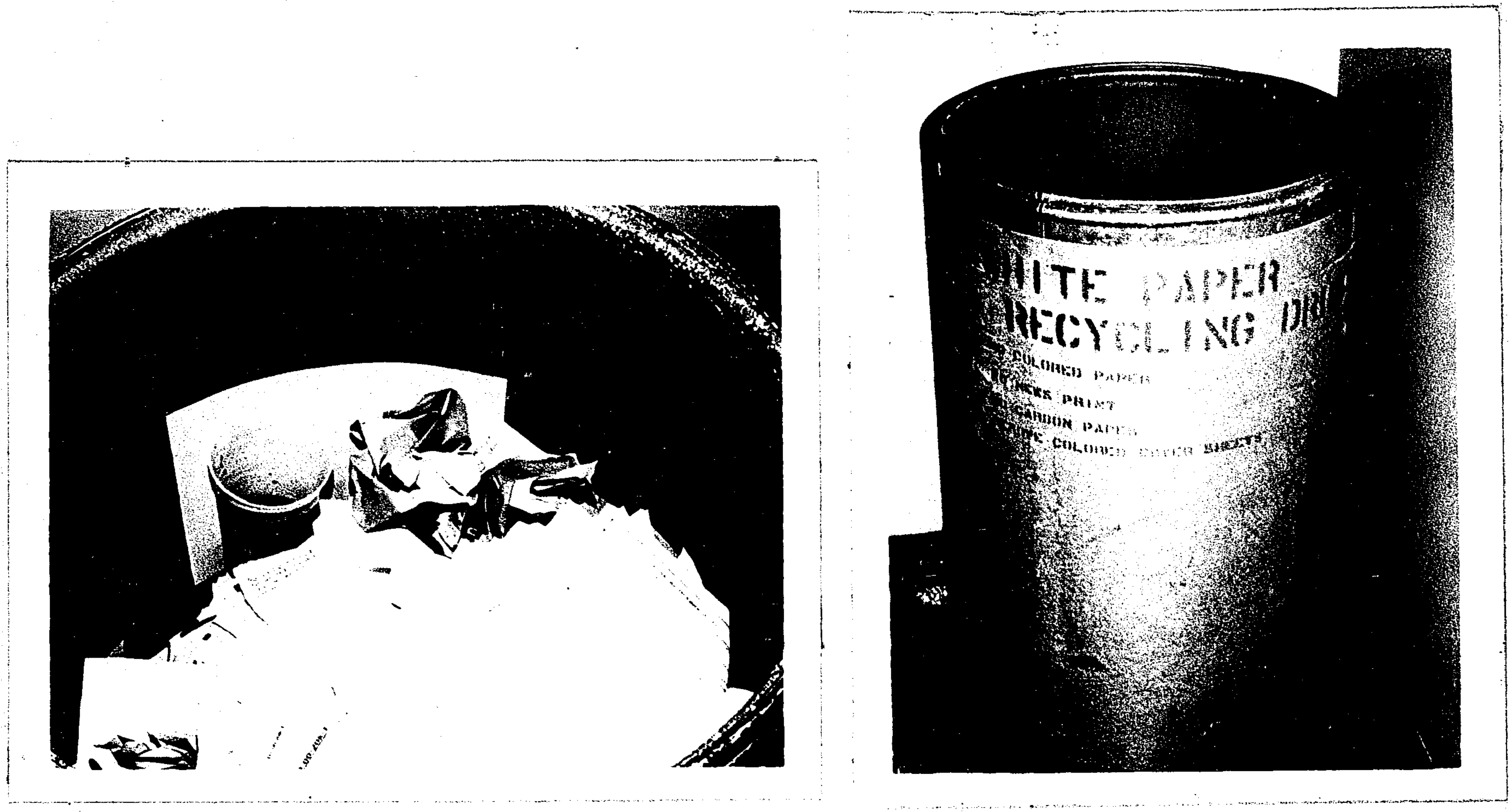


Figure 18. Clearly Labeled Hallway Container - No Top Invites Contaminating Materials

2.1.3.2.3 Permanent type containers are recommended for areas other than the computer processing facilities. As illustrated in Figure (23) near the end of this Section, these can be constructed of plastic, fiberglass, fiberboard and canvas. They are commonly stocklisted as tote boxes, trash container bases, self-stacking boxes, et. cetera. They are available in many sizes and colors and should last at least 3-5 years. The advantages of these containers include not only their durability, but relatively low cost (particularly in quantity lots of 50 boxes or more), distinctive shapes and color, and nesting/stacking capability which minimizes storage space requirements when not being used. Hardened, corrugated fiberboard appears to be the "best buy" from the standpoint of size, cost, and durability.

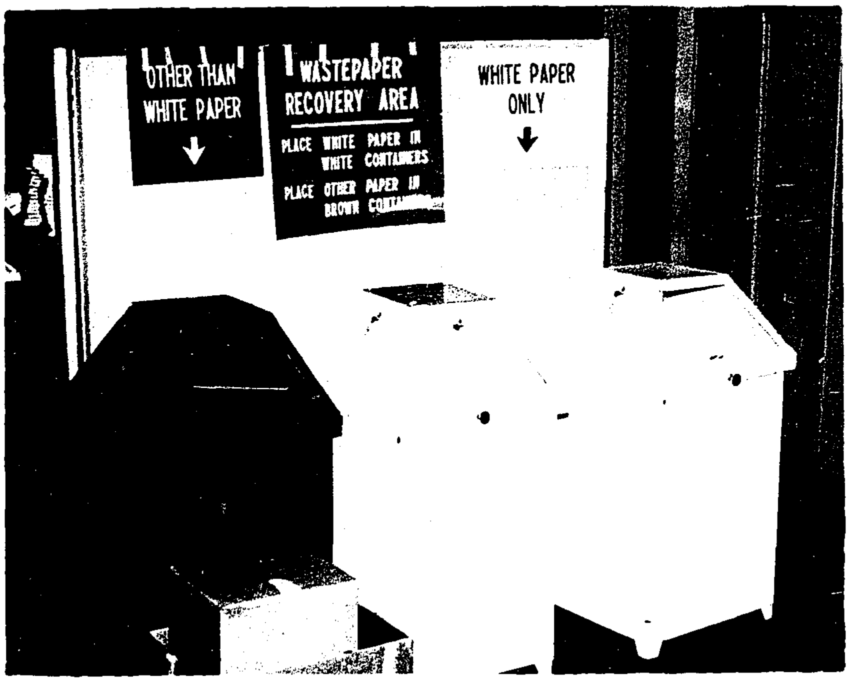
2.1.3.3 Appearance.

2.1.3.3.1 Containers that are similar in appearance to wastebaskets should be avoided in order to prevent employee confusion. They also connote trash and will act as a negative influence on personnel asked to participate in the recovery program.

2.1.3.3.2 The containers must be acceptable in appearance for use anywhere and be easily identifiable as part of the wastepaper recovery program. They should be clearly marked as storage containers and consistently labeled from one container to the next. (Lack of markings, etc. will not only confuse people, but may also result in unauthorized removal for private use.) If possible, poster or similar signs should be placed nearby listing acceptable and non-acceptable items; however, posters themselves can be obtrusive and become unattractive in a very short time and their use is only recommended where a poster board is readily available.

2.1.3.4 Securable.

2.1.3.4.1 In addition to other characteristics, it is important that containers set out in hallways or other areas of traffic be well marked <u>and</u> provided with a <u>lid</u>. Considerable contamination results when containers are left open; it invites unconcious deposition of lunch remains, beverage wastes and other unacceptable waste items.



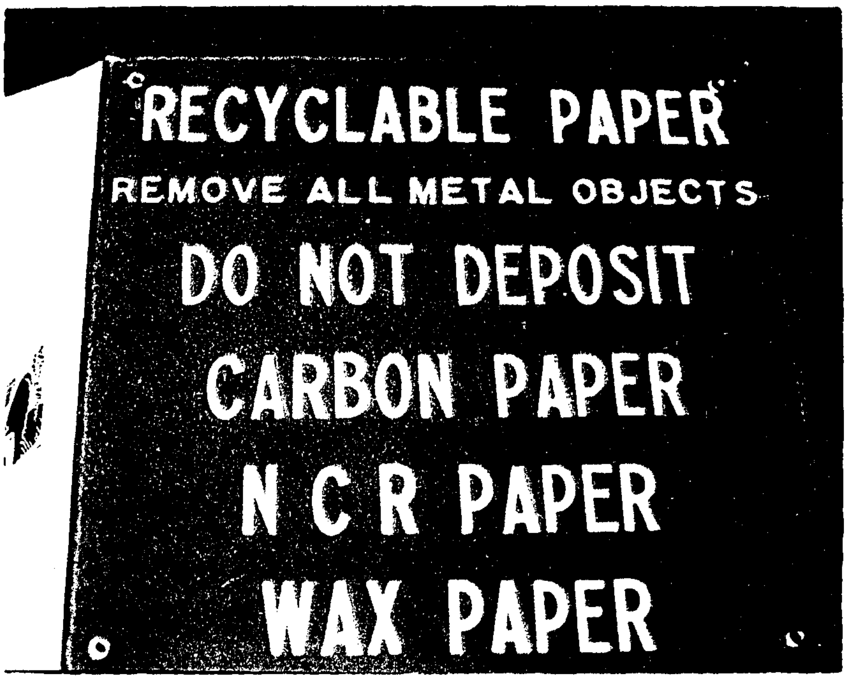


Figure 19. Clearly Labeled Hallway Containers - Securable Tops

2.1.3.4.2 The covers should be snug-fitting and boldly labeled on top to remind personnel of its recycling-related function. (Referenc 13-19).

2.2 Collection/Gathering System Personnel

2.2.1 Like any desirable operation, removal of accumulated wastepaper must be done with maximum efficiency and effectiveness. This requires adherence to the following set of guidelines when setting up a system to gather paper within a facility.

2.2.1.1 "Convenience is sacred to the public:" The most successful source separation programs have been those that impose the least requirements on the personnel generating the wastepaper.

2.2.1.2 Continuity: Only use personnel to gather and store accumulated paper who will perform the function on a regular basis and are not subject to frequent replacement.

2.2.1.3 Collection reliability: Provide schedules of pickups and stick to them; nothing will defeat a recycling program faster than missing pickups and allowing waste to overflow containers.

2.2.1.4 Minimize labor requirements: Keep the number of wastepaper transfer operations to a minimum.

2.2.1.5 Use the right container for the job: Match containers to the physical limitations of the building, the wastepaper generated, and the personnel available to do the job. (For example, containers used for gathering and transferring paper in single-story buildings may be unwieldy or totally incompatible for use in multistory buidlings without elevators.)

2.2.1.6 Contamination must always be dealt with: Particularly with recovery of white ledger paper other than computer printouts and cards. Screening for contaminants can be done by gathering personnel, but should not be done at the point of gathering unless there is no alternative.

2.2.2 A number of approaches can be used to gather the separated paper from central and hallway containers. They essentially involve either the office employees themselves, military personnel tasked to do custodial/janitorial jobs, contract janitorial personnel, base collection personnel or special overhires.

2.2.2.1 Office Employees:

2.2.2.1.1 Employees should be required to transfer their accumulated paper from their desk-top and/or tray containers to central containers. In small areas these central containers may also serve as large hallway/floor receptacles. This utilization of the paper generators themselves is warranted as long as the locations of the containers are close to employee traffic patterns and can be accomplished as a secondary task during office "errands."

2.2.2.1.2 It is <u>not</u> recommended, however, that the gathering of paper from central containers or movement and transfer of hallway stored paper be accomplished by office employees. This task removes the "convenience" factor from the program, reduces productivity, and provides significant potential for discontinuity.

2.2.2.1.3 It is also <u>not</u> recommended that personnel other than the office employees themselves gather wastepaper from individual desk-top containers and trays. Tests at Vandenberg and Tyndall Air Force Bases showed that it is not cost effective to use "outside" personnel in this manner. In addition, the use of "outside" personnel (such as a base collection crew) requires close supervision and time to familiarize themselves with the locations of all the containers; this learning period may be extensive, particularly if the building(s) has a large employee population and is divided into many office spaces. The net effect is usually displeasure with the program and poor recovery effectiveness resulting from missed pickups and/or interference with office activities.

2.2.2.2 Military Custodial Assigned Personnel.

2.2.2.2.1 Frequently, military personnel working in a facility will also be assigned extra duties of clean up, trash removal and other tasks associated with the janitorial/custodial function. At some installations these custodial tasks have been expanded to support recycling programs. The results have been mixed with respect to effectiveness of removal and effectiveness of screening-out contaminants.

2.2.2.2.2 When considering using military personnel to gather and transfer recovered wastepaper within a building, it is important to keep the following things in mind:

- Lack of Motivation: Extra duties involving custodial-type work is not often, if ever, a voluntary endeavor. Usually the lowest ranking personnel are tasked to do the job, which certainly wasn't promised the individual when he/she was being recruited into the service; when the lowest ranking personnel are individuals with considerable time in the service, they tend to resent the tasking even more than relatively younger service personnel. The result is a definite lack of motivation accompanied by a desire to do as little as possible in meeting minimally acceptable requirements of the tasks.

- Lack of Continuity: There is a learning curve associated with every job and recycling-related tasks are no exception. For new programs it may take up to one month of operating experience to optimize gathering routes and establish frequency of the collection. Familiarity with the points of collection is important, and collection reliability "is essential for maintaining high participation rates." Added to these factors is the need to recognize and screen out contaminating material during transfer of the paper from containers used for gathering it to storage containers used for moving the materials to a contractor or processing center. Use of military personnel usually does not offer the length of service, per individual, necessary to effectively learn the requirements and nuances of the gathering system, particularly the important task of rapidly recognizing and screening out contaminants; the method of choosing personnel for the tasks based on lowest rank means that whenever someone of lower rank is assigned to the work area, the extra duty assignments may also be transferred to that individual. This turnover disrupts the program. In addition, many individuals may be assigned the custodial tasks on a rotating basis, which means that the personnel may not do the recycling-related tasks frequently enough to reinforce their learning.

- Lack of Proper Equipment: Often military personnel do not have the same type of trash collection equipment available as contract custodial personnel. Hence, whereas contract custodians may have sidebag carriers, platform trucks, etc, the military person may have to rely on use of plastic bags or other means of carrying light trash loads to the refuse bin/dumpster. Consequently, he/she will have to make a separate trip and manually carry the separated paper rather than be assisted by mechanical means. Faced with this need to make separate trips for the trash and paper, respectively, many personnel will try to make one trip, by mixing the two categories of waste together and either put the mix directly into the refuse dumpster or into the storage area for recycled paper. The former action results in the loss of recyclable paper and the latter action contaminates the wastepaper and may make it unmarketable or require costly labor to remove the unwanted items.

2.2.2.2.3 The use of military personnel to gather and transfer paper appears to work best in (1) small buildings where the amount of paper generation is low (less than one ton a month) and little time is required for the task; (2) where the gathered paper will be sent to a processing center that can sort out contaminants; and (3) where the only paper to be moved is boxed waste computer printout paper and/or computer cards. Close, continued supervision is a must.

2.2.2.3 Contract Custodial/Janitorial Personnel.

2.2.2.3.1 From the standpoint of continuity, reliability, proper equipment, and employee productivity, it is wise to use contract custodial personnel whenever they are available.

2.2.2.3.2 The cost of using custodial personnel to gather and transfer wastepaper will usually be minimal or nothing at all. Programs within the Federal government and private organizations have shown that diversion of recovered paper from the waste stream will reduce the amount of time janitors spend on emptying wastebaskets and transferring the refuse to outdoor bins/dumpsters. The time freed up has then been effectively used by the janitors to gather and transfer accumulated wastepaper. In some instances, additional costs have been incurred but this seems to occur whenever custodial personnel are required to spend additional time sorting out contaminating materials as the paper is transferred to the building's main storage containers.

2.2.2.3.3 Use of custodial personnel may be easier to accomplish in buildings that are served by a day crew. Employed to supplement night crews and accomplish such tasks as replacing burnt-out light bulbs, these personnel often have free time that can be used for the recycling program. Both HQ Strategic Air Command, Offutt Air Force Base, Nebraska, and HQ Aerospace Defense Command, Colorado Springs, Colorado, use day crews to gather and transfer accumulated paper within their respective headquarters buildings without additional costs to their custodial contracts. Similar operations have been successful elsewhere.

2.2.2.3.4 Where using contract custodial personnel it is extremely important that they be given clear instructions on what and how to do the tasks required. In addition, careful and continuous monitoring of these support activities must be accomplished by the program coordinator responsible for the building in which the paper is being recovered. The task of <u>monitoring should not</u> be left up to office individual(s) responsible for monitoring normal janitorial operations (the so-called government building custodians) because experience has clearly shown that these individuals rarely have the time and/or inclination to monitor and document custodial performance, whether it is good or poor.

2.2.2.3.5 Use of contract custodial personnel does not guarantee continuity of individual personnel throughout the course of the contract, but it does seem to offer the highest potential for meeting this requirement and obtaining reliable support when compared to other alternatives. Recycling program managers should be aware that night crew custodial personnel often do the work as a second, part-time job and under these circumstances some of them will quit and be replaced by others during the course of the contract. When this occurs both the building and overall program coordinators must work through the Technical Representative of the Contracting Officer or similar official to ensure that replacement personnel know what to do in order to maintain gathering/ collection reliability and effectiveness.

2.2.2.3.6 Custodial contracts are usually for a one-year period of service. Multiyear contracts are possible but experienced installation managers avoid them because performance quality varies markedly from one contractor to another. It is easier to bear with a poor contractor under a one-year arrangement than trying to terminate a long-term contract (it is difficult to develop the extensive documentation required to show cause why a contract should be cancelled). If a contractor exhibits a lowered level of performance than specified by the contract, it will usually not involve trash-related tasks, and therefore, wastepaper gathering activities, because these are highly visible services. (A contractor will first cut corners on the not-so-visible services such as sweeping and mopping). Hence, responsible monitoring should result in a continuation of required wastepaper gathering tasks throughout the length of the contract; particular attention should always be paid to the contractor's performance in sorting out contaminants, since the quality of this task is most sensitive to a contractor's lack of attention.

2.2.2.3.7 It is possible to add recycling-related responsibilities to a custodial contract after it is in effect. However, these responsibilities should be included in the original Request For Bid (RFB) whenever time and circumstances allow. Input to the RFB should be made as early as possible since a three-month lead time is normally required to prepare and go out for the RFB. (Reference 20-22).

2.2.2.4 Base Collection Personnel

2.2.2.4.1 Base wastepaper collection personnel can be used most effectively when outside storage capability is non-existent and/or contract custodial personnel are not available for in-building paper gathering and transfer.

2.2.2.4.2 Base collection personnel should <u>not</u> enter offices and empty trays and desk-top containers; it's time consuming (and therefore, costly), can interfere with office activity and be unreliable since it is easy to miss these containers in large and/or crowded office areas.

2.2.2.4.3 Base collection personnel should concentrate only on central or hallway storage containers. They should be permanent-type employees whose availability ensures continuity and reliability of operation. Military personnel should not be used if they are also responsible for sorting out contaminants, since turnover of personnel is highly likely and can significantly impair effective maintenance of acceptable contamination levels. (See also paragraph 2.2.2.2).

2.2.2.5 Special Overhires

2.2.2.5.1 It's possible to hire part- or full-time employees to assist the recycling program. Many organizations hire students, handicapped people, young people on probationary work reformation programs, et. cetera. All are viable sources of prospective labor.

2.2.2.5.2 Unfortunately, unless the person is hired as a permanent employee, the installation can expect a high turnover rate accompanied by irratic gathering and sorting reliability and effectiveness. A program will not succeed under these conditions.

2.2.2.6 Other Personnel

2.2.2.6.1 Use of existing inter-office mail distribution personnel to gather and transfer wastepaper has been used in non-military office areas. However, this method does not appear to have much potential on military installations since in most military buildings inter-office mail distribution is handled by office personnel themselves, rather than by personnel hired for that particular purpose. In those buildings that have a separate mail-distribution crew, the quantity of wastepaper generated will probably be too much for them to handle unless an extra employee(s) is hired to perform only that task. (Reference 22-35).

2.3 <u>Gathering and Associated Equipment</u>.

2.3.1 Gathering Approaches.

Central Container

- Cardboard boxes
- Fiber, canvas, plastic tote boxes
- Trash container bases
- Fiber drums
- Unused shelf space

- Custodial/designated personnel collect paper using platform trucks and large containers, handtrucks, dual basket trash collection trucks, hampers, tilt carts, etc.

- Base collection crew collects using handtrucks and drums (not recommended if method must be used in many buildings and/or in large buildings-too time consuming and expensive)

Dock/Storage Area

- Store drums, hampers, etc., or
- Transfer contents to shipping containers (placed on pallets), or
- Dump contents into dumpster/bin, or
- Transfer paper/containers to contractor-provided parked trailer

No Dock/In-Building Storage Area

- Base collection crew collects from central containers and loads directly onto truck with liftgate, or

- Contents are hand transferred into dumpster/bin for temporary storage

- CONEX type containers used to store drums with paper or transfer collected paper into shipping/transportable containers that can be stored in the CONEX (difficult to do in cold/inclement weather)

- Transfer paper/containers to contractor-provided parked trailer

Figure 20. Central Container Gathering and Storage Options

2.3.1.1 A formal system of gathering and transferring accumulated wastepaper should be developed. There are a variety of ways to accomplish the tasks, as already alluded to. Essentially, the variations occur within the generalized system described below:

- Office employees deposit their paper in central and/or hallway containers.

- A member of the custodial crew gathers the recovered paper from central containers, using handcarts or similar equipment. A quick scan for contaminants may be accomplished at this point or when transferred at the central storage area.

- The material is brought to the building's central storage area or loaded directly into a collection truck.

2.3.1.2 Variations to the system can include the following, depending upon manpower and equipment resources, building configuration, type and quantity of wastepaper generated, et. cetera. (Reference Figures 20, 21).

- Mobile tote/roll-away containers can be used as hallway storage containers in which employees can directly deposit their accumulated paper. Custodial or base collection personnel can then roll these containers into a collection truck, using lift gate or raised dock for assistance, or dump the contents into a larger bin/dumpster that will be hauled away for either further processing or direct transport to the buyer.

- Custodial personnel (Figure 22) can wheel a platform truck with large empty boxes/fibre drums to each of the central containers, dump the accumulated paper into the platform-carried containers, and transport the paper to the dock/storage area. At this point:

- The full boxes/drums can be covered and placed on a pallet (if building is a large generator and serves as a central collection point for other buildings) and banded (if non-pallet sized boxes are used).

Hall/Floor Storage

. Mobile Carts (Roll-a-way tilt trucks, hampers) . Fibre Drums	Containers	Fibre drums & Roll-a-way may be best if some steps/ curbs exist

. Base collection crew wheels carts/drums from building & replaces containers, or with empty carts

. Custodial/designated personnel move carts to dock/storage area (use handtrucks for fibre drums); replace in the empty carts, if applicable

Dock/Storage Area	No Dock/In-Building Storage Area
. Base collection crew rolls carts/drums onto collection truck, provide replacements; hampers are easier to stack & would not take up much room on truck, or	. Base collection crew uses truck with liftgate, or
. Cart/tilt truck contents are dumped into dumpster/bin (which are moved by lugger truck to processing area, or transferred directly onto truck for transport to buyer; the latter requires screening of waste for contaminants by collection personnel, or	. Contents are hand transferred into dump-ster/bin for temporary storage, or
. Transfer contents to shipping containers (placed on pallets) (requires screening for contaminants & forklift avalability), or	. Transfer contents to contractor-provided parked trailer
. Transfer contents (possibly carts) to contractor-provided parked trailer (may be difficult to fully load unless transferred to shipping-type boxes; requires screening for contaminants)	

Figure 21. Hallway Gathering and Storage Options

Figure 22. Custodian Gathering Wastepaper with Platform Truck-Carried Container

This procedure requires the custodial personnel to screen the paper for contaminants as it is transferred from the central to platform-carried containers, a practice that will probably be cumbersome and time consuming, but necessary.

- The contents of the boxes/drums can be dumped or transferred to pallet-sized boxes, on pallets, or into bins/ dumpsters used for hauling the paper away. Screening for contaminants can be rapidly and easily performed during this operation if the paper is transferred by hand to the large storage receptacles.

- Custodial personnel can use "compartmentalized" cleaning supply and trash collection carts to simultaneously collect trash and the accumulated paper. These carts hold two canvas bags and have a middle shelf area. A handtruck and drum can be used to transfer a large quantity of wastepaper at one time; 200 pound loads appear to be a weight that can be moved effectively, particularly by two people.

- Computer printout paper and computer cards are most easily moved by storing in the boxes and cases they are delivered in, or in similar size boxes.

2.3.1.3 As indicated in Figures 20 and 21, a common problem with many installation buildings, is a lack of dock or in-building storage area. Alternative solutions to this problem may include:

- Use of US Army "CONEX" shipping containers. These containers come in various sizes, have easy to open doors, and measuring 6'2" x 6'11" x 8'6" offer protection from the weather. Containers are used at Letterkenny Army Depot, Chambersburg, Pennsylvania and may be available as surplus through DPDO or Army channels.

- Use of covered refuse bins/dumpsters that can be hauled away and dumped at a processing site or at the buyer's site (this is used at HQ Aerospace Defense Command, Colorado Springs, Colorado).

- Use of a buyer-provided tractor-trailer for storage (if the buyer is willing and the installation can afford the lower prices the buyer is certain to pay for providing this capability).

- Direct collection of recovered paper from central storage containers by a base collection crew, or use of moveable carts that can be moved from hallways into the collection truck and replaced with empty ones (the latter procedure may not be efficient because of the bulk of the carts and the limited size of the collection truck).

- Limiting recovery to boxed computer printout paper and cards that can be stored in a minimal space within the building and easily moved by a collection crew. (Reference 36-45).

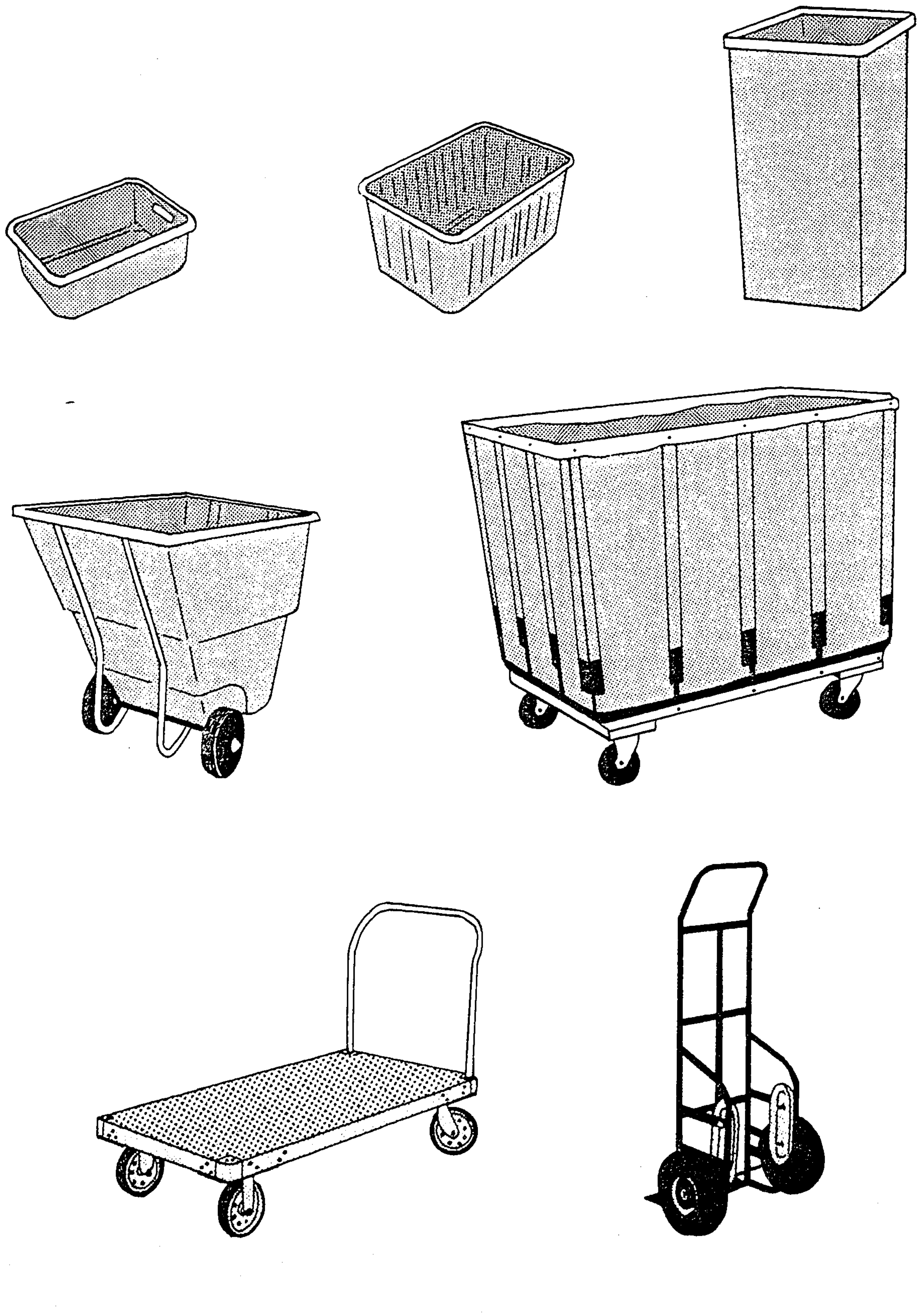


Figure 23. Examples of Central Storage Containers (top row) and Wastepaper Gathering Equipment

2.3.2 Equipment

2.3.2.1 Figure 23 illustrates the type of equipment described in the previous paragraphs.

2.3.2.2 It is advisable to use equipment already available on the installation in order to minimize costs. However, whether used or new, on-floor gathering/collection equipment should take into account the following criteria:

- Wheels; should be of large diameter for easy movement over carpets, door sills and elevator clearances (if applicable).

- Tire Material; should be resilient and resistent to marking floor surfaces.

- Axles; should not project beyond the wheel frame or cart face and should be capped (if not, they can cause personal injuries and damage walls).

- Bumpers; on all sides, adequate to protect walls.

- Rub Rails; particularly needed in congested areas; should be coordinated with the vehicle details.

- Size; should pass freely through all doorways and, if possible, require only one leaf of double swing doors to be open for passage; should be easily moveable by personnel.

- Capacity; should have sufficient capacity to minimize off-route trips to central storage areas. Ensure equipment can withstand loading desired (for example: mobile roll-a-way type refuse containers may have an 80 gallon capacity which equates to approximately 10.6 cubic feet. Assuming 38 pounds per cubic foot for stacked white ledger or computer printout paper, 10.6 cubic feet represents 403 pounds, which exceeds the 200 pounds rated capacity of the containers and could result in rapid container failure if ever the full volume is used, which would be rare because of the configuration. (Reference 46-49).

2.3.2.3 Equipment that can be used for stroage and gathering include the following:

- Heavy canvas duck hamper trucks with rubber casters on the bottom.

- Easy tilt trucks (high weight capacity, one piece molded high density polyethylene trucks; expensive but durable and not unattractive).

- Dock-dumper box trucks (1200 pound capacity but designed for easy mobility and one-man handling and dock-level dumping operation).

- Reinforced corrugated or fiberboard containers (some arrive flat for easy storage; unfold easily, attach to trolley base with swivel casters) or come with built-in pallet skid or without, up to 1200-1500 pound capacity; may be expensive unless provided by buyer).

- Round or square fibre drums (inexpensive, readily available, high weight capacity; square drums save storage space, increase shipping volume; use with hand truck).

- Metal/wood platform trucks (should be large enough for at least two 23-inch diameter (I.D.) fibre drums (24 inches wide by 48 inches long), be non-tilting, have cushioned rubber wheels and come with rubber bumpers).

- Outdoor refuse bins (four-wheel type or stationary, with two or three piece, <u>securable</u> covers (to avoid problems with the wind, if applicable), 1.0-1.5 cubic yard capacity).

- Hand truck (also known as appliance hand truck and utility truck; should have 500 pound capacity; should have stair climber tread (roller bearing crawlers) or stair user slides to facilitate rolling over curbs and stairs; recommend models with fastening belt.)

Figure 24. Example of Cart-Type Storage/Gathering/Collection Equipment

- Mobile Toter(TM) System, Roll-A-Waste(TM) System, Mobile Refuse Container(TM), or similar cart system (80-gallon, 200-pounds suggested capacity (Figure 24); high density molder plastic container with lid; could serve as acceptable hallway or central storage container in narrow hallways/crowded office areas; easy to move (but unwieldy on stairs); some carts come with dumper units; FSC Class 7240).

- Custodial waste collection and maintenance compartmentalized carts; hand carts with canvas side bags.

- Pallets and pallet jacks.

3.0 SCHEDULING

3.1 A formal schedule for gathering and collecting recovered wastepaper should always be established and adhered to for each building involved in the recovery program. Each building and area program coordinator should be given a copy of the schedule and the names of personnel to contact if the need arises.

3.2 The following guidelines for scheduling the gathering/collection of wastepaper should be followed:

- Ensure the number and capacity of containers and frequency of pickup will accommodate the rate of generation. Avoid overflow situations (which will create a negative attitude among many employees).

- Conduct a "dry run" before program implementation to familiarize pickup personnel.

- A month of operating experience will help to optimize routes and establish frequency of collection.

- Be flexible and able to change locations of certain central containers or frequency of pickup at certain locations because of unexpected high or low generation rates, or surges (except surges during the first week of implementation because of pre-implementation inventory buildup by motivated personnel and during calendar year files cleanout).

- Encourage gathering/collection personnel to provide recommendations to increase program operating efficiency.

- Ensure backup containers are available and/or an alternative collection plan is formulated to meet emergency-type situations that could occur because of surges in paper generation during end-of-the-fiscal and calendar year periods, or when the buyer fails to pick up the paper on schedule. (Lack of backup capacity and plans can result in loss of recyclable paper to the trash bin and an unattractive, unacceptable housekeeping appearance.)

- Monitor and supervise the operation closely. (Reference 50-53).

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SECTION VII

ON-BASE COLLECTION SYSTEM

1.0 INTRODUCTION

1.1 Ideally, a paper recovery program involves the gathering and storing of the waste material within a single building and its subsequent collection by a buyer or his agent. Unfortunately, most military installations are characterized by conditions that do not favor cost-effective, long-term recovery operations, particularly because of the need for an added cost, well-organized, well-managed multi-building collection system. Conditions necessitating a collection system include the following:

1.1.1 Low generation rate: As will be discussed in Section X, the generation of white ledger paper, per office-type worker, is low compared to civilian-type organizations within the non-DOD Federal structure (e.g. 0.25 pounds per person per day versus 0.51 as indicated by the EPA).

1.1.2 Lack of large, in-building populations: Aside from military-occupied buildings in Washington, D.C., most of DOD's work is carried out in one- to three-story buildings which translates into relatively low office populations per location.

1.1.3 Wide dispersal of buildings: It is not uncommon for most buildings of high paper recovery potential to be scattered over a wide area on military installations. This presents a challenge to implementing a recovery program because buyers prefer to pick up waste materials from one location point rather than from the multiple points of generation present on an installation.

1.1.4 Lack of in-building storage area: Installation buildings rarely have central storage capabilities that will accommodate accumulation of wastepaper in sufficient quantities to attract buyer pickup from the buildings themselves. Use of balers to maximize available space will generally be non-cost effective.

1.2 Under these conditions program planners must evaluate several alternatives for collecting and consolidating wastepaper in accordance with the requirements of buyers and the market in general. These alternatives should include tradeoffs between the categories of wastepaper present (e.g., tabulating cards, sorted white ledger, and/or computer printout paper only), and the amount of resources necessary to collect and process the materials. Systems for multiple paper category collection can be expensive and installations must always weigh those costs against less ambitious but perhaps more cost-effective programs (such as concentrating only on tabular card recovery).

1.3 Regardless of program scope, every collection system must be characterized by high reliability and continuity. Reliability means establishing a schedule of pickups and maintaining it; it means being able to handle unusual situations (such as paper surges) and having adequate backup resources during contingency situations. Continuity means avoiding frequent personnel turnover that can threaten effectiveness, efficiency and, therefore, the survival of a program. Experienced personnel are necessary for the program because of the many things they have to do and which take time to learn effectively; such "things" include knowing what they are required to pick up and where they must do it (without missing pickup locations), how to recognize and/or respond to unusual situations, and how to interact effectively with office personnel. No collection system should be set up if it fails to guarantee meeting these conditions.

2.0 METHODS OF COLLECTION

2.1 Computer Card Recovery Only

2.1.1 One option for recovering computer cards only is to utilize the existing base mail distribution system to collect boxed cards weekly from generating activities and deliver them to a specified location. The collections should be staggered throughout the week to minimize the load on mail pickup personnel. For buildings that produce quantities of cards that could overwhelm the mail distribution system, such as Base Supply, a separate method of collection will be necessary (e.g., Tyndall Air Force Base Supply uses one of their trucks and crew to periodically pickup and transfer Supply-generated cards to the local DPDO area). (Reference 1). Buildings without a mail stop can use their internal distribution system to send their cards to a building that is on the mail distribution pickup system. The cards collected can go to either a temporary location or directly to the DPDO. There are advantages and disadvantages to both.

2.1.1.1 If temporary storage space is available at a base activity, such as base Civil Engineering, the boxed cards can be "mailed" there and then placed on a pallet; subsequently, the weekly accumulation can be delivered to the DPDO area for further storage, in a base-supplied building, and eventual sale.

2.1.1.1.1 The advantage of this option would be the ability to recover 80 percent (or a similarly negotiated percentage) of the sales revenue for use on installation energy recovery and environmental projects. Recovery of these monies would also accommodate DOD policy to keep the recovered monies at the local level in order to serve as an incentive for continued resources recovery.

2.1.1.1.2 This option would require someone to store the cards as they are delivered. The cards could be stacked in a box pallet which takes up an area four feet by four feet. Once a week a flatbed truck would be needed to transport the pallet to the DPDO. The possible disadvantage of this procedure is the necessity to have a forklift available at both the staging area and the DPDO to load and off-load the cards. Ensuring that personnel properly stack the cards is also a matter of concern, although this requires little training.

2.1.1.1.3 If the cards are merely stacked without palletizing at the staging area, they could be loaded onto a flatbed truck, delivered to the DPDO, and off-loaded at the DPDO directly into a box pallet.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 4756TH AIR BASE GROUP (ADCOM)
TYNDALL AIR FORCE BASE, FLORIDA 32403

REPLY TO ATTN OF: DEEV (Mr. McDonald/2496) 31 JAN 1978

SUBJECT: Continued Recovery of Used Computer Cards

TO: 4756 ABG/DEI/SS/DPME/DPCO/JA
ADWC/OI/LGP/MAL/LGSPP/ACF/ACD/LGTA
ADWC/LGMOF/LGSC AFCEC/DEE 2021 CS/LGM
USAF HOSP/SGG 678 ADG/DOPM AFCEC/DEM

1. Used computer cards generated by your organization should continue to be recovered and delivered to the Defense Property Disposal Office (DPDO), Bldg 6027.

2. The Base Mail Distribution System can be utilized to ship boxed cards to DPDO (Stop 43). All cards must be properly packed in their original cartons or other suitable boxes.

3. The shipping of these boxed cards should be staggered throughout the week to minimize the load on mail pickup personnel. Organizations generating large amounts of used computer cards should utilize their own transportation to deliver them to DPDO.

4. Those buildings without a mail stop can use their internal distribution system to send their cards to a building that is on the mail distribution pickup system.

GEORGE R. TAYLOR, Colonel, USAF
Base Civil Engineer

Cy to: DPDO

Figure 25. Letter Recommending Computer Card Collection Via Base Mail Distribution System

This procedure would eliminate the forklift requirement, but would require at least two man to perform the once weekly loading, transportation and unloading operations. (It is possible that free labor would be available through local work release programs, et. cetera, and the possiblity should be pursued through the installation's Civilian Personnel Office. However, the driver should be a Federal government employee.)

2.1.1.2 Another variation in using the existing mail distribution system is to send the cards directly to the DPDO.

2.1.1.2.1 A possible disadvantage to this procedure is the potential loss of revenues to the base if DPDO elects to keep 100 percent of the revenues.

2.1.1.2.2 The advantage of this procedure is the avoidance of utilizing Civil Engineering or other activity labor and equipment to support the program, although the time may be only a few hours per week.

2.1.1.3 The mail distribution system of collecting cards has been used at Offutt Air Force Base, Nebraska and is being effectively used at Tyndall AFB, Florida. Both systems involved direct transfer to the DPDO. (See Figure 25). (Reference 2-4).

2.1.2 A second option, commonly used on military installations, to recover computer cards is to require that each organization be responsible for delivering its own cards to the DPDO. There are notable disadvantages to this method:

2.1.2.1 No revenues are returned to the installation.

2.1.2.2 Productivity suffers because considerable man-hours are lost when each organization uses its own personnel to load, transport and unload individual quantities. Delivery of cards is sporadic and recovered card buildup can lead to individual building storage problems because official base vehicles are often difficult to obtain for this purpose. Hence, personnel often wait long periods before they can take the cards to the DPDO; or they utilize their own vehicles for transport. The use of privately-owned vehicles is undesirable and the entire procedure of waiting, coordinating, unloading, et. cetera is wasteful of available manhours. (Reference 5).

2.2 Use of Refuse Dumpsters/Bins

2.2.1 Where in-building central storage space is limited or nonexistent covered refuse dumpsters/bins can be a practical means for recovering and transferring wastepaper.

2.2.2 The system requires clean, covered bins; an associated refuse front-loading/rear-loading/lugger truck (whatever is routinely used in the local situation); and a staging area where the wastepaper can be sorted and processed for eventual shipment.

2.2.2.1 The bins are located in designated areas near participating buildings.

2.2.2.2 The refuse truck picks up the loaded bins and transfers them to the recycling processing center. There they are dumped and then returned to their original location.

2.2.2.3 Center personnel sort the paper, remove contaminants, palletize or bale the paper, and store it for shipment. (Reference 6, 7).

2.2.3 This procedure may be cost effective if pickup locations are kept to a minimum (i.e. only at significant generators of the wastepaper), travel distances are minimized, bins are surplus and capable of protecting contents in inclement and windy weather, and non-productive time associated with the regular refuse collection system can be utilized.

2.2.4 It may be possible to include pickup provisions in a new or amended refuse collection contract. This should only be done if the contractor can adhere to a regular schedule, can rapidly respond to contingency situations (e.g., sudden paper surges) and do these tasks in an economically acceptable manner (as revealed through system planning cost analysis).

2.2.5 The provisions of paragraph 2.2.4 above also apply to use of in-house refuse management resources.

2.2.6 The potential for contamination of the recovered paper is very high if the bins/dumpsters are placed where people pass closely by (e.g. near entrance ways). (Reference Figure 25). Under these circumstances, both the convenience of the container and its refuse receptacle appearance invite people to throw in lunch remains, waste from home, newspapers, et. cetera as they pass by. If the containers can't be placed away from these locations they should be clearly marked for recycling purposes only <u>and</u> the covers and doors should be secured in such a way that they cannot be readily opened by passers-by (i.e., remove the convenience factor), but can be opened with a little effort by in-building gathering personnel.

2.2.7 In some circumstances, roll-a-way bins/dumpsters may be collected directly by a buyer, as in the case of HQ Aerospace Defense Command (HQ ADC), Colorado Springs, Colorado. In this mode of operation it is critically important that recovered paper be screened to remove contaminants <u>before</u> it is placed into the bins. (Reference 8).

2.3 <u>Use of Covered Flatbed Truck and Dedicated Crew</u>.

2.3.1 A highly flexible collection system, used at Vandenberg Air Force Base, California and other bases involves a two-man crew and a flatbed truck equipped with a hydraulic liftgate. Both crew and truck should be dedicated to the collection operation. The truck should be covered.

2.3.2 The crew can accomplish pickups in a number of ways:

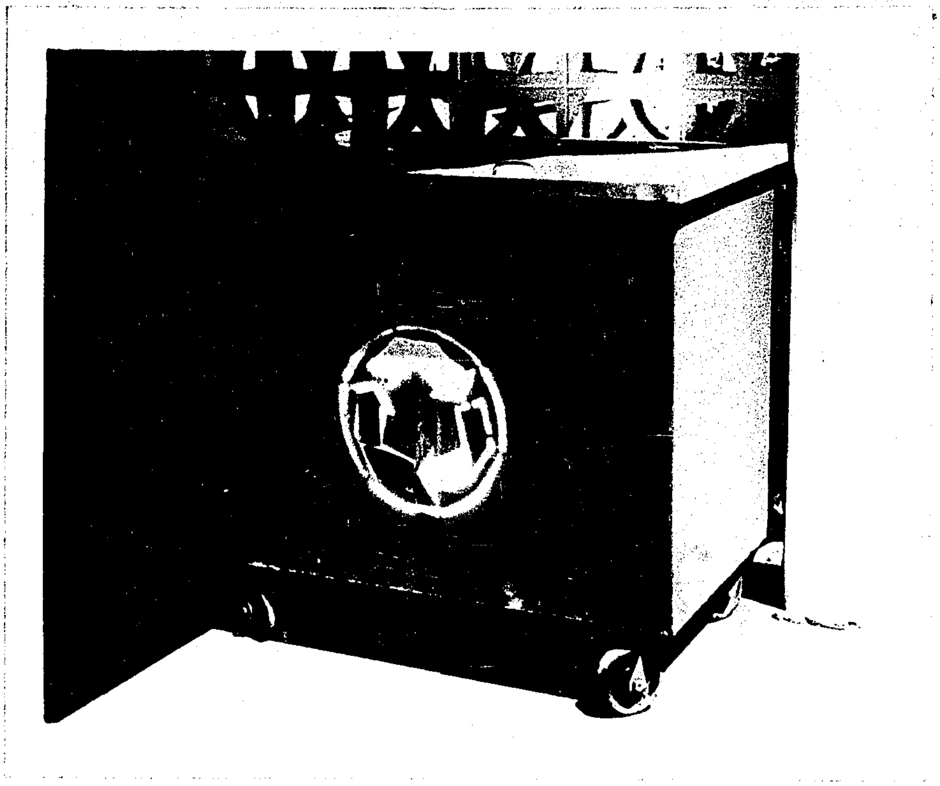


Figure 26. Outside Covered Bin-Accessibility to Pedestrian Traffic, without Secured Cover, Invites Contaminating Wastes

2.3.2.1 Where one central storage area in/by a building is possible, paper can be transferred to the truck by rolling or carrying the paper (whatever is applicable) onto the truck and replacing the loaded containers/ carts with empty ones.

2.3.2.2 Where in-building collection of paper from office central containers is necessary, collection crews can use hand trucks and fibre drums to transfer the paper; if fibre drums are used as central containers, they can be removed and replaced with empty ones; if other containers are used, the contents can be transferred into empty drums and then carried by hand truck onto the collection vehicle.

Figure 27. Wastepaper Collection Via Transfer to Fibre Drums and Handtruck-Vandenberg AFB

Figure 28. A Hydraulic Liftgate Increases Collection Flexibility and Efficiency

2.3.2.3 Variations of this procedure can be used depending upon local building characteristics and limitations as described in Section VI.

2.3.3 It is essential that the truck(s) be covered to facilitate collections and protect the materials in wet and/or windy weather. A hydraulic liftgate is also necessary to facilitate movement of paper-laden containers that can weigh 200 pounds or more. Without a liftgate, flexibility is lost with respect to the various type of containers that can be used (e.g. rolling carts, drums without wheels, etc) and personal injury potential rises when the heavy containers must be elevated by hand up onto the bed of the truck. As indicated in the accompanying figures, a liftgate increases efficiency in moving large loads from buildings rapidly onto the vehicle for transport to a processing area.

2.3.4 The crew should follow a regular schedule of pickups and be able to respond to contingencies.

2.3.5 In-building pickup from many central container points should be minimized.

2.3.6 Under no circumstances should the crew be required to empty desk-top or intermediate tray containers (they can miss containers; interfere with office functions; and the task is too time consuming).

2.3.7 If possible, crews should not attempt to sort out all contaminants during transfer operations (too messy; too time consuming; demoralizes crew members). (Reference 9).

2.3.8 A backup vehicle and crew member <u>must</u> be available in case of vehicle nonavailability or crew member absence. (Reliability of collection must always be insured!)

2.3.9 The truck should have sufficient capacity to allow the crew to stay on the route without constant return to the processing area. (At Vandenberg AFB a 1½ ton truck seemed the minimum size necessary to respond to collection requirements using a system of fibre barrels to transfer stored paper onto the truck and then to the processing center.)

2.3.10 Use of contracted or permanent overhire personnel to accomplish these tasks are recommended; they should also be tied in with operation of the central processing facility (if one is used).

2.4 Use of Military Personnel.

2.4.1 As described in Section II, the abundance of historic recycling program failures on Air Force installations can be blamed, in part, on attempting to use military personnel for collection and processing activities. The turnover of these personnel disrupted the continuity that must be maintained for effective, efficient recovery operations. Related to this turnover is the inescapable fact that "spare" Air Force personnel are simply not available on the installations; current reduction in authorized force levels, coupled with the resulting "do more with less" mode of operations translates into an environment wherein personnel cannot be redirected to continually perform non-military essential tasks, such as recycling, desirable as that goal is. DOD policy discourages use of military personnel as indicated by DOD Directive 4165.50 wherein it explicitly states that "military personnel expense may not (sic) be reimbursed from the net proceeds" of sales. (Reference 10).

2.4.2 Reference this Section, paragraph 3.5, for related discussion on how the US Army uses available troop labor and an innovative incentive system for program support at Ft Sill, Oklahoma. The incentive program may have some applicability to installations if modified to accommodate Air Force manpower constraints.

2.5 Use of Base Civil Engineering Taxi

2.5.1 Don't use it!

2.5.2 The collection system will not be able to meet the necessary criteria of reliability and continuity: The taxi system cannot be dedicated to the recovery operation; the tasks will be rotated among different drivers; and they will be unable to spend sufficient time learning the requirements of and performing those tasks. In addition, the size of the taxi truck and availability of only one driver (per truck) will usually be inadequate for the scope and physical requirements of the job. The discussion in paragraph 1.3 applies.

2.6 Use of "Ad Hoc" Installation Litter Patrols

2.6.1 Not recommended!

2.6.2 The collection system will not be able to meet the necessary criteria of reliability and continuity: Frequent turnover and varying size of the litter pickup crew make it impractical and risky to rely on this source of labor. The discussion in Section VII, paragraph 1.3 applies.

2.6.3 In addition to the above, there is the very real possibility that paper pickup would absorb the majority of the time allotted to the litter recovery function. If this happens, base command personnel may become unhappy with the litter situation and order the patrol to concentrate primarily on litter pickup; the resulting loss of wastepaper collection capability can definitely threaten the ability of the installation to continue the program, particularly if collection schedules are disrupted or not met at all.

2.7 A Possible Method for Recovery of Computer Printout Paper Only.

2.7.1 Ellsworth Air Force Base, South Dakota, employed a system for recovering computer printout paper that may have application elsewhere.

2.7.2 The Base Commander required that organizations purchasing computer paper exchange one box of used paper for every new box required. This procedure resulted in a reported 80 percent recovery. (How long this approach can continue to operate effectively is unknown). (Reference 11).

2.7.3 This procedure forces using organizations to establish their own system(s) for recovering the paper. Hence, base Supply which sends computer-developed reports to other organizations must coordinate with those activities on a method to retrieve the reports when their usefulness is ended; the same situation applies to Data Automation, etc.

2.7.4 It will be impossible to retrieve all computer paper generated by an installation. For example, classified reports must be filed and/or destroyed; many small, personnel-related reports are sent to all organizations and the quantity, per organization will usually be too small to bother with; and many reports are filed away permanently. Hence, allowance must be made for this unrecoverable portion and the one-for-one box approach should be amended accordingly. (Sixty-five to 80 percent recovery of all computer paper used appears to be a realistic appraisal of recovery potential; see Section X).

2.7.5 Any installation considering this approach should consider the effect that the recovery operations may have on employee productivity, particularly since it represents a system similar to in-house collection of computer cards as discussed in paragraph 2.3.2.

3.0 ADDITIONAL GUIDANCE ON COLLECTION SYSTEMS

3.1 Scheduling.

3.1.1 Keep routes centralized.

3.1.2 Establish a schedule of collection as early as possible. A month of operation usually provides time necessary to refine it. Be flexible and quick to respond to recommended changes from the collection crew and building program coordinators.

3.1.3 Allow collection crews to have a say in establishing and/or making schedule changes. Ensure they are trained to report when conditions seem to change in buildings that may affect the collection requirements.

3.1.4 Provide building program coordinators with a written schedule as early in the program as possible. This schedule should include the approximate time of day and frequency of pickup, and the name and telephone number of collection program management.

3.1.5 Some buildings with low generation (e.g., less than 500 pounds per week) may not warrant regularly scheduled pickups. Collection should then be done on an "on-call" basis.

3.1.6 Schedule a block of time during the day to handle "on-call" collections. Do not drop scheduled collections in order to respond rapidly to call ins; request program coordinators to monitor paper buildup and to give the collection crew at least 1-2 days notice that the containers are nearing capacity.

3.1.7 Stick to the schedule. If problems arise which will interfere with planned pickups, ensure adequate backup equipment and/or personnel can be employed to maintain reliability of the collection; notify appropriate building coordinators if pickups will be delayed beyond the day of the regularly scheduled collection. (Experiences at Vandenberg AFB, HQ ADC, and other private and government organizations clearly demonstrate that people become negatively motivated when receptacles overflow, which then lowers their participation and program recovery effectiveness; in addition, valuable paper will be lost to the non-recyclable stream when there is no room left in the recycling-related containers).

3.1.8 Where collection personnel are required to pickup from many points within a building, have them "dry run" and repeat the collection, accompanied by building and appropriate area coordinators, until they are sufficiently familiar with all pickup locations. A map showing these pickup points would also be beneficial and would speed up the familiarization process.

3.1.9 Antipicate surges in wastepaper generation from special events, fiscal and calendar year files cleanout (documentation eligible for destruction during calendar year-end cleanout is considered destroyed when placed in recycling containers. For Official Use Only and privacy act information must be appropriately shredded/torn.) (Reference 12, 13).

3.2 Collections in Outlying Buildings.

3.2.1 Buildings located beyond the centralized area shouldn't be included in the program unless they are large generators of paper (at least one ton per month) and/or the planned collection schedule and collection crew has sufficient "slack time" to absorb the additional collection time needed to service these buildings.

3.2.2 Use of base service organizations and in-building personnel to deliver accumulated paper to a central processing/storage area should be discouraged.

3.2.2.1 As discussed earlier in this report, use of military personnel for collection and delivery of recyclables is discouraged: Lack of reliability and continuity stemming from personnel turnover and equipment availability problems, plus interference with mission productivity are some of the more compelling reasons. (Reference this Section, paragraph 2.4).

3.2.2.2 Voluntary support from base service organizations is not recommended because volunteers frequently exhibit a drop off in motivation and participation within a year after their initial support; as with regular employees, only the promise of financial rewards appears to provide the best "guarantee" of continued support from volunteers and volunteer groups. (Reference 14, 15).

3.2.2.3 Offering financial rewards to base service groups at Vandenberg AFB was initially investigated by base and recycling contractor personnel. Groups such as the Enlisted Airman's Council, et. cetera expressed interest in collecting wastepaper from outlying buildings in return for contributions to their organizations or to a base improvement club called the Full Circle; however, the base could not take advantage of their interest. The primary obstacles to enlisting these organizations' assistance was:

- It would create competition between the groups for limited resources.

- The contractor-operated Recycling Center accounting procedures would become undesirably extensive and complex (and therefore costly to maintain).

- Funds from the contractor would have to be routed through the base Accounting and Finance Office, the accounting would be complicated and the legality of transferring funds generated from Government-owned property (i.e., the wastepaper) to the volunteer groups could not be readily resolved. (Reference 16, 17).

3.2.2.4 Vandenberg AFB also investigated the possibility of providing revenue-based incentive funds to individual mission support organizations in return for their support to gather, collect and transport paper from their outlying buildings to the base Recycling Center. However, the base could not find any legal means for allowing the Recycling Contractor to reward individual units for their assistance. The problem with this concept is that military personnel cannot be paid financially (or rewarded) for performing non-defense related activities during "workdays for which they are already being paid to contribute 100 percent of their time to the defense mission." (Reference 18).

3.2.2.5 Reference paragraph 3.5 below for a unique way in which the US Army at Ft Sill, Oklahoma used a different incentive to obtain military troop support.

3.3 <u>Personnel</u>.

3.3.1 The minimum number of personnel needed to collect wastepaper will be dictated by the quantity to be picked up per day and the difficulty involved in collecting from individual buildings, particularly multistory buildings without elevators.

3.3.1.1 Two persons should be used when collecting accumulated wastepaper. This should provide sufficient manpower to minimize the potential for personal injury when moving heavy laden carts, fibre drums and other storage containers.

3.3.1.2 There should always be one additional person available as a substitute for regular collection personnel. This individual can be used whenever one of the crew members is unavailable because of sickness, annual leave or other reason. The importance of this third person is to insure continued reliability of the system. (Reference 19, 20).

3.3.2 It's important to maintain continuity of the system and therefore to keep personnel turnover to a minimum. To minimize turnover the following are recommended.

3.3.2.1 All members of a collection crew should be able to do every task required of the operation, from driving to in-building pickup tasks. This allows each member to complement the other and to share in the responsibilities. Accordingly, all members should be paid equal salaries; failure to do so increases the potential for morale and frequent personnel turnover. (Reference 21, 22).

3.3.2.2 Allow collection personnel a voice in recommending changes to the system.

3.3.2.3 The collection crew should be able to interact favorably with office personnel, but they shouldn't be expected to solve all problems rightfully falling within the purview of the overall program manager. Such problems may include encountering consistently high contamination, and requests by individual building coordinators for services beyond those originally agreed to by the program manager and made part of the collection crew responsibilities. The crew should serve as "ambassadors" but not as problem solvers. Failure to support the crew in this regard will unnecessarily burden personnel and create a morale problem.

3.3.2.4 Clearly define the crew's responsibilities and give them adequate time to accomplish their tasks. If they must also help in areas not part of the collection requirement, such as loading processed paper onto buyer vehicles, give them adequate notice (e.g., three days, if possible) so that they can prepare for the tasks and adequately rearrange their collection schedule to provide time for the additional task and at the same time minimize interference to the pickup operation.

3.3.2.5 Insure adequate equipment is available to the crew at all times. This includes having a backup vehicle whenever the main truck is down for repairs or periodic maintenance.

3.3.2.6 Don't require collection personnel to act as primary sorters for screening out contaminants when transferring paper from buildings to a processing location.

3.3.2.6.1 Collection personnel don't view themselves, and rightfully so, as "collectors of garbage." Quality peronnel will not stay with the program if they have to constantly deal with messy storage conditions and high contamination. (Reference Figure 29, for example).

3.3.2.6.2 If contamination becomes/is a problem, the program manager should resolve the problem as soon as possible with the appropriate building coordinators.

3.3.2.6.3 One way of minimizing the potential for these conditions is to provide adequate storage containers <u>and</u> to require separation of <u>only</u> high value paper by office personnel. Multilevel separation requirements, such as collecting all colored paper as well as white ledger, tends to confuse personnel with the undesirable result that they throw <u>everything</u> into recovery receptables. Figure 29 illustrates what can happen under these circumstances; it presents a time consuming, dirty, frustrating and unwelcome task for collection crews who may be otherwise motivated to support the program on a long-term employment commitment. (Reference 23-25).

Figure 29. Constant Messy Storage and High Contamination Conditions Discourages Collection Personnel

3.3.3 One additional, but potentially costly effect of frequent personnel turnover is increased equipment wear and damage. Frequent turnover of personnel at two installations observed under this research effort resulted in unfamiliarity with the collection truck's controls; this often culminated in frequent, costly damage to the vehicles' clutch mechanism. (Reference 26, 27).

3.4 Equipment-Trucks

3.4.1 It's important to have adequately sized equipment in "good" operating condition when operating a separate collection system. The alternatives for obtaining trucks to do the job are usually limited by cost, timing, and availability. Possible options and problems are described in the following paragraphs.

3.4.2 Buying New Trucks

3.4.2.1 Normally, existing equipment should be used in establishing a recovery program. It is the intent of source separation programs to recover materials and dollars with minimum capital investment. This policy is reflected in DOD Directive 4165.60 on solid waste management and resources recovery which states that new or additional equipment will be procured through the appropriations (i.e. direct funds) normally available for equipment acquisition. (Reference 2)8. Direct funding means that the recycling equipment directly competes for funds usually budgeted for mission essential support functions; the expense cannot be reimbursed from recovery program proceeds.

3.4.2.2 If, however, an installation believes that reimbursable after-expense funds will cover the cost of a new (or used) piece of equipment (such as a truck) and can be obligated <u>before</u> the next fiscal year, then the purchase can be made from the proceeds of the recovery program. For a new truck there is little likelihood of this happening, however, until the demand for recyclable paper dramatically rises above historical performance levels (see Section IV). There is no possibility of combining proceeds from more than one year to cover large capital investments since funds <u>cannot</u> be carried over from one year to the next. (Reference 29-30).

3.4.3 Using Existing Base Activity Trucks

3.4.3.1 If an authorized base vehicle is being underutilized, it can be used in the recovery program. Reimbursable expenses for its operation include fuel, maintenance, and repair but not salaries for military personnel if they are used in the collection operation.

3.4.3.2 Before using such an underutilized vehicle, the following factors must be considered:

- Will the vehicle always be available for the collection task? Reliability is an essential feature of successful recovery programs; a vehicle should not be "borrowed" for the recovery program if it is subject to frequent withdrawal to support the basic mission function for which it was originally authorized.

- Can the installation provide an adequate backup vehicle when the designated truck is unavailable because of maintenance, repair or diversion to other tasks?

- Is the vehicle so old or in such condition that it will receive low priority when brought in for maintenance or repair? Unless absolutely necessary, base vehicle maintenance organization cannot afford to spend time and resources on vehicles that are not mission essential and/or where the cost of repair exceeds the salvage value of the vehicle. (At one installation, the recycling program had to use three vehicles to support a one-vehicle collection system. The reason: the base-supplied trucks were old and received such low priority maintenance attention that two backup vehicles were always needed to provide a degree of reliability in the collection system). (Reference 32, 33).

- Will the vehicle be used in such a manner that sufficient mileage is accumulated each month and/or other criteria are met to maintain its authorized use for the activity to which it is assigned (i.e., will it still be "underutilized" during use in the recovery program?)

3.4.3.3 The materials recovery test at Vandenberg AFB showed that the Air Force can legally provide a contractor with an Air Force vehicle(s) that is assigned to an active installation organization. This proved to be a hardship on the installation Civil Engineer because of reasons related to the aforementioned factors, namely:

- The Air Force was obligated by contract to provide the contractor with an alternate vehicle, to maintain program continuity, whenever repairs were necessary above and beyond "normal maintenance." The original truck provided to the contractor came out of the base Civil Engineer's fleet; it was old and required such considerable upkeep and repair that the contractor found it difficult to keep running and apparently impossible to maintain to Government standards. (Maintenance and repair were the responsibility of the contractor).

- As a consequence, the installation was frequently asked to provide an alternate vehicle and just as frequently found it difficult to do so. The base vehicle operations/motor pool section was highly reluctant to provide the substitute truck which meant the Civil Engineer had to pull another vehicle out of his fleet to meet contractual obligations; this in turn made it very difficult to meet civil engineering mission support requirements.

- The poor condition of the truck, the necessity for frequent substitution, and the high cost to repair and maintain it resulted in an undesirable amount of discomfort for both the contractor and installation personnel and critical disagreement with respect to ultimate responsibility for the vehicle's condition. An additional excess vehicle from DPDO was provided the contractor for additional capability, but its "not in operating condition" at time of receipt only added to the contractor's maintenance budget problems and did little to solve the problems with the original vehicle.

- Ultimately, the installation appeared to resolve the problems during negotiation and award of a new contract to the same contractor. The new contract did not require the Air Force to provide an alternate vehicle under any circumstances. However, Vandenberg agreed to replace the original vehicle with two different, one and a half ton trucks (one with a lift gate) in "good operating condition." Both vehicles originated with the base Civil Engineer: one was underutilized; the other was scheduled for replacement, however, instead of turning it in to the DPDO for salvage, the installation furnished it to the contractor and simultaneously sought approval for one additional vehicle authorization. If approved, the additional authorization would allow the installation to keep the truck out of salvage (when its replacement came in) and on loan to the recycling contractor.

- Under the new contract the contractor receives a monthly fee from the Air Force. Part of this fee reflects increased budgeting to accommodate anticipated maintenance and repair of the Government-furnished trucks. (See also Appendix F). (Reference 34-39).

3.4.4 Obtaining Additional Vehicle Authorization

3.4.4.1 AFM 67-1, Chapter 15, and Volume 6 provide a full outline of procedures to be followed when seeking approval for an additional vehicle authorization.

3.4.4.2 Most authorizations are time consuming. If a vehicle is authorized, it will usually result in the lost of an authorization in another organization. (Reference 40).

3.4.5 Obtaining Vehicle from Salvage (DLA/DPDO)

3.4.5.1 Vehicles turned over to the Defense Logistics Agency (DLA) become excess personal property and can be obtained for use in a materials recovery program. Nonappropriated fund activities have first choice to the available property.

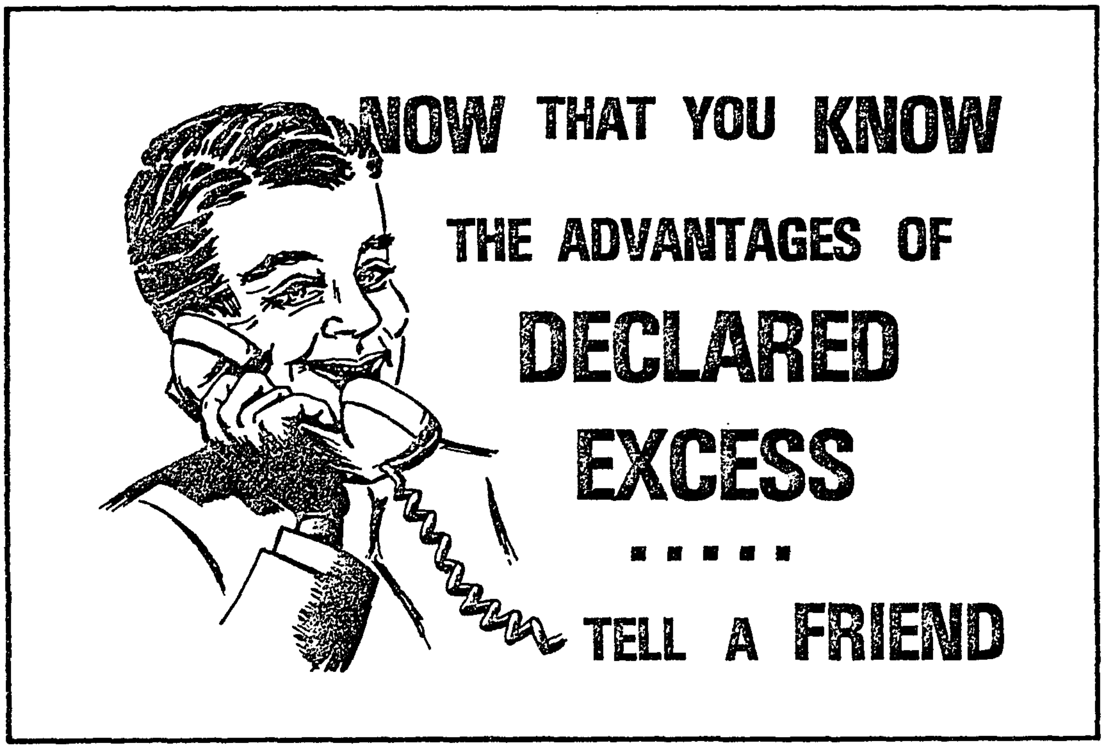
3.4.5.2 Vehicles in salvage may be available at the installation's servicing DPDO and/or from throughout the DLA system. To determine the availability of trucks and other equipment within DLA, the installation's recovery program planner/manager can do one or more of the following, as necessary:

3.4.5.2.1 Contact the local DPDO and determine local equipment availability and specifications.

DECLARED EXCESS PERSONAL PROPERTY

EXCESS LISTING	MILITARY PRIORITY DATE (MPD)	ISSUE DATE
78/EPPL-20	19 MAY 78	17 APR 78
	78139	

AUTOMATIC RELEASE DATE INDICATED BY ITEM



Issued By

DEFENSE LOGISTICS AGENCY

Defense Property Disposal Service

Battle Creek, Michigan 49016

Figure 30. DLA Publication "Declared Excess Personal Property" and Example Property Availability Data and Condition Codes

GROUP 23 EXCESS PERSONAL PROPERTY DATA

2320-00-835-8463 TRUCK, CARGO UI EA QTY 1 UV 6,512.00 TV 6,512.00

2 1/2 TONS, RATED CAPACITY. BODY, STEEL, INSIDE DIM, 147 IN. LG, 88 IN. W, 60 IN. H, W/SIDE EXTENSIONS, LATTICE, REMOVABLE SIDES, BOTTOM HINGED TAILGATE, W/TOP BOWS AND TARPAULIN, W/CAB, CONVENTIONAL CAB, FRONT MTD CAB, SEPARATE CAB, OPEN, 3 PERSONS, SEATING CAPACITY, SINGLE CONTROLS, SITDOWN DRIVE CONTROLS, STATIONARY TYPE SEAT. 154 IN. WHEELBASE, TREAD WIDTH, 67-3/4 IN. FRONT, 72 IN. REAR. ENGINE, 1 ENGINE, GASOLINE TYPE, 6 CYLINDERS, 127 MAX BHP AT 3400 RPM, LIQUID-COOLED, FRONT MTD W/FORWARD PROJECTING HOOD, WHITE MOTOR CO THE LANSING DIVISION, MODEL NO. OA331. REVERSE SPEED, W/TRANSFER-TRANSMISSION 2 SPEEDS, FRONT AXLE, DRIVING, AUTOMATIC ENGAGEMENT, 1 AXLE, FRONT AXLE, DRIVING, AUTOMATIC ENGAGEMENT, 1 AXLE. REAR AXLE, 2 AXLES, 2 DRIVING AXLES, AIR-HYDRAULIC SERVICE BRAKES. ELEC DATA, 24 V STARTING, IGNITION AND LIGHTING SYSTEMS, W/SEALED 24 V STARTING SYSTEM, 24 V IGNITION SYSTEM, 24 V LIGHTING SYSTEM, W/SEALED SYSTEM FOR UNDERWATER FORDING, EQUIPPED W/TRAILER BRAKE CONNECTION. AIR TYPE, W/TOWING PINTLE HOOK. GOVT SPEC, MIL, MIL-T-712 /CANCELLED/, MFR, ARMY TANK-AUTOMOTIVE CENTER, WARREN MICH, MODEL NO. M35. 1952 STUDEBAKER, MDL M35, SN M25443, USA REG 4C2038, ECR 1573.48...

DOC NR SX1523 8048 L009 PROP LOC SX1523 ARD 78209 COND R2 FUND 2 GSA 3 MSC 4

*****H I G H V A L U E************************H I G H V A L U E**************************H I G H V A L U E******

2320-00-904-3277 TRUCK, PIPELINE CONSTRUCTION UI EA QTY 1 UV 21,208.00 TV 21,208.00

2-1/2 TONTRUCK, 6X6, MULTIFUEL ENGINE, 6 CYL, 140 BHP AT 2600RPM, MANUAL TRANSMISSION, 67 3/4 IN NOM FRONT WHL TREAD W, 70 IN NOM REAR WHL TREAD W, AIR-HYDRAULIC ACTUATED BRAKES, 134 1/2 IN NOM OUTSIDE BODY LG, 96 IN NOM OUTSIDE BODY W, AND 14 IN NOM OUTSIDE BODY H, 16900 LB CURB WT, 24020 LB MAX GROSS VEHICLE WT, MFR CODE 81349. MFG KAISER JEEP CORP, 1969, MDL M-756A2, SN 0335-10056, USA REG NO 04044569, ECR 6625.80..

DOC NR SX1523 8041 L006 PROP LOC SX1523 ARD 78209 COND R1 FUND 2 GSA 3 MSC 4

*****H I G H V A L U E************************H I G H V A L U E**************************H I G H V A L U E******

2320-00-926-0924 TRUCK, STAKE UI EA QTY 1 UV 2,210.00 TV 2,210.00

1-1/2 TONS. 14,000 LB, RATED GROSS VEHICLE WT. BODY, WOOD AND STEEL, INSIDE DIM., 144 IN. LG, 85 IN. W, 42 IN. H, STAKES, LATTICE, REMOVABLE SIDES, FRONT MTD CAB, SEPARATE, CLOSED, DOORS, 3 PERSONS, SEATING, SITDOWN DRIVE CONTROLS, STATIONARY SEAT, 157 IN. WHEELBASE. TREAD WIDTH, 70 IN. FRONT, 67 IN. REAR. GASOLINE, MODEL NO. C5309, GOVT SPEC, MIL-T-45339, TYPE 5, CLASS A, GROUP 1. CHEVROLET, MODEL NO. C5309. CHEVROLET, 6 CYL, ODOMETER READING 99570 MILES REG NO 6B80621. ECR 293.98. MFR GM CHEVROLET DIV, MDL CS41409, SN CS498Z117180..

DOC NR SZ3319 8048 L015 PROP LOC SZ3319 ARD 78209 COND R2 FUND 2 GSA 9 MSC 4

2320-00-926-0949 TRUCK, CARGO UI EA QTY 1 UV 2,881.00 TV 2,881.00

1/2 TON. 4,800 LB RATED GROSS VEHICLE WT, BODY, WOOD AND STEEL, INSIDE DIM, 78 IN. LG, 50 IN. W, 37 IN. H, STAKES, LATTICE, REMOVABLE SIDES, BOTTOM HINGED TAILGATE, FRONT MTD CAB, SEPARATE, CLOSED, DOORS, 3

Figure 30. DLA Publication "Declared Excess Personal Property" and Example Property Availability Data and Condition Codes (Continued)

CONDITION CODES AND EXPANDED DEFINITIONS

Condition Code	Expanded Definition
N-1	New or unused property in excellent condition. Ready for use and identical or interchangeable with new items delivered by a manufacturer or normal source of supply.
N-2	New or unused property in good condition. Does not quite qualify for N-1 (because slightly shopworn, soiled, or similar), but condition does not impair utility.
N-3	New or unused property in fair condition. Soiled, shopworn, rusted, deteriorated, or damaged to the extent that utility is slightly impaired.
N-4	New or unused property so badly broken, soiled, rusted, mildewed, deteriorated, damaged, or broken that its condition is poor and its utility seriously impaired.
E-1	Used property but repaired or renovated and in excellent condition.
E-2	Used property which has been repaired or renovated and, while still in good usable condition, has become worn from further use and cannot qualify for excellent condition.
E-3	Used property which has been repaired or renovated but has deteriorated since reconditioning and is only in fair condition. Further repairs or renovation required or expected to be needed in near future.
E-4	Used property which has been repaired or renovated and is in poor condition from serious deterioration such as from major wear and tear, corrosion, exposure to weather, or mildew.
O-1	Property which has been sightly or moderately used, no repairs required, and still in excellent condition.
O-2	Used property, more worn than O-1 but still in good condition with considerable use left before any important repairs would be required.
O-3	Used property which is still in fair condition and usable without repairs; however, somewhat deteriorated, with some parts (or portion) worn and should be replaced.
O-4	Used property which is still usable without repairs but in poor condition and undependable or uneconomical in use. Parts badly worn and deteriorated.
R-1	Used property still in excellent condition, but minor repairs required. Estimated repairs would cost no more than 10% of acquisition cost.
R-2	Used property in good condition but considerable repairs required. Estimated cost of repairs would be from 11% to 25% of acquisition cost.
R-3	Used property, in fair condition, but extensive repairs required. Estimated repair costs would be from 26% to 40% of acquisition cost.
R-4	Used property, in poor condition, and requiring major repairs. Badly worn, and would still be in doubtful condition of dependability and uneconomical in use if repaired. Estimated repair costs between 41% and 65% of acquisition cost.
X	Salvage. Personal property that has some value in excess of its basic material content but which is in such condition that it has no reasonable prospect of use for any purpose as a unit (either by the holding or any other Federal agency) and its repair or rehabilitation for use as a unit (either by the holding or any other Federal agency) is clearly impractical. Repairs or rehabilitation estimated to cost in excess of 65% of acquisition cost would be considered "clearly impractical" for purposes of this definition.
Scrap	Material that has no value except for its basic material content.

Figure 30. DLA Publication "Declared Excess Personal Property" and Example Property Availability Data and Condition Codes

3.4.5.2.2 Ask the local DPDO for a copy of, and assistance in, researching DLA publication "Declared Excess Personal Property" which contains an Excess Personal Property Listing (EPPL). This document lists excess items, their descriptions, condition code, property location, value and other information necessary for decision making. (See Figures 30)

3.4.5.2.3 Request the local DPDO to make a telephone inquiry into the DLA system to determine if any equipment desired for the recovery program is available within DLA. A response should be received within 72 hours. The installation itself can also directly request this inquiry; the telephone number can be obtained from the local DPDO (as of the date of this writing the telephone number was AUTOVON 369-6695).

3.4.5.2.4 Equipment obtained from DLA is normally free issue; however, the installation must pay packaging, crating, handling and transportation costs. (Reference 41-43).

3.4.5.3 To obtain equipment from DLA an installation has to establish a need for the item(s) and obtain concurrence from the installation commander. Supply forms (such as AF Form 601A/B, Custodian Request/ Receipt) have to be filled out and submitted through command channels for approval. When command approval is received the installation is authorized to work with DPDO on obtaining the desired property items.

3.4.5.4 Operational and maintenance support for excess property items obtained from the DLA/DPDO have to be supported by nonappropriated funds, (i.e., out of the recycling program funds). Fuel and maintenance cannot be obtained from Government sources. (Reference 44).

3.4.5.5 Pay careful attention to the Condition Code of items available in the DLA system. As described in paragraph 3.4.3.3 above, repair and maintenance requirements of available vehicles/equipment may be more extensive and expensive than their actual worth to the recovery program. In addition, equipment requiring frequent attention will present constant problems in trying to maintain reliability of the collection system.

3.4.6 Contract. As recommended previously, investigate the possibility of contracting for collection services using contractor rather than Government-furnished vehicles. This method has been used with apparent success at the Letterkenny Army Depot, Chambersberg, Pennsylvania; there the refuse collector loads paper-laden rolling carts onto a dump truck, assisted by a lift gate, delivers the paper to the DPDO for processing, picks up empty carts and delivers them to the appropriate collection point. The carts are stored on covered docks or in the large CONEX storage containers described in Section VI. (Reference 45).

3.5 RAW Deal Incentive Program

3.5.1 A unique sytem of collecting recyclable materials, known as the RAW (Recycle and Win) Deal Program, has been developed and implemented at Ft Sill, Oklahoma. The system uses incentive awards to motivate installation troop personnel to collect recyclable material, ranging from wastepaper categories to aluminum cans, from office areas, clubs and soldiers living off post and other "outside sources" of materials.

3.5.2 Important elements, policy and guidelines for the RAW Deal program include the following:

3.5.2.1 The incentive program is open only to battalions and the Headquarters Commandant. To provide incentive for small organizations, two divisions were created: Command elements and "larger" troop units compete in one division, and supported battalions in the other. Major subordinate command elements are not eligible for awards, but they and all units and activities are required to recycle.

3.5.2.2 Each unit must compete on its own. They have to make their own arrangements with potential sources of recyclable material, but activity directors are encouraged to "share the wealth" and not give indefinite

RECYCLABLE MATERIAL RECEIPT
(USAFACFS Cir 420-47)

Unit/Activity ....

Building No. .... Date.................................

	Quantity	Points
Aluminum Cans	....	....
Punch Cards	....	....
Computer Printouts	....	....
High-grade (white) Paper	....	....
Newspaper	....	....
Corrugated Cardbord	....	....
....	....	....
....	....	....
....	....	....

The above material was delivered this date to the Recycle Center Processing Activity, Bldg 3328, Fort Sill, OK.

Received By: ....

Delivered By: ....

FS Form (DFAE) ~~404~~ 447
1 Oct 77

7710-3815 Army-Fort Sill, Okla. 3M

Figure 31. Ft Sill RAW Deal Weight and Points Receipt

support to a single unit. Each commander and activity is free to use any paper accumulation and gathering techniques they determine to be "practicable" for their operations.

3.5.2.3 Troop elements competing in the program bring the recyclable materials to a base processing location called the Recycle Center Processing Activity (RCPA). They must use/find their own vehicles to make the deliveries. Materials must be properly segregated and free of contaminants before they will be accepted.

3.5.2.4 Receipts are given to the delivery vehicle driver stating both the source of the material and the unit to which points will be awarded for the recyclables. (Reference Figure 31). Copies of the receipts are retained and tallied by the Environmental Division of the Facility Engineer.

3.5.2.5 By listing the source of the material, the receipts can be reviewed by installation Inspector General (IG) inspectors to determine compliance with the recycling program by staff and operational elements. An Environmental Divison employee represents the IG in the conduct of this compliance evaluation.

3.5.2.6 Units delivering recyclables receive points based upon the category and weight of the materials. Six materials required to be recycled are assigned a point value as follows:

- Aluminum Cans	30 points per pound
- Computer printouts	9 points per pound
- Computer punch cards	15 points per pound
- Mixed white paper	9 points per pound
- Newspaper	3 points per pound
- Corrugated cardboard	1 point per box

- Originally, only six points per pound were received for the mixed white paper and three points per pound for newspaper. However, because computer wastepaper items were significantly more valuable in comparison, troops concentrated on those recyclables and neglected "most of the (other) white office paper." The points for the mixed white paper were subsequently raised to nine points in order to encourage increased participation and recovery. Similarly, to spur collection of newspapers, the points value was increased to six points per pound.

3.5.2.7 At the end of each fiscal year quarter, participating units with the highest point total in each RAW Deal recycling division are rewarded with a $5,000 facilities-related project of choice within their area. The choice is made by each winning unit commander, with the concurrence of the Facilities Engineer. Projects may be one of several scheduled for action by the Director of Facilities Engineering, but expedited for the winning organizations. The primary restriction to any project chosen is that it "not result in a violation of any statute or regulation." (Reference 46-50).

- As an example of the incentive and type of award possible under this program one of the smallest units on the installation won a project to fix up and convert their open bay barracks into individual rooms; the key factor appeared to be the realization by the unit's individuals that their personal involvement could directly result in obtaining better quarters to meet their needs. (Reference 51).

3.5.3 The RAW Deal Program will not have direct applicability to Air Force installations because of its dependence on troop labor and equipment. This method of collection, coupled with non-uniform gathering methods within contributing buildings and a policy that the recyclable materials be shared with different troop units, does not provide a confident structure for maintaining high reliability and continuity of effective materials collection.

3.5.4 The RAW Deal program does provide, however, an example of how highly motivated personnel, in positions of authority and backed by command authority, can use imagination, ingenuity, available resources and continuous publicity to promote a recycling program with positive incentives to motivate and promote participation. (Reportedly, Ft Sill would recover nearly 700 tons of recyclable wastes in one year under the RAW Deal program; this amounts to an estimated 5 percent of the waste generated (Reference 52). This success, although possibly a short-term one, would be directly related to the aforementioned factors).

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SECTION VIII

PAPER PROCESSING/PROCESSING CENTER

1.0 GENERAL

1.1 Establishment of an installation wastepaper recovery program will usually be complicated and costly because of the need to have a central location to consolidate, process, and store materials for sale. Installation-unique factors generating this need for centralization are addressed in Section VII.

1.2 The scope of the centralization operation will depend upon the number of wastepaper categories collected, market requirements, and type of containers used for collection. Categories and market requirements are discussed in Sections III and IV; containers are discussed in Sections VI and VII.

1.3 This section will discuss techniques and operational routines commonly used/recommended for central processing; necessary equipments; and guidance for choosing effective personnel.

2.0 TECHNIQUES

2.1 Palletizing

2.1.1 Buyers prefer wastepaper tightly packaged in either mechanically baled or containerized form. Mechanical baling can be effective, but its costs frequently exceed the value received for the waste items. Mechanical baling is discussed in paragraph 2.2.

2.1.2 Palletizing includes packing the wastepaper into large pallet-size corrugated boxes placed on a pallet or stacking the paper directly onto a pallet; both methods use baling wire to secure the items and prevent breakage during shipping. Paper can be packed uniformly with high density in bulk containers and offers a cost advantage over balers in that baling generally reduces the volume little more than that which is achieved with container packing. (Reference 1).

2.1.3 Recommended methods for palletizing each category of wastepaper include:

2.1.3.1 Pack the following in tri-wall, corrugated boxes:

- Loose computer cards.
- Loose ledger and other paper grades.
- Stacked computer printout (if supply of corrugated boxes is no problem).
- Shredded paper (e.g., from printing shops; packs very well and is good "filler" for other paper if grade is compatible).

2.1.3.2 Stack directly onto pallets:

- Boxed computer cards (preferably in the boxes in which they were originally delivered).
- Clumped, stackable computer printout paper.
- Boxed computer printouts.
- Boxed, staging area (i.e., the installation's files storage area) mixed paper.

2.1.4 Palletizing by either method provides a convenient way to screen out contaminants; computer printouts previously boxed at their source should be quickly scanned to ensure that carbon paper and miscellaneous other unwanted materials are not included. Boxed computer cards will usually be very pure with respect to contamination; colored cards should be boxed separately.

2.1.5 Containers

2.1.5.1 Containers will sometimes be provided by the buyer. More likely, however, they will have to be found on the installation as discards

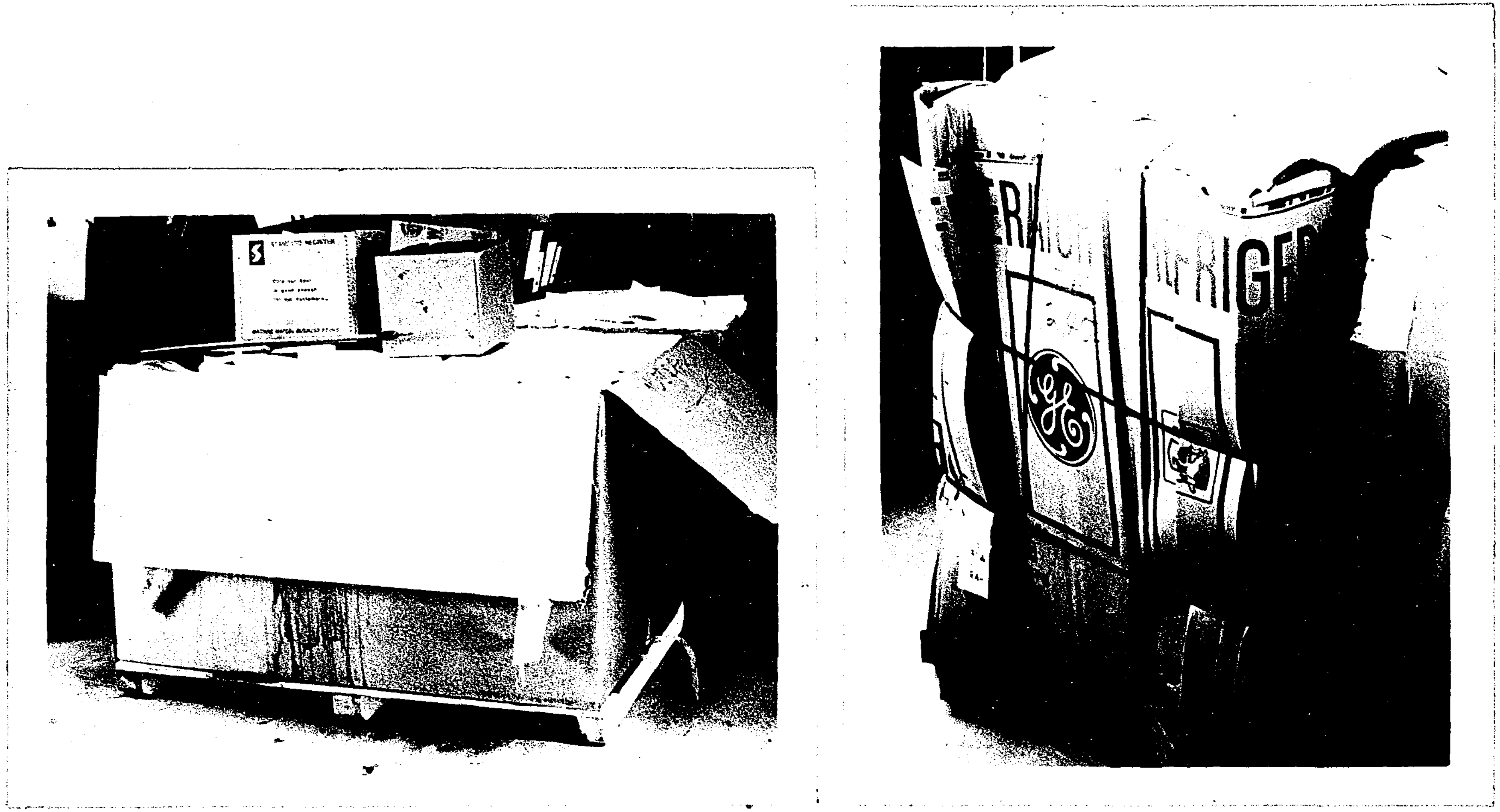


Figure 32. Wastepaper Packed in Discarded Tri-Wall and Corrugated Appliance Boxes

(e.g., appliance boxes, equipment cartons, etc) or bought for the purpose. Important characteristics include:

2.1.5.1.1 Loading capacity: Buyers prefer mill-sized "bales;" the minimum-sized "bale" is 600 pounds. Typical boxed loads fall in the range of 1200-1500 pounds. Tri-wall corrugated boxes usually provide the loading and stacking strength needed for this task.

2.1.5.1.2 Uniform size: Boxes of uniform size facilitate storage and improve stacking capability in transport trucks and railcars.

2.1.5.1.3 Pallet size: Pallets typically measure 4 feet by 4 feet or 3 feet by 4 feet in order to make them compatible with truck or railcar dimensions. Therefore, boxes should be compatible with the pallets in order to facilitate banding, and make the most effective use of vehicle cargo space.

- Standard width of trucks is 8 feet.
- Standard width of railcars is 9 feet.
- Ideal box would be 36 inches wide by 48 inches long by 36 inches high; this would allow stacking of 2 abreast by 2 high in a truck and 3 abreast by 3 high in a railcar (Note: pallets may not be allowed under certain contractual agreements). (Reference 2-4).

2.1.5.1.4 Covers: Covers help secure the contents and protect against inadvertent contamination, the weather, and reduce fire hazard potential.

2.1.5.2 Fibre drums can be used for storage and shipment but are not recommended for the following reasons:

- For equal, total capacities drums will be more costly than corrugated box containers (unless the drums can be found as surplus or discounted under "mass buying" procedures).

Figure 33. Stacking, Banding and Palletizing Wastepaper

- Less time is required to fill and handle a large volume of paper in one container than in a number of small ones (i.e., drums).

- Boxes simplify handling. One 1,000 pound box container can hold five times as much as a 200 pound fibre drum, which means that loading can be done in less time.

- Boxes make more efficient use of storage space than fibre drums. A 1,000 pound box will take up the same amount of space as four fibre drums holding 800 pounds (Reference 5). (Fibre drum space utilization can be improved by using square drums, but this capability will still be offset by the factors listed previously).

2.1.5.3 Fibre drums may be useful, however, whenever loading facilities or pallet handling equipment are not available and smaller containers are needed that can be loaded onto the shipping vehicle by hand.

2.1.6 Pallets

2.1.6.1 Surplus wooden pallets are often available from installation shipping and receiving areas. They can also be inexpensively made from scrape wood such as the 3/8 inch wood slats that come with shipping containers of heavy equipment. (Reference 6).

2.1.6.2 Reference Figure 34. A small, but very important feature that pallets <u>must</u> have is a "slot" for the steel banding to slip through. Without this slot, which is <u>not</u> common to all pallets, banding will frequently break when the pallet and container are moved by forklift or pallet jack. Hence, all surplus pallets should be inspected for these slots before they're accepted for use in the recycling program particularly when wastepaper is directly stacked on a pallet rather than in a corrugated box. (Reference 7).

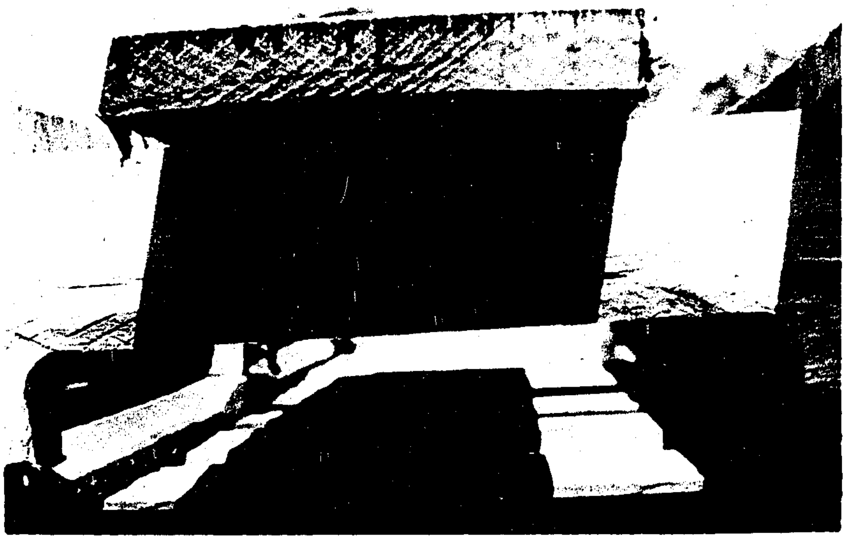


Figure 34. Pallet and Banding Slot (dark area, top photo) and Stacked Central Files Storage Boxes

2.1.7 Other Comments

2.1.7.1 The weight of pallets and containers are usually included as the weight of the wastepaper material offered for sale through the DPDO; buyers estimate the pallet's value in their bidding.

2.1.7.2 Boxed paper from the installation's central files storage, made available during fiscal year cleanout, should not be sorted through unless the high value paper makes up the bulk of the paper and is easily retrievable. However, analysis of files at different military installations showed that the paper content of these files is very heterogeneous and removal of the high grades is not cost effective. Consequently, they should be placed on a pallet without processing. In some cases, it is better for the buyer to provide his/her own pallets since the value of the paper may be less than the value of the pallet itself and buyers are reluctant to bid in this situation. (Reference 8-11).

2.2 Baling

2.2.1 Types of Balers

2.2.1.1 Balers are available in single or multistage, horizontal or vertical (upstroke and downstroke), portable and stationary models. The primary differences between the units is the direction of the action of the compaction ram, convenience of operation and investment costs.

2.2.1.2 Large volume wastepaper operations (i.e. greater than 5 tons per day) commonly use a horizontal, continuous push-through, single stroke baler. Often the wastes must be shredded prior to baling in order to obtain a homogeneous material that will improve bale characteristics and minimize bridging or blockage in the continuous feed hopper. Chutes, conveyors and other mechanical aids are commonly used with these balers The resulting bales are bound together with metal straps, wire or twine. The capacity and associated high costs of these systems (range of $20,000 - $30,000 (1978)) will exceed the needs and cost capabilities of most installation wastepaper recovery programs. (Reference 12-18).

2.2.1.3 Vertical balers are more commonly used for installation-level wastepaper processing. These include both pit-type and above grade, free standing units. Pit-type or chute-fed balers provide faster operations than hand-fed, above grade balers, but are "far more expensive" than the latter. Both types of units require tie wires/bands to retain compaction of the bales. The capacity and costs of these baler units makes them more applicable to corrugated cardboard and other wastepaper recovery than horizontal units. (Reference 19-21).

2.2.2 Guidelines for Obtaining Baler

2.2.2.1 Seek a vertical, upstoke baler if daily tonnage is less than 5 tons per day. (Reference 22).

2.2.2.2 Determine if the servicing DPDO has a baler that can be utilized for the wastepaper recovery program. (A DLA/DPDS survey in the mid-1970s showed that 55 percent of DPDO's within the continental United States have paper balers). (Reference 23).

2.2.2.3 Determine if the available baler(s) is designed for wastepaper and of what type.

2.2.2.3.1 Each component of refuse (glass, paper, plastic, etc.) has a different density, internal void ratio (ratio of voids to solids) and moisture content. This variability makes the design and operation of compaction equipment difficult and, as a result, balers are frequently designed to handle homogeneous wastes such as corrugated or scrap metals. Hence, a baler used for scrap metal should be investigated to determine if it will also be effective for cardboard or ledger paper.

2.2.2.3.2 The baler must also provide a capability for tying the bales while they are under compaction pressure. Without restraints, such as baling wire/bands, baled refuse material has "spring-back" potential and lacks the cohesive stability to retain the shape of the bale during subsequent handling. Consequently, the baler must have either automatic bale tying equipment or channels through which baling wire can be passed for manual baling. (Reference 24, 25).

2.2.2.4 Determine if the baler can produce "mill-sized" bales of at least 600 pounds minimum weight. (Failure to produce mill-sized bales may reduce the weight that can be transported per truckload and result in reduction of the price per ton received for the material. See also Section IV).

2.2.2.5 Ensure that the baler has safety features meeting or exceeding OSHA standards. Recommended safety features include the following:

2.2.2.5.1 Safety door/liftgate: Baler will not operate unless safety door is fully closed.

2.2.2.5.2 Safety door/liftgate: If safety door encounters any obstruction (e.g., an arm) while closing, the platen (pressure plate) and safety door should automatically stop, reverse and shut off.

2.2.2.5.3 Safety switches: If the main access door or safety door opens while baler is operating, the platen should automatically retract and stop the baling motor(s).

2.2.2.5.4 Safety hydraulic relief valves(s).

2.2.2.5.5 Bale ejector system (some double door units do not include bale ejectors).

2.2.2.5.6 No protruding parts.

2.2.2.5.7 No exposed moving parts (Reference 26-31).

2.2.2.6 Ensure that the baler has a "full bale" indicator. This aids the baler operator in making consistent sized bales and also helps prevent oversizing the bale (which could damage the baler during the ejection cycle.)

2.2.2.7 Ensure that the service and parts are readily available. (The Commissary at one west coast installation was forced to contract out for custom remanufacture of a broken cylinder wall because the original manufacturer, located on the east coast, could not provide timely delivery of the replacement part. (Reference 32).

2.2.2.8 Ask the baler manufacturer(s) for a listing of users, contact them and ask for their opinions on quality, waste category applicability, service and replacement parts. (This research may save the installation future headaches and costs. For example, Figure 35 lists problems one installation encountered in attempting to bale corrugated cardboard; the baler obviously failed to meet the capacity, quality, safety and service requirements for which it was bought; apparently, it was purchased with little or no guidance with respect to its applicability; other installations can learn from these experiences. (Reference 33).

2.2.2.9 Ensure the unit conforms with accepted industry codes such as the National Electrical Manufacturers Association (NEMA) and the Joint International Code (J.I.C.) on interchangeability of parts. Check with an organization, such as the Waste Equipment Manufacturers' Institute of the National Solid Wastes Management Association (NSWMA) to determine if a unified listing or ratings for balers is available for reference. (As of 1978 the NSWMA had a listing of ratings for commercial/industrial stationary compactors, but <u>not</u> for balers. Inquiries should be addressed to the National Solid Wastes Management Assocation, WEMI, 1120 Connecticut Avenue, N.W., Washington, D.C., 20036). (Reference 35-37).

2.2.2.10 Consider renting a baler; however, this will normally prove to be uneconomical since rental fees, over the years, will probably exceed the purchase price itself. "A lease-purchase arrangement, however, for perhaps a five-year period may prove under some circumstances to be economically acceptable." (Reference 38).

2.2.2.11 Ask the servicing DPDO to check out possible arrangements with potential material buyers under which the buyer provides a baler for installation use.

The following problems, hopefully not common, were experienced by one military installation when they attempted to bale corrugated cardboard. The point of listing these problems is to illustrate that the baler may have been chosen for a task for which it was not designed or it was simply inadequate for the task it was designed for; in either case, other installations can improve their own decision making by researching into the experiences of other organizations that are using equipment under procurement consideration.

In three years of operation, a user encountered the following problems with its vertical baler:

1. Hydraulic leaks are common.

2. Hoses need frequent repair or replacement.

3. Chain slips off drive frequently.

4. Control box required repair; solenoid requires frequent replacement; limit switches won't stay in place.

5. Upper doors required reconfiguration and reinforcement.

6. Retainer "dogs" are too small to prevent spring-back of the corrugated material.

7. Cardboard jams in hopper crevices and around platen edges; this impedes the baling operation; particularly since the jammed cardboard is difficult to remove.

8. The main hydraulic ram cylinder broke and an extensive delay in repair resulted because the manufacturer was unable to respond adequately; the user had to contract out for a custom remanufacture of the broken part in order to get the system back on line.

9. Moving parts are exposed.

10. The lower, main access door is difficult to open when the bale is ready for removal.

11. In order to achieve desired bale sizes for flat-bed truck shipping, the user had to raise the floor of the baling chamber by putting 2 inch by 6 inch wood planking on it; without this raised floor, the platen would not lower sufficiently to make the desired smaller bale.

12. It is difficult to obtain the desired weight for corrugated cardboard bales. This difficulty apparently arises from a "safety feature:" The ram and platen will reverse direction whenever an unknown amount of resistance is encountered, presumably to avoid overloading and damaging the mechanism; however, this feature sometimes impedes baling whenever backpressure arises from "stubborn" cardboard pieces.

Figure 35. Example of an Inadequate Baler Purchase

Note: A different higher capacity model, built by the same company as the one above, has been used without problems by another on-base recycling unit for both corrugated cardboard and ledger paper. (Reference 34).

Figure 35. Example of an Inadequate Baler Purchase (Concluded)

2.2.2.12 Ask the DPDO to check the DLA system for excess balers. (However, don't take a baler just because it is available; ensure it meets criteria described in this section before accepting it!).

2.2.2.13 Consider sharing a baler(s) that may already be in operation by the installation's commissary and/or Base/Post Exchange activities.

2.2.2.14 Consider palletizing rather than mechanical baling.

2.2.3 Baler Operating Procedures

2.2.3.1 Baler operating procedures will vary depending upon the type of baler installed and the auxiliary pieces of equipment (such as chutes) used to aid the operation.

2.2.3.2 Most installation recycling programs will use a vertical, hand-fed, above-grade baler such as illustrated in Figure 36 Consequently, Figure 37 has been drawn up to illustrate the nature and sequencing of tasks associated with this type of operation. The procedures have been taken from information provided by a baler manufacturer under GSA contract. (Reference 36, 37).

2.2.4 Other Baler Information

2.2.4.1 Buyers of a new baler should ensure that the manufacturer includes operating instructions, replacement parts stock list, maintenance and trouble-shooting guidance with the baler.

2.2.4.2 If the baler is obtained from salvage or other sources as a used unit and operating and maintenance guidance is unavailable, write for this information from the manufacturer. Appendix 6 contains abstracts of the type of information desired in these areas. (Reference 40, 41, 42).

2.2.5 Keep in mind that with respect to:

2.2.5.1 Baling versus palletizing: There is very little difference with respect to density; high grade paper packs uniformly with high

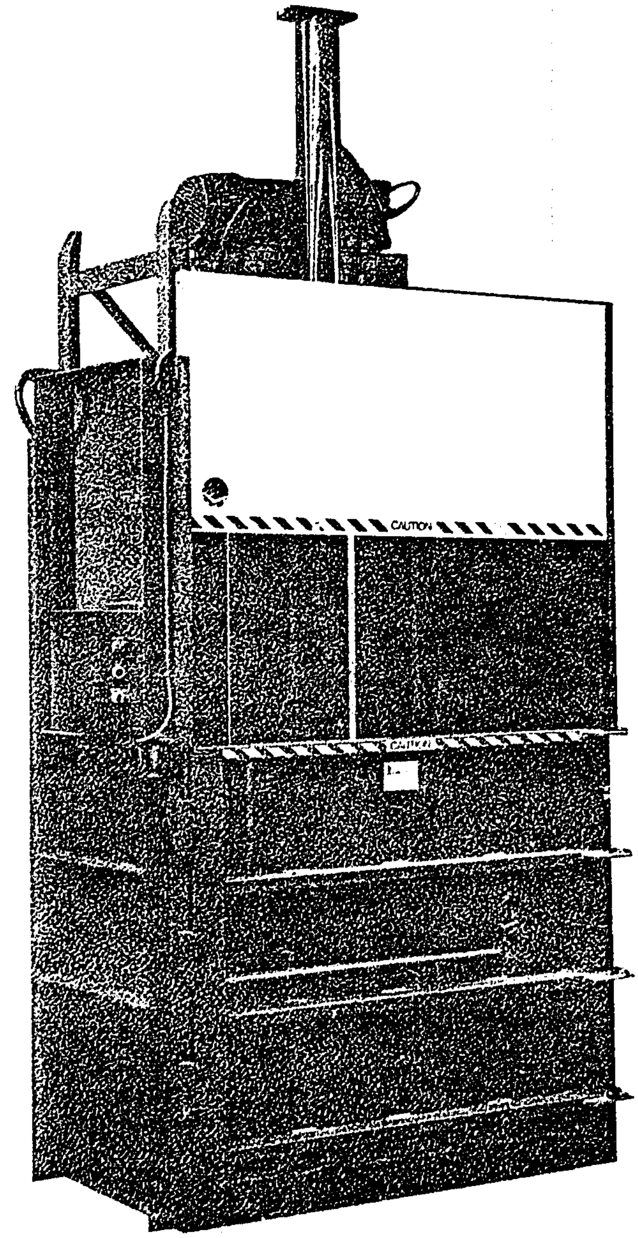


Figure 36. Above Grade Vertical Baler

density in a loose form in bulk containers; generally baling will not reduce the volume significantly beyond that achieved by hand packing.

2.2.5.2 Contractor preferences: Many buyers prefer nonbaled paper because it is not economically feasible to scan or check baled paper for contamination; DPDO must investigate buyer preferences.

2.2.5.3 Risk of baling: Buyer may reject an entire bale if the amount of contamination visible at time of delivery appears to exceed specifications.

2.2.5.4 Costs: Capital and operating costs may not justify purchase.

3.0 EQUIPMENTS

3.1 Recommended equipments for a processing center include the following:

3.1.1 Warehouse Platform Scale

- Pallet sized platform: 48 inches by 48 inches or 36 inches by 48 inches.

- 2,000 pound plus capacity.

- Easy readout dial.

- Simple installation: Avoid models that require recessing into the floor unless the recessed area is already available.

3.1.2 Forklift or pallet jack.

3.1.3 Handtruck.

3.1.4 Hand strapper, steel banding, and banding carrier handtruck (see Figure 37).

ACCURATE IND. MODEL #60 & #72 BALER

"READ THE FOLLOWING BEFORE OPERATING BALER"

This baler is designed to provide long and continuous service. It will make full size, proper weight bales and eject them when the instructions listed below are followed accurately.

NOTE: Selector switch on control panel determines mode of operation of Baler.

DOWN		UP
BALE	AUTO	EJECT

A. PREPARE TO BALE

A-1. Open main door and clean out all slots in chamber floor with narrow broom handle. Be sure ejector arms are lying flat on bottom of baler floor.

A-2. Place several large pieces of cardboard to cover chamber floor to provide good support for bale ties.

A-3 Close and lock main door, make sure lock pin is inserted completely through lock mechanism.

A-4 Check ejector chains at rear of baler (they should be disengaged and hook retainers; not on the platen hooks).

B. BALE

B-1 Set Selector Switch in "AUTO" position.

B-2 With platen and aluminum safety door in full position, fill chamber with cardboard to be baled. DISTRIBUTE EVENLY (Sides, corners and middle).

B-3 PRESS "GREEN" start button momentarily and release.

CAUTION: Do not leave any material hanging over top of the main door. If the aluminum safety door is prevented from

Figure 37. Example Operating Procedures for Vertical, Hand-fed Above Grade Baler

closing completely because of any obstruction, the platen will stop, reverse and shut off automatically.

CAUTION: KEEP CLEAR OF ALUMINUM SAFETY DOOR AND MAIN DOOR WHILE IN OPERATION.

CAUTION: DO NOT ATTEMPT TO RE-POSITION CARDBOARD WHILE UNIT IS IN OPERATION.

B-4 If the safety door hits an obstruction, the platen will stop, reverse and shut down. In this case, push the material back further into the receiving chamber so safety door will clear it. Repeat B-3.

B-5 Automatic Operation. If the safety door closes without being obstructed, the platen will compress the cardboard down into the bottom of the bale chamber. The platen will stop, pause momentarily, and start rising to fully open position, automatically carrying the safety door. The baler will automatically shut off.

B-6 Repeat items B-2 through B-5. Normally it takes 30 to 60 or more cycles to complete a bale, depending on the material being baled.

B-7 Proper bale height is achieved when "RED" line is visible during the pause prior to reversing on left platen guide at top of main door. Red line is viewed through window in aluminum safety door. As soon as this situation occurs, prepare bale for ejecting.

CAUTION: DO NOT MAKE BALE OVERSIZED. IF BALE IS MADE OVERSIZED, BALER COULD BE DAMAGED DURING EJECTION CYCLE.

C. PREPARE BALE FOR EJECTION

C-1 After proper bale height is reached (B-7) place several large pieces of cardboard to cover top of bale.

C-2 Place selector switch in "DOWN-BALE" position.

C-3 Press "GREEN" start button momentarily to start motor and release. Platen will come down, compress bale and shut off automatically.

C-4 Unlock and open main door. (Pull out and use handle extension if necessary).

C-5 Place bale ties around bale and secure (5 ties spaced evenly in slots are recommended).

CAUTION: The main door must be fully opened and platen still fully extended compressing bale.

Figure 37. Example Operating Procedures for Vertical, Hand-fed Above Grade Baler (Continued)

D. EJECTING BALE

NOTE: It is suggested that a wooden pallet or other material handling device be placed in front of the baler to receive the bale after ejection.

D. EJECTING BALE continued

CAUTION: The main door must be fully opened and platen still fully extended compressing bale.

D-1 Place "RED" ejector chain hooks on "RED" platen hooks at rear of baler. Make sure chains are straight and not twisted.

D-2 Place selector switch in "UP EJECT" position.

D-3 Press "GREEN" start button and hold.

CAUTION: Watch bale as it is ejecting to be sure it clears the safety door. An over-sized bale could hit the safety door and damage it.

D-4 Platen will raise ejector arms and bale is ejected.

CAUTION: DO NOT USE PLATEN TO PUSH OR EJECT BALE.

D-5 Remove bale from area.

CAUTION: "CLEAN UNDER EJECTOR BARS BEFORE CLOSING MAIN DOOR" - USE NARROW BROOM HANDLE.

D-6 Close main door, place selector switch in "AUTO" position and press start button - the baler will cycle once and shut off. This will automatically disengage the ejector chains.

D-7 Open chamber door and start at A-1. above.

Figure 37. Example Operating Procedures for Vertical, Hand-fed, Above Grade Baler (Concluded)

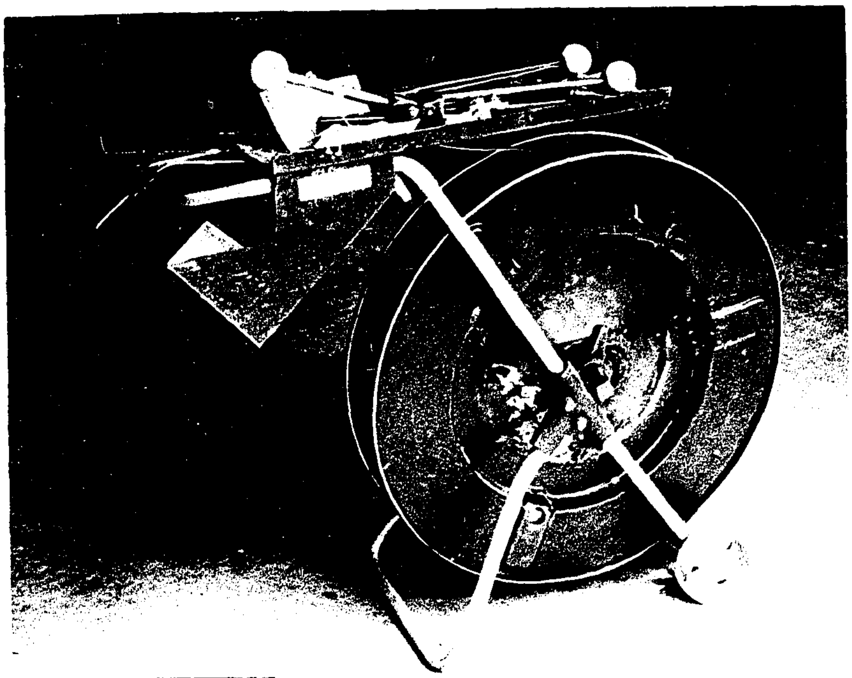


Figure 37. Handstrapper, Steel Banding and Carrier Handtruck

- Strapper and carrier: Reference GSA Supply Catalog, FSN: 3540-00-223-8440.

- Strapping/banding:

  . FSN: 8135-00-283-0667.

  . Acceptable width: one-half inch to three-fourths inch by 0.020 inches thick.

  . Use steel, not plastic strappings; although less expensive than steel, experience at Vandenberg AFB showed that plastic was "okay" for newspaper banding but unacceptable for other application. The plastic strapping stretches considerably and requires its own strapping machine and associated tools. (Reference 43-45).

3.1.5 Sorting platform/jig (see Figure 40). Useful if many paper categories are collected and further segregation is necessary.

3.1.6 Wooden pallets with banding holes in sides (see Figure 34).

3.1.7 Tri-wall/heavy duty corrugated cardboard boxes (if palletizing loose ledger/computer cards).

- pallet size is desirable.

- should be of consistent size.

- load capacity from 600 to 2000 pounds.

- may be available from buyers.

- see also characteristics under paragraph 2.1.5 above.

3.2 As discussed in paragraph 2.2, a vertical baler may be useful if economically justified and acceptable to buyers.

- if a vertical baler is used it is important to ensure that cardboard is always available to place on the bottom and top of the formed bales, and also on the sides, depending upon the baler used (reference the manufacturer's operating instructions, if available).

4.0 PROCESSING CENTER MATERIAL FLOW AND RECORD KEEPING

4.1 The routines/task structure for centrally processing will obviously vary in accordance with the number of wastepaper categories recovered; the containers used and the method of collecting the material from around the installation; and the method of processing (e.g., palletizing versus mechanical baling).

4.2 Material handling efficiency and effectiveness are critical to the success of any production activity and centralized wastepaper processing is no exception. Labor will normally be the dominant cost factor and the processing center must be set up to maximize their productivity. This can be accomplished by, among other things:

- Minimizing the number of wastepaper categories that must be collected and processed; restrict them to the highest value items (see also Section III).

- Minimizing the contaminant level in each wastepaper category by exercising consistent, visible quality control at the source of wastepaper generation (see also Section VI).

- This will also improve collection and processing personnel morale because it "elevates" their tasks above those they normally associate with garbage collection.

- Providing adequate space for each task and a smooth flow arrangement for the movement of the wastepaper from the time it's brought in for weighing to the time it's ready for transfer to storage awaiting sale. In this regard the Center should have:

- a scale located by the entrance to the Center.

- storage space for at least two days' maximum anticipated incoming quantity of material.

- space for sorting and/or screening for contaminants.

- adequate working space for a pallet of each category of material being processed and located immediately next to sorting/screening activities.

- facilities that will minimize lifting distances and heights.

- a program to train personnel to handle more than one task (ensures backup capability and task variety).

4.3 The installation's Industrial Engineering office(s) should be used to make recommendations for establishing the layout of the Center.

4.4 To illustrate how a Center might be set up, reference the accompanying figures on the central processing activities established by the contractor at Vandenberg AFB in 1977-78. The following description represents task sequencing related to those illustrations.

4.4.1 Paper delivered in drums or boxes (e.g. computer cards).

4.4.2 Paper weighed and weight recorded, by category, for the buildings from which the material was collected.

4.4.3 Boxed computer cards are placed directly onto a pallet.

4.4.4 Stacked/clumped computer printout paper is placed directly onto a pallet.

4.4.5 Other paper, in drums used to collect it, is temporarily stored in a holding area awaiting further processing.

4.4.6 Paper is taken from holding area and dumped onto a "jig" or working bench (approximately 3.5 feet high by 20.0 feet long by 2.5-3.0 feet wide).

4.4.7 Paper is sorted by category and placed into new drums; contaminants are also screened out during this activity.

4.4.8 Drums with newly sorted paper are stored awaiting baling.

4.4.9 Paper, by category, is then baled and or banded; weighed; and moved to a storage area awaiting sale. (Reference 46).

4.5 Record Keeping

4.5.1 An accurate, timely record-keeping system must be established to accompany and document the physical activities of the materials recovery

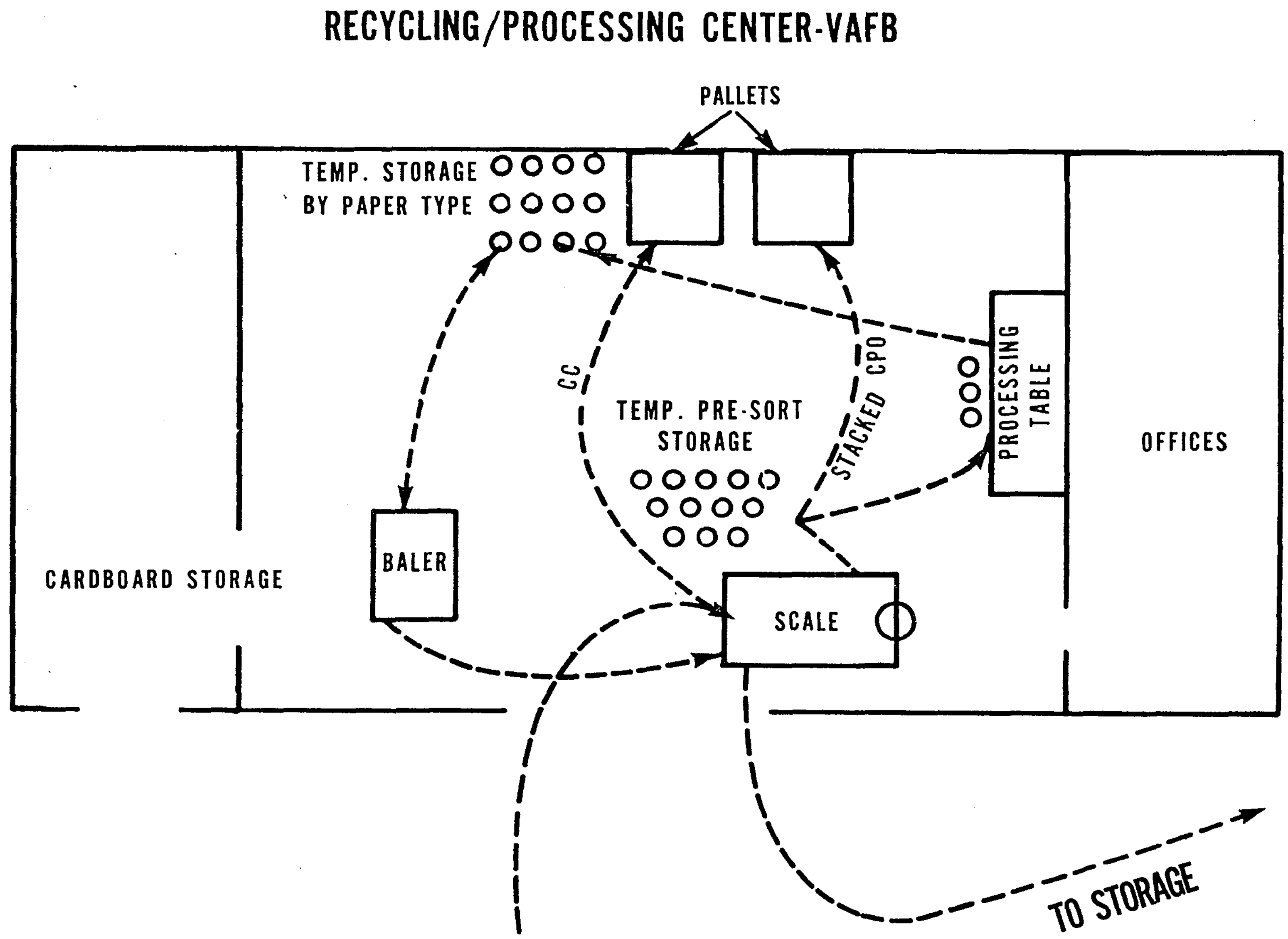


Figure 38. Layout of VAFP Processing Center (not to scale)

Figure 39. Weighing Incoming Wastepaper (top) and Temporary Storage Before Sorting

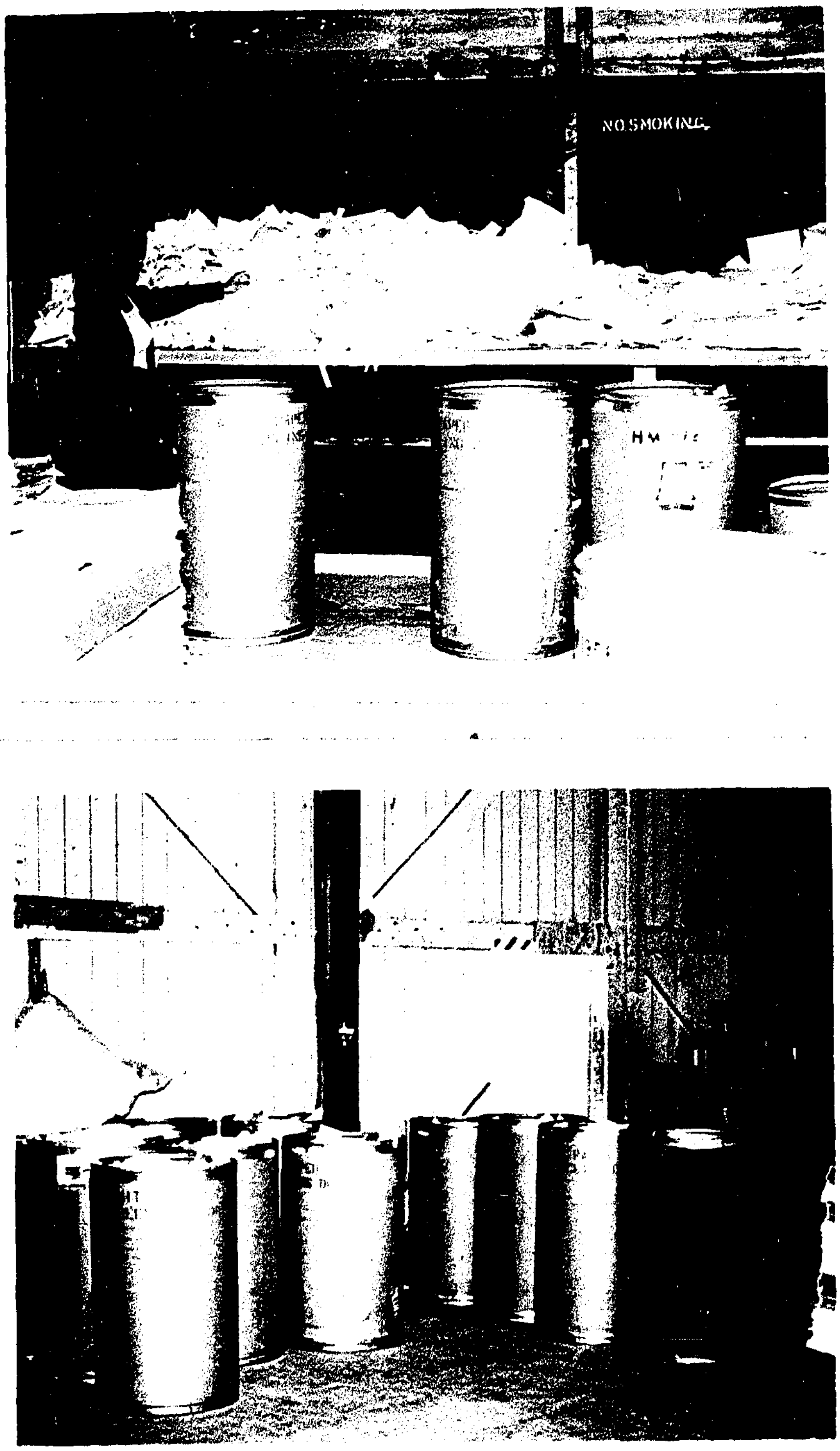


Figure 40. VAFB - Sorting on Table Jig (top) and Sorted Wastepaper Awaiting Baling

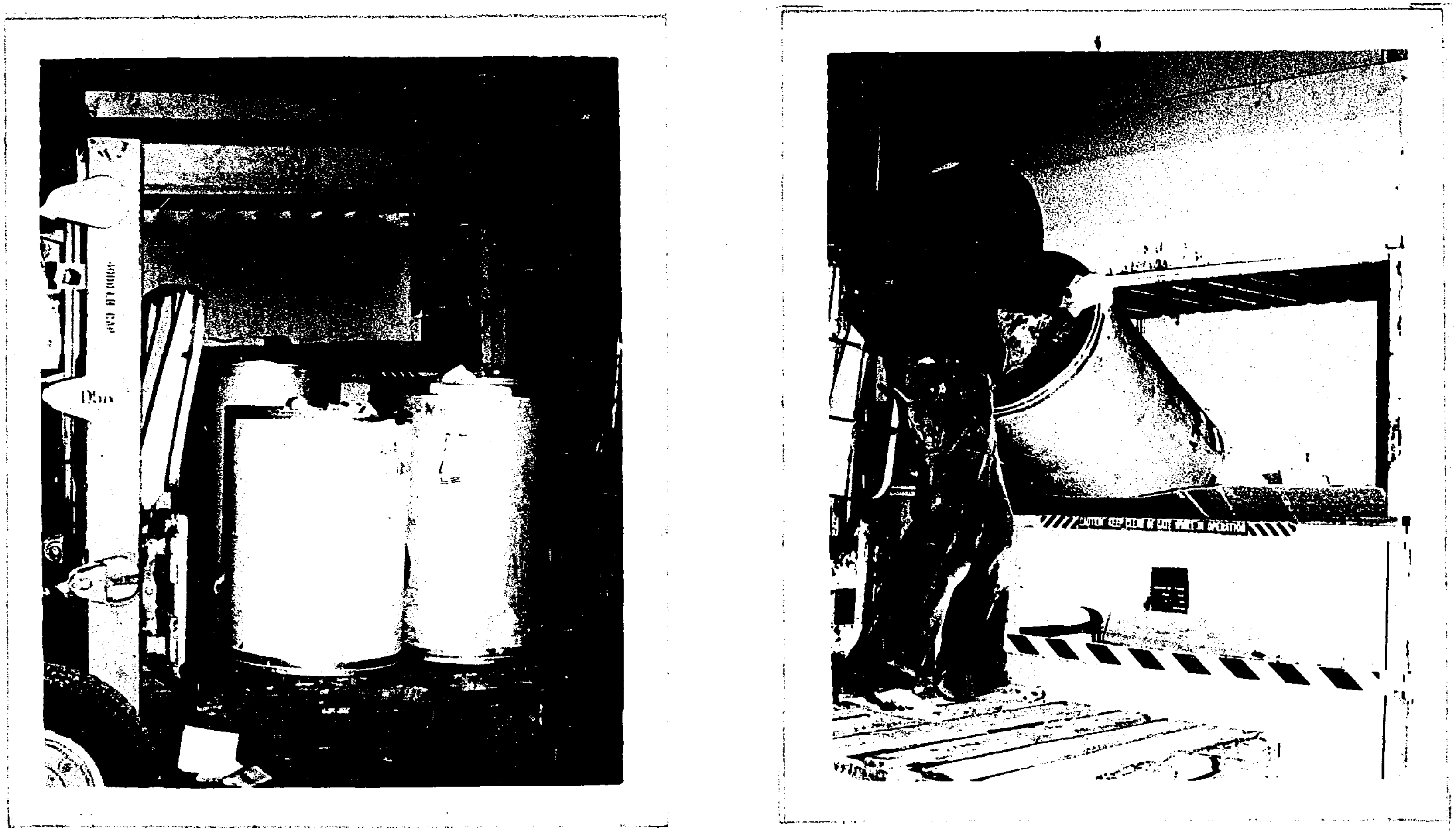


Figure 41. VAFB - Loading Baler (assisted by forklift)

Figure 42. VAFB - Banding Compressed Bale

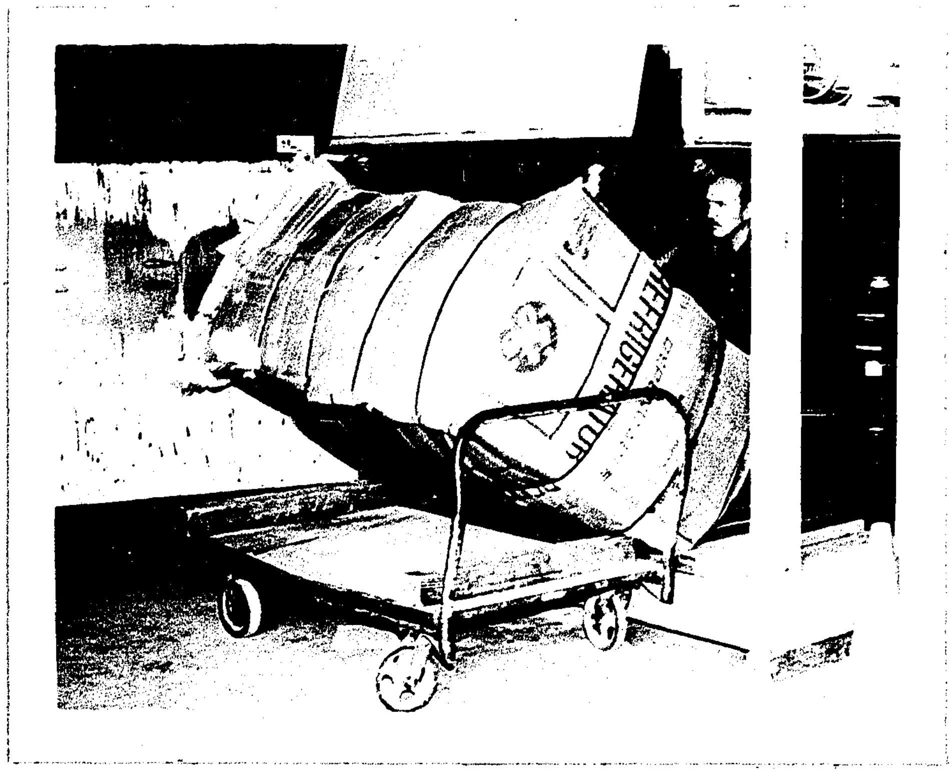
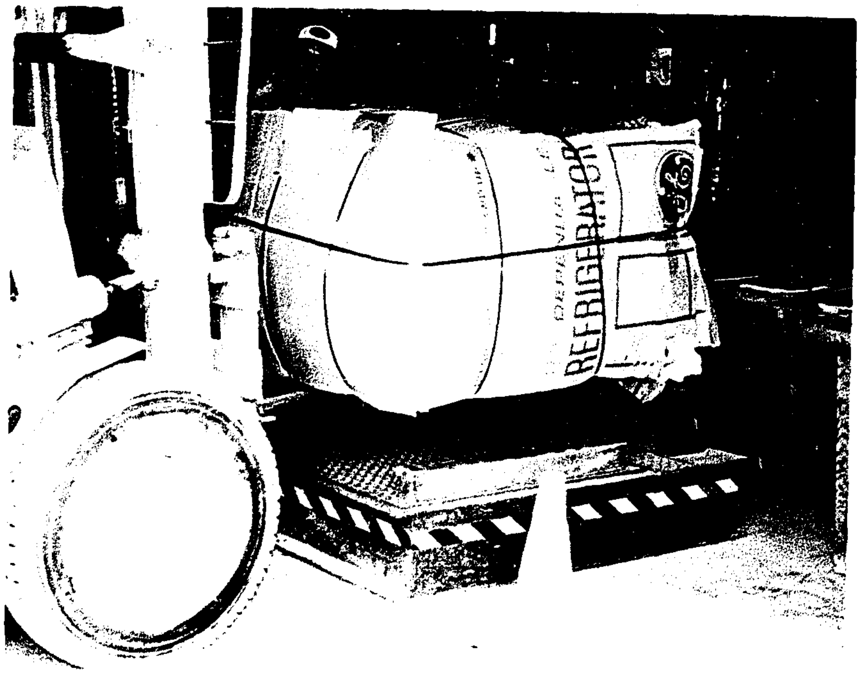


Figure 43. VAFB - Ejecting Bale onto Platform Truck (Note Skids) and Transferring It to the Scale



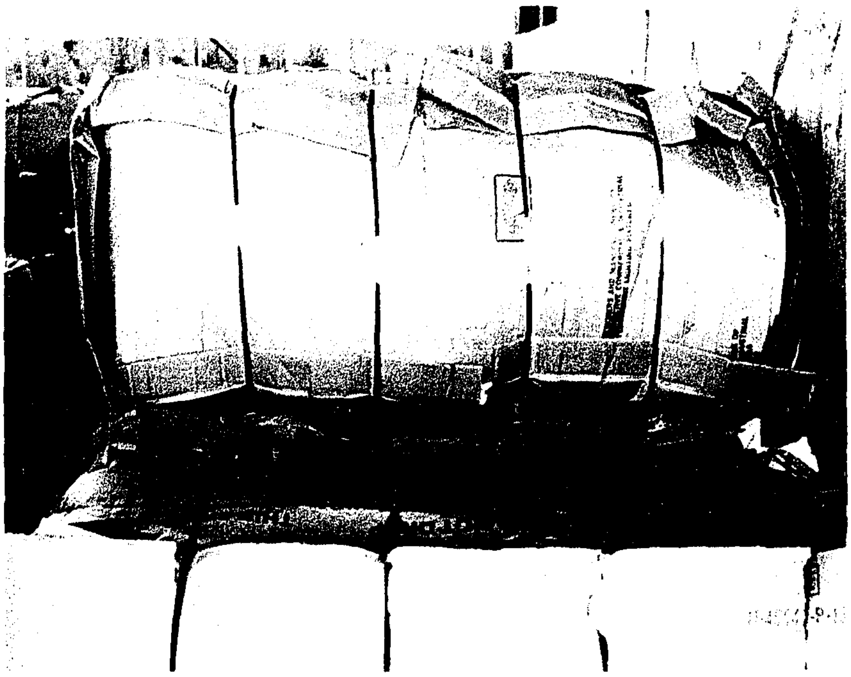


Figure 44. VAFB - Weighing and Stacked Bales in Storage

program. These records should ensure that adequate data is available for proper management control and planning, such as:

- Quality control: Being able to identify buildings or organizations that are existing or potential sources of inadequate contamination control and/or inadequate producers of wastepaper.

- Production control: Determine levels of throughput capacity and personnel capabilities; this also supports the planning activities such as:

  - Forecasting: of material recovery levels, sales volume, expenses, cash flows, etc.

  - Budgeting: of manpower, equipment and financial resources.

4.5.2 Figures (4.5.2 and 4.5.2) provide examples of two important record forms used by the contractor at Vandenberg AFB in 1977-78. (Reference 47).

5.0 JOB DESCRIPTIONS AND PERSONNEL CHARACTERISTICS

5.1 Job Descriptions

5.1.1 It's advisable to establish job descriptions for everyone involved with the recovery program. Position descriptions will be required when overhires are employed and these will be reviewed by the Civilian Personnel Wage and Classification office before hiring authority is approved. Air Force Form 1378, Position Description, is normally used for this purpose. (See Figure 47).

5.1.2 Job descriptions should describe, as a minimum, Duties and Responsibilities. In this regard information in Table 2 on waste material processing and collection activities can be used as a guide for developing job descriptions. Usually, the scope of installation-level recovery programs will limit the number of personnel that can be economically employed and considerable overlap of duties and responsibilities will be required. This overlap is also desirable because (1) it will allow personnel to perform many tasks in a backup capacity; and (2) provide variety and (hopefully) more interest in the jobs.

5.2 Personnel Characteristics

5.2.1 As discussed in Section VII, paragraph 1.3, a recovery program must be characterized by reliability and continuity. Therefore, personnel considered for jobs within the program must be judged against these criteria.

5.2.2 Use of military personnel is not recommended because (1) their expenses are not reimbursable from program revenues, (2) recycling positions are not "mission essential" and cannot be permanently assigned against the positions; (3) "borrowing" personnel from normal mission assignments diminishes the effectiveness of those mission support activities and can only be afforded, if ever, on a short-term basis; and (4) the temporary nature of such assignments requires constant retraining, creates productivity losses and generally creates a continuous problem in meeting the requirements of the recovery program. Even at installations such as Ft Lewis, Washington, where an installation regulation specified that available troop personnel would be given special duty assignments to the recycling program for periods of at least one year, the realities of mission-first considerations result in rapid turnover of personnel (three-month assignments are not uncommon). (Reference 48-54).

5.2.3 For these reasons it is wise to hire civilian employees either through a service contract or as overhires. However, hiring civilians will not guarantee avoidance of problems with turnover. Turnover potential can be minimized if:

5.2.3.1 Management-type personnel are given opportunities to exercise supervisory control and judgment. Hence, Comprehensive Employment and Training Act (CETA) personnel can be good candidates for employment in the program but they must be used in a capacity that may include but also go beyond the semi-skilled tasks of material collection and processing.

5.2.3.2 Quality control keeps contamination levels down and collection points neat. If either condition requires program personnel to spend much time cleaning up collection areas and/or sorting out significant non-desirable trash items from the collected material, it reduces the tasks to little more than highly visible garbage collection acitivity. This in turn discourages people from staying with the program very long, particularly since the jobs will probably be low paying ones.

Date	Bldg. No.	White Ledger	Colored Ledger	CPO	CPO W/C	Tab Cards	OCC	Other	Remarks

Figure 45. Example of Vandenberg Resource Recovery Program Receiving Weight Log

Production Control Log

Week Of 31

Date 7/31/78

Product	No. of Each	Weight
CPO	1 BALE	1,225
CPO	1 BALE	1,125

Remarks

Production Supervisor ____________

Date 8/1/78

Product	No. of Each	Weight
C.L.	1 BALE	1,200
W.L.	1 BALE	1,200
CPO	1 BALE	

Remarks

Production Supervisor ____________

Date 8/2/78

Product	No. of Each	Weight
CPO	1 BALE	1,275
W.L.	1 BALE	

Remarks

Date ______

Product	No. of Each	Weight

Remarks

Figure 46. Example of a Production Control Log

5.2.3.3 The right people are selected for the right jobs. For example, women seem to be more reliable, patient, and highly motivated than men in sorting out different categories of wastepaper and undesirable/ contaminating materials. (Reference 55). The use of handicapped personnel in recycling-related activities has been extensive and highly publicized since such programs produce theraputic and income benefits for the participants. In this regard, program planners should consider the following factors when developing an employment strategy for a program:

5.2.3.3.1 Physical and mentally handicapped people seem to fit in best when the recycling organization is large and where they can be assigned to specialized jobs. For example, Davis-Monthan Air Force Base, Arizona, entered into an agreement with the Arizona Training Program of Tucson (ATP), a state training agency in charge of the mentally retarded. (Reference Appendix H) the ATP collected, segregated and marketed the wastepaper which was uneconomical for the installation to do through any other alternative program. At least 24 mentally retarded adults worked on the program and of these, 20 were primarily concerned with sorting paper into five different categories. The cost of all wages for the workers was recovered through program sales. (Reference 56-59). Similar seemingly successful use of handicapped workers in large organizations and specialized jobs (such as corrugated cardboard or newspaper processing only) was noted in such locations as Camp Lejeune, North Carolina and Robins Air Force Base, Georgia. (Reference 60-62).

5.2.3.3.2 On the other hand, use of handicapped personnel in a small organization, where various tasks have to be accomplished by each individual, may not benefit either the handicapped worker nor the employee. For example, at Vandenberg AFB, the regionally sponsored contractor attempted to train handicapped personnel as part of a state approved program. However, the effort did not work out and handicapped workers were not continued in the small, multi-task program because:

- They were not flexible enough to handle the various tasks required with each job position (e.g., if they helped collect paper but couldn't drive, it created a problem in meeting program collection requirements when the regular driver was unavailable; a similar problem arose in the need to perform both processing and forklift operations). The recycling operation could not be cost effective under these conditions.

- Other employees had to work harder because of handicapped workers' slowness and higher tendency for errors, which then adversely affected morale and made it more difficult to keep non-handicapped workers in the program. (Reference 63).

POSITION DESCRIPTION	1. NUMBER OF IA'S	2. POSITION NUMBER

3. ORGANIZATION LOCATION AF,AlLC	4. POSITION TITLE		
2854th Air Base Group Civil Engineering Division Operations & Maintenance Branch Sanitation Section Refuse Collection & Disposal Unit	5. CLASSIFICATION	6. CLASSIFIED BY	7. DATE

8. DUTIES AND RESPONSIBILITIES *(Indicate time percentages, where required)*

I. INTRODUCTION:

Approved functional statements are filed in the Position Management Section and operating official's office. The purpose of this position is to perform semi-skilled labor tasks involving the recycling of solid waste.

II. DUTIES AND RESPONSIBILITIES: Performs one or a combination of the following semi-skilled labor tasks:

1. Receives loose scrap paper, punched cards and cardboard for bailing. Separates out undesirable material when observed.

2. Operates bailing machine and strapper.

3. Performs preventive maintenance and makes minor adjustments to equipment.

4. Operates gasoline powered fork lift truck.

5. Records number of bales on production log.

6. Stacks bales in storage area.

7. Cleans area after each operation.

III. CONTROLS OVER WORK:

Supervisor provides specific instructions for new tasks, after which incumbent may independently complete duties involving several distinct tasks or steps. Supervisor may check work in progress or review results of finished projects.

IV. OTHER SIGNIFICANT FACTS:

9. I certify that this is an accurate statement of the major duties and responsibilities of this position and its organizational relationships, and that the position is necessary to carry out government functions for which I am responsible. This certification is made with the knowledge that this information is to be used for statutory purposes relating to appointment and payment of public funds, and that false or misleading statements may constitute violations of such statutes or their implementing regulations.

10. REAUDIT CERTIFICATION					DATE	SIGNATURE AND TITLE OF IMMEDIATE SUPERVISOR
DATE						
SUPERVISOR						
CLASSIFIER						

AF FORM FEB 1378 (REVISED

Figure 47. Example of a Recovery Program Position Description

TABLE 2. ILLUSTRATIVE JOB DESCRIPTION INFORMATION

The following information can be used as a guide for developing appropriate waste material processing center and collection activity job descriptions. These personnel job descriptions will rarely be as neatly separable in practice because of the limited number of personnel that can be economically employed.

I. Operations Manager

Description:

Direct operation of Process Center.

Control flow of materials from collection point to finished product.

Duties and Responsibilities:

Maintain effective collection system by close contact with building and organization coordinators.

Local public relations.

Represent recovery program at local environmental, planning coordination and other installation level meetings.

Establish processing center rules and regulations.

Keep processing center and area in a clean, safe operating condition.

Maintain close supervision of processing center and collection personnel.

Maintain equipment in good working order.

Prepare shipments of processed material.

Direct training of new personnel.

II. Production Supervisor

Description:

Direct operations of operators and processors.

Control flow of production.

Duties and Responsibilities:

Direct labor supervision and driving of collection vehicles.

TABLE 2. ILLUSTRATIVE JOB DESCRIPTION INFORMATION (Continued)

Production scheduling and expediting.

Maintain data logs and production records.

Instruct/train personnel in methods of performing their duties.

Maintain operating area in neat and safe condition.

III. Collectors and Material Processors

Description:

Collect recyclables from installation pickup points.

Process recyclables to a marketable form.

Duties and Responsibilities:

Drive collection vehicles, (briefly scan materials for contaminants and load waste materials on to vehicles.

Inform Production Supervisor of problems encountered in collection activities; recommend changes in collection point locations and schedules, as thought necessary.

Unload, weigh and record weight of collected material.

Sort out contaminating material.

Palletize material and/or operate mechanical baler and banding strapper.

Operate fork lift truck or pallet jack.

Weigh and record weight of each pallet/bale of waste material.

Transport and store pallet/bales

Perform preventive maintenance and make minor adjustments to baling and associated processing center equipment.

Clean area after each operation.

IV Clerk-Typist/Administrative Assistant

Description:

TABLE 2. ILLUSTRATIVE JOB DESCRIPTION INFORMATION (Concluded)

Provide administrative and clerical support.

Duties and Responsibilities:

Type letters; file documents; enter data into appropriate reports; answer telephone.

(Reference 48-53)

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62. "Report of Recycling Efforts at Robins AFB, Georgia," Letter Report, Directorate of Plans and Programs, Robins Air Force Base, Georgia, 1 July 1975, p. 3.

63. Interview with Mr Robert Stearns, Former Director of Santa Maria California Retarded Workshop and Manager, Community Environmental Council Recycling Center, Vandenberg Air Force Base, California, 2 August 1978.

SECTION IX

PUBLICITY AND EDUCATION

1.0 GENERAL

1.1 An effective wastepaper recovery program depends upon both the mechanics of recovery and even more importantly, employee understanding and belief in the reasons for undertaking and maintaining the program. Achieving employee awareness, concern and cooperation depends upon a well thought out, multilevel publicity and education campaign fundamentally based as follows:

1.1.1 The recovery program is intended to be a long-term, permanent operation.

1.1.1.1 In this regard, a commitment to implementing the program should only be made after a careful, realistic analysis of recoverable materials has been made, the mechanics and cost of recovery have been defined, and market analysis shows that the program can be self-sustaining over a reasonable period of time, three years as a minimum.

1.1.2 The program is being implemented for practical, not only philosophical reasons.

1.1.2.1 The program should be based upon installation-specific economic advantages and incentives, supplemented by "it's the right thing to do" or "nice to have" environmentally related goals. People will be more receptive to, and positively motivated by a program which pays for itself through installation cost avoidance and/or net dollar returns than they will by non-specific (though desirable) statements of environmental improvement; the economics and the installation-specific relationships make the program more tangible and therefore acceptable to personnel.

1.1.2.2 Under these motivational aspects it is also important to show employees that any funds available, after covering expenses, can be spent to implement energy conservation and environmental improvement projects on their installation.

1.1.3 Installation command personnel visibly demonstrate that they are committed to, and involved with the recovery effort.

1.1.4 Instructions to personnel are simply and clearly stated, oriented to each individual's working area (if unique) and provided/ explained to them on a personal basis.

1.1.5 Program progress reports to employees are provided on a frequent, timely basis, particularly during the first year of operation.

1.1.6 Personal contact is maintained between program managers, building coordinators and the employee to ensure rapid feedback and resolution of problems, questions and education of new employees.

1.2 The publicity and education campaign must incorporate various mechanisms/methods to promote recovery program implementation and sustain its operation. These include the following.

1.2.1 First, obtain the support of the installation commander. Briefings should then be given to increasingly lower echelons of personnel, starting with the command staff and proceeding through Commander's Calls, supervisory meetings, and other regularly scheduled meetings of installation organizations. Base media are also useful, but should be used to supplement the personal appearance approach.

1.2.1.1 Not everyone should be briefed. As recommended in Section III, the potential for achieving economic success is increased by limiting the wastepaper categories to computer tabulating cards, computer printout paper and, maybe, other high grade white ledger paper and then only to those buildings that are high generators of each category. Consequently, although many organizations and/or personnel will want to get on the recycling "bandwagon," program management personnel (or their representatives) should be prepared to explain why not everyone or every building is included, and briefers should avoid promoting the program at meetings when the majority of the attendees will not be involved.

1.2.1.2 Special employee meetings are not recommended; see discussion under paragraph IX 1.2.3 below.

1.2.1.3 Special attention should be given to ensuring lower level and front-line supervisors are briefed on the program in their area. Pre-implementation follow-up should be conducted to determine if these supervisors have been informed and consulted on the effective means of implementing the program in their areas of responsibility.

1.2.1.3.1 It is critical that the head of each involved organization show that he/she is 100 percent behind the program; similarly it is critically important that this show of support "cascade" down to each level of supervision. Without this total base of support, the recycling program will get off to a weak start and will be in real danger of being increasingly ignored because of employees attention to their regular work responsibilities.

1.2.2 Another "critical" element in the planning, promotion, implementation and maintenance of the recovery program is identification of key building and work area program coordinators who are motivated, capable of handling the tasks and authorized time, by their supervisors, to perform those tasks.

1.2.2.1 Organizational commanders are useful for identifying these people (see Section X). Do not assume that base Civil Engineering-listed building custodians make good coordinators and should be automatically chosen. For example, experience at Vandenberg AFB, California, showed that only 30 percent of these individuals were in positions and/or motivated to effectively bear recovery program responsibilities in their building. (Reference 1) (Note: In the Air Force, a worker in each building is chosen and designated as the "building custodian;" in this extra duty capacity he/she is responsible for such tasks as inspecting and reporting janitorial deficiencies/compliance and requesting base Civil Engineering real property/ building repair/ maintenance support. In performing these tasks the building custodian does not have to interface with many employees and, consequently, may not have been chosen for the tasks on the basis of skills that are necessary for an effective recovery program coordinator).

1.2.2.2 Work area coordinators may not be needed; it depends upon how many people work in the building, the diversity of functions and the number of different organizations represented in the building. If more than one individual is needed because of these factors, the principal organization in the building should designate a coordinator to be the building's major point of contact and he/she should then be assisted by coordinators designated to represent other organizations and/or work areas in that particular building.

1.2.2.3 In addition, it is a good idea to have each organization that is a major occupant in more than one building in which recycling will be implemented, to designate an office and central point of contact for all those buildings. This will make it easier to coordinate actions and feedback, and identify replacement personnel (when necessary because of work relocation, change of station and similar actions).

1.2.3 Implementation and maintenance of the recovery program should be promoted through personal, face to face meetings and printed, explicit letters of instruction.

1.2.3.1 Large group educational sessions of 100 or more employees have been used in civilian organizations to promote recycling programs (Reference 2). However, this type of session is <u>not</u> recommended for installation use, even in buildings with large populations (e.g., 500 plus employees). This recommendation is based upon the following experiences and experimentation.

1.2.3.1.1 Large group sessions were held at Headquarters Aerospace Defense Command, Colorado. Less than half of the building's 1035 employees attended or were able to attend, and subsequent participation response to the program, even among those who attended, was poor. The program manager resorted to a personal, face to face meeting with employees to improve their understanding and support of the program. (Reference 3-5)

1.2.3.1.2 A more personal, one to one approach to introducing the program to employees was used wherever possible in programs tested or ongoing at installations such as the Naval Construction Battalion Center, Port Hueneme, California; Tyndall Air Force Base (AFB), Florida; and Vandenberg AFB, California. At these locations, program managers/ developers and building coordinators were used to explain pertinent requirements and facts of the program, pass out the appropriate recycling containers and instructions, et. cetera. Follow up surveys showed that (1) compliance was most evident among those employees who first learned about the program through person-to-person contact; (2) decayed compliance appeared to be correlated with a lack of subsequent reinforcement by supervisors and program management/coordination personnel. The effectiveness of this approach was particularly evident at Tyndall AFB where, in achieving an overall recapture effectiveness of nearly 90 percent of available white paper, over 80 percent of the program coordinators indicated that they used and preferred the employee to employee approach. (Reference 6-9)

1.2.3.1.3 Another reason for avoiding large group sessions on an installation is the loss of productivity that occurs when personnel must leave their offices/buildings and travel around the installation to attend the briefing in a building large enough to accommodate the group.

1.2.3.2 Use of small group meetings of employees within a given office area can be effective for overviewing the program. However, providing the detailed instructions and recycling containers should be done after these meetings on a desk by desk basis.

1.2.3.3 Clear, explicit written announcements and instructions to commanders, program coordinators and employees will reinforce verbal announcements and provide a readily available source of guidance for everyone involved. The use of this personal approach, supplemented by clear, printed instructions is not unique to recycling. In a recent survey of chief executives and presidents of 50 major United States and Canadian corporations, face-to-face communication was listed by 30 of the respondents as being the single most effective employee communication technique; use of the printed word was also listed by 11 chief executives as being the most important means of promoting good communication. (Reference 10)

2.0 DOCUMENTATION-EDUCATIONAL MATERIALS

2.1 Obtaining Initial Support

2.1.1 An important step on the way to implementing a wastepaper recovery program is to first determine if a program is technically and economically feasible. To do this it is important to alert installation command staff to the objectives of the proposed program and the need for their cooperation and assistance in obtaining data necessary for the feasibility evaluation. This "recycling alert" can be accomplished through (1) briefings at major staff level meetings and the installations Environmental Protection Committee; and (2) through directive correspondence from the installation commander to all commanders/chiefs of organizations which are major occupants of each building under study.

2.1.2 Briefings

2.1.2.1 Figure 48 gives an example of the content of a briefing that could be given to staff members.

2.1.2.2 The following key points should be noted from this example and stressed in briefings developed from it:

- Environmental Protection Agency requirements to consider selected waste item recycling
- Conditions under which recovery is not required
- Use of recycling revenues to cover expenses
- Use of any after expense revenues to fund installation environmental improvement and energy conservation projects
- Need to conduct feasibility study, and method(s) to be used for gathering needed data
- Need for support from every organization

Figure 48. Example of Briefing for Obtaining Initial Support

VU-GRAPH 1

THE REQUIREMENTS FOR RECOVERY OF CERTAIN HIGH VALUE SOLID WASTE ITEMS STARTS WITH THE:

. EPA SOURCE SEPARATION GUIDELINE

- IN APRIL 1976 THE ENVIRONMENTAL PROTECTION AGENCY PROMULGATED A "GUIDELINE" THAT MAKES IT MANDATORY FOR ALL FEDERAL AGENCIES TO RECOVER SELECTED SOLID WASTE ITEMS FOR THE PURPOSE OF RECYCLING.

- EPA STATED THAT RECYCLING SHALL BE IMPLEMENTED, IF POSSIBLE, IF CERTAIN CONDITIONS EXIST AS FOLLOWS:

  1. IF, AS IN OUR CASE, A MILITARY BASE EMPLOYS OVER 100 OFFICE WORKERS, THAT BASE MUST ATTEMPT TO RECOVER HIGH GRADE WHITE PAPER, INCLUDING COMPUTER PAPER AND CARDS.

  2. IF THE BASE GENERATES 10 OR MORE TONS OF CORRUGATED CARDBOARD PER MONTH, THE BASE MUST ATTEMPT TO RECOVER IT FOR RECYCLING.

  3. AND, THIRD, IF THE BASE HAS OVER 500 DWELLING UNITS/FAMILIES, IT MUST ATTEMPT TO RECOVER NEWSPAPERS FROM THOSE HOUSING AREAS.

- THE LEGAL REQUIREMENT TO RECOVER THESE MATERIALS IS NOT ABSOLUTE. EPA AND THE AIR FORCE AGREE THAT IF:

  1. THERE IS A LACK OF MARKETS FOR THE RECOVERABLE ITEMS, OR IF

  2. THE RECOVERY PROGRAM CANNOT BE ECONOMICALLY SELF-SUSTAINING,

  THE BASE(S) INVOLVED DO NOT HAVE TO SET UP A RECOVERY PROGRAM.

VU-GRAPH 2

DoD DIRECTIVE 4165.60

- DoD RESPONDED TO THE EPA DIRECTIVES FOR SOLID WASTE RECYCLING BY PUBLISHING DoD DIRECTIVE 4164.60 IN OCTOBER OF 1976.

- IN ADDITION TO ESTABLISHING MORE SPECIFIC CONDITIONS FOR IMPLEMENTING RECYCLING PROGRAMS, IT PROVIDES FOR THE ABILITY OF BASES TO SHARE IN THE REVENUES GENERATED BY SALE OF RECOVERED ITEMS.

Figure 48. Example of Briefing for Obtaining Initial Support (Continued)

1. THE DEFENSE PROPERTY DISPOSAL OFFICE (DPDO) WILL HANDLE THE CONTRACTS FOR SALE OF THE RECOVERED ITEMS. HOWEVER, UNLIKE HISTORICAL PRACTICE, THE DPDOs WILL NOW ONLY RECEIVE APPROXIMATELY 20% OF THE REVENUES FOR THE PURPOSE OF COVERING THEIR EXPENSES. HERETOFORE, THEY PLACED ANY REMAINING MONIES IN THE AIR FORCE'S CENTRAL DEPOSIT FUND, WHICH MEANT THAT THE BASES DID NOT RECEIVE ANY DIRECT BENEFIT FROM THEIR RECYCLING EFFORT.

2. NOW, THE BASE WILL RECEIVE ANY AFTER-DPDO EXPENSE REVENUES TO

   A. REIMBURSE CERTAIN EXPENSES FOR OPERATING AND SUPPORTING THE PROGRAM; AND

   B. THEY WILL BE ABLE TO UTILIZE REMAINING REVENUES FOR FUNDING PROJECTS IN (1) ENVIRONMENTAL IMPROVEMENT AND (2) ENERGY CONSERVATION.

- FINALLY, DoD ESTABLISHED ANNUAL REPORTING PROCEDURES FOR DOCUMENTING PROGRAM PERFORMANCE.

- HOWEVER, IF A BASE DETERMINES THAT THEY CANNOT ESTABLISH A RECOVERY PROGRAM, THEY MUST REEVALUATE THE POSSIBILITY AT LEAST EVERY THREE YEARS AND REPORT TO EPA, THROUGH THE CHAIN OF COMMAND, ON THEIR FINDINGS.

VU-GRAPH 3

HQ AIR FORCE

- PURSUANT TO DoD REQUIREMENT, HQ USAF PROVIDED IMPLEMENTING INSTRUCTIONS TO ALL MAJOR COMMANDS IN LATE MARCH AND APRIL OF 1977.

- PRIMARY AMONG THESE INSTRUCTIONS WAS A REQUIREMENT FOR ALL BASES TO CONDUCT FEASIBILITY STUDIES FOR IMPLEMENTING A RECOVERY PROGRAM UTILIZING A LOW CAPITAL INVESTMENT SCHEME OF SEPARATING HIGH VALUE ITEMS FROM THE SOLID WASTE STREAM AT THE POINT OF SOURCE OF GENERATION. FOR MOST OF US, THAT'S AT THE DESK.

  HENCE, THE TERMS "SOURCE SEPARATION" FOR RECYCLING ORIGINATED FROM THIS CONCEPT, WHICH IS THE LOW COST WAY OF WASTE RESOURCE RECOVERY RECOMMENDED BY THE EPA.

- ONCE THE FEASIBILITY STUDIES ARE COMPLETED, BASES WILL IMPLEMENT THE PROGRAMS WHENEVER THEY ARE PROJECTED TO BE COST-SUSTAINING.

- WHATEVER THE OUTCOME OF THESE STUDIES, ALL MAJCOMs MUST REPORT THEIR FINDINGS TO HQ USAF IN SEPTEMBER (77) IN ORDER TO ALLOW THE AIR FORCE AND DoD TO EFFECTIVELY REPORT TO EPA ON OUR PROGRESS IN THIS AREA.

Figure 48. Example of Briefing for Obtaining Initial Support (Continued)

HQ ADC

- IN RESPONSE TO USAF'S INSTRUCTIONS, HQ ADC HAS DIRECTED THAT WE ANALYZE OUR SITUATION AT TYNDALL AND REPORT OUR RESULTS TO THEM BY 10 AUGUST.

PRESIDENT'S MEMO

IN ADDITION TO ALL OF THESE REQUIREMENTS, PRESIDENT CARTER RECENTLY SENT A MEMO TO ALL FEDERAL AGENCIES EXPRESSING HIS INTEREST THAT WASTE PAPER RECYCLING PROGRAMS BE IMPLEMENTED WHEREVER PRACTICAL BY THE END OF THE YEAR.

<u>VU-GRAPH 4</u>

SCHEDULE FOR TYNDALL

- IN ORDER TO RESPOND EFFECTIVELY TO THESE REQUIREMENTS, WE MUST CONDUCT A COMPLETE AND THOROUGH ANALYSIS OF TYNDALL'S POTENTIAL FOR RECYCLING.

- TO DO THIS WE HAVE ESTABLISHED A NUMBER OF STEPS FOR DATA GATHERING AND ANALYSIS, AS REFLECTED ON THIS VU-GRAPH.

- THE KEY TO THE ANALYSIS IS THE GATHERING OF ACCURATE DATA COVERING THE NUMBEROUS OCCUPIED FACILITIES ON THE BASE. UNFORTUNATELY, THIS DATA IS NOT READILY AVAILABLE IN CURRENT REPORTS OR OTHER TRADITIONALLY KEPT RECORDS ON FILE.

- THEREFORE, WE MUST COMPLETE A COMPREHENSIVE DATA GATHERING SURVEY OF ALL OCCUPIED FACILITIES THAT CAN POTENTIALLY PARTICIPATE IN A WASTEPAPER RECOVERY PROGRAM.

- TO DO THIS, WE MUST HAVE THE SUPPORT OF <u>EVERY</u> ORGANIZATION ON THE BASE IN CONDUCTING THE SURVEY. WE SIMPLY DO NOT HAVE THE TIME OR MANPOWER RESOURCES TO ACCOMPLISH A DATA GATHERING SURVEY ON OUR OWN.

- THIS ASSISTANCE WILL TAKE THE FORM OF A QUESTIONNAIRE TO BE COMPLETED BY EACH ORGANIZATION, FOR EVERY FACILITY FOR WHICH IT IS RESPONSIBLE AND WHICH HAS BEEN SPECIFICALLY DESIGNATED FOR STUDY.

- ONCE WE HAVE RECEIVED THE DATA FROM THIS SURVEY, WE'LL BE ABLE TO PROCEED WITH THE ANALYSIS AND DEVELOP ESTIMATES OF THE QUANTITIES OF WASTEPAPER ITEMS POTENTIALLY RECOVERABLE FROM OUR PAPER GENERATING ACTIVITIES.

- WE'LL THEN BE ABLE TO DRAW UP A PLAN ON HOW BEST WE COULD RECOVER THOSE MATERIALS AND, TOGETHER WITH THE QUANTITY ESTIMATES, WE'LL GO TO THE LOCAL DEFENSE PROPERTY DISPOSAL OFFICE (DPDO) AND ASK THEM TO (1) RESEARCH THE AVAILABILITY OF MARKETS FOR THE ITEMS, (2) DETERMINE ESTIMATED PRICES WE CAN SELL THE GOODS FOR, AND (3) DETERMINE THE TYPE OF SERVICE POTENTIAL BUYERS CAN OFFER THE BASE.

Figure 48. Example of Briefing for Obtaining Initial Support (Concluded)

- FOR EXAMPLE, IF THERE IS A MARKET FOR WHITE BOND PAPER, WILL THE BUYER DEMAND THAT WE PROVIDE ALL COLLECTION AND STORAGE CONTAINERS, OR WILL HE DO THAT?

- THE ANSWERS WILL OBVIOUSLY AFFECT THE TYPE AND QUANTITY OF RESOURCES THAT WE WOULD HAVE TO APPLY TO THE PROGRAM, AND THIS, OF COURSE, WILL AFFECT THE ECONOMIC ANALYSIS.

- FINALLY, GIVEN ALL OF THE FOREGOING INFORMATION AND ANALYSIS, WE'LL BE IN A POSITION TO MAKE A DECISION REGARDING THE VIABILITY OF IMPLEMENTING A WASTEPAPER SOURCE WEPARATION PROGRAM ON TYNDALL.

- THE RESULTS AND GO/NO GO DECISION WILL THEN BE FORWARDED TO HQ ADCOM FOR THEIR FURTHER USE.

- Schedule of events and milestones

2.1.3 Commander's Letter

2.1.3.1 An example of a recommended letter to obtain initial support for program evaluation is displayed as Figure 49. It should be distributed within a week after the initial briefing to the staff.

2.1.3.2 Pertinent points in this letter include:

- Regulatory requirements to recover wastepaper where feasible (Air Force definition is economic feasibility; ability to be self sustaining)

- When the feasibility study must be completed

- Office of prime responsibility (OPR) for the study

- Request for, and type of support needed

- Suspense date for response

- Attachments describing data needed

2.1.2.3 Refer to Section X for detailed description of data needs and method of evaluation.

2.2 <u>Implementing the Program</u>

2.2.1 If the feasibility study shows that a wastepaper recovery program will be economically self sufficient, a combination of correspondence, personal communications and media support should be utilized to educate and promote employee participation in the program. In whatever form this publicity and education effort takes it is vitally important that it be based as described in paragraph 1.1 of this section. Illustrative examples of implementation material are described in the following paragraphs; it should be adapted to fit the scope and procedures of each installation's particular program.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 4756TH AIR BASE GROUP (ADCOM)
TYNDALL AIR FORCE BASE, FLORIDA 32403

1? JUL 1977

REPLY TO ATTN OF: CC

SUBJECT: Data Collection for Wastepaper Source Separation Planning

TO: (Appropriate Organization/Commander/Chief)

1. Pursuant to federal law (Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976, PL 94-580) and Presidential Order, the Department Of Defense has directed (DODD 4165.60) compliance with Enviromental Protection Agency requirements for wastepaper source separation and recycling at all military installations where feasible. In order to implement this program, HQ USAF has ordered Base Commanders to determine the feasibility of establishing and operating such a program on their installations.

2. A study of Tyndall Air Force Base must be completed and reported to HQ ADCOM no later than 10 August 1977. 4756ABG/DEEV is designated OPR for this effort and must have specific assistance from every organization on Tyndall. The required assistance is indicated in the attached questionnaire.

3. A list of selected facilities under your responsibility is attached. I request you appoint a responsible individual or individuals to physically survey the listed facilities and complete a questionnaire for each facility listed. In order to meet the HQ ADCOM imposed deadline, your response to 4756 ABG/DEEV must be received no later than 28 July 1977.

James E. P. Randall

JAMES E. P. RANDALL, Colonel, USAF
Commander

2 Atch
1. Facilities Listing
2. Source Separation Questionnaire

Figure 49
Example Letter Requesting Initial Support

2.2.2 Commander's Kick-Off Letter to Organizational Commanders/ Chiefs

2.2.2.1 Figure 50 provides an example letter that could be adapted to serve as a "kick-off" letter to all organizational leaders who will be involved in the wastepaper recovery program.

2.2.2.2 Important points of this letter include:

- Implementation date

- (Regulatory requirements, if not mentioned in earlier correspondence; e.g., Commander's Letter described in paragraph 2.1.3, this section)

- Program will not interfere with accomplishment of assigned mission responsibilities and is expected to be economically self sustaining

- Use of net funds, if any, for installation energy conservation and environmental improvement projects

- Buildings included in the program

- General description of how the implementation and operation will be carried out

- Request for full support

- Office, telephone numbers and personnel serving as program management points of contact

2.2.2.3 On this and other introductory documents a subtle but effective way to reinforce the idea of recovery is to type at the bottom of each page, "This Paper is Recyclable" (assuming the paper fits in the category of the wastepaper being recycled!)

Figure 50. Example - Commander's Kick-Off Letter

12 September 1977

CC

Support of Wastepaper Recovery Program

Each Organization Commander Who Will Be Involved

1. On 3 October 1977 we will be implementing a program to recover high grade wastepaper for the purpose of recycling in accordance with current federal mandates for resource recovery. The program will not interfere with your ability to accomplish mission functions. It will be economically self-supporting and may provide funds needed for energy conservation and environmental improvement projects on the base.

2. Listed on Attachment 1 are certain buildings which were selected for participation in the program because of important factors such as mission function, number of personnel, and other data collected and analyzed in a previous survey by the base Civil Engineering organization. Contractor and base Civil Engineering personnel will be working closely with personnel you previously designated to assist in each facility, individual instructions will be provided all affected personnel, and status reports will be provided as necessary.

3. Request you provide full support for the implementation and operation of this program. Please announce it during your staff meetings and ensure that supervisory personnel provide whatever support program management personnel will need to establish the program in your buildings.

4. Capt Robert Saver, 2426 CES/DEEV, Extension 5228, and Mr Ted Reklamierung, Recycle, Inc., Extension 6194, are project managers and available for further information as needed.

WILLIAM P. POWER, Colonel, USAF
Commander

1 Atch
List of Buildings

This Paper is Recyclable

2.2.3 Instructions to Building Coordinators/Project Monitors

2.2.3.1 Written instructions and aids are important tools for personnel designated to support implementation and operation of the recovery program. An example package of instructions is provided in Figures 51 and 52. These instructions should be personally handed to the Building Coordinators on or about the same time recycling containers are delivered to them.

2.2.3.2 Basic letter of instruction, Figure 51 includes:

- Introduction and date of scheduled implementation

- Emphasis on personal approach and support of unit commander and supervisors

- Description of containers that can be used and need to enlist advice of personnel in where to put them (Program management personnel should have previously surveyed the area, with the Building and/or Area Coordinators, and have made recommendations for container placements in accordance with guidance given in Section VI of this Guide)

- Need to monitor implementation progress and respond to problems

- When and how containers will be delivered and program personnel that will be available to provide additional guidance

- Indication of commander-level support

- Attachments with briefing guide and instructions to participants

2.2.3.3 A Briefing Guide for building coordinators is given as an attachment to the basic letter of instructions. It is illustrated in Figure 52.

Figure 51. Example - Letter of Instructions to Building Coordinators/Project Monitors

ECW

Wastepaper Recovery Program

ADWC/DOE (MSgt Provost)

1. Tyndall AFB is ready to implement the wastepaper recovery program discussed in Attachment 1. As Project Monitor, you are the pivotal individual in your building for planning, briefing you co-workers, and distributing supply items. Therefore, request you take the following action to ensure implementation on 3 Oct 77.

a. Using Attachment 2 as a guide, brief your personnel, particularly supervisors, on the goals and operation of the program; and provide every individual who normally handles paper with a copy of Col Randall's letter (Attachment 3). If at all possible, enlist the aid of your unit commander.

b. We will provide desk-top holders and intermediate storage trays/containers which wil be affixed with "Use It Again Sam" labels and other appropriate information. The intermediate containers used should fit easily on top of bookcases, tables, etc.

c. It is important to seek advice on location of the office area trays from the people working there. Let them get involved. The trays should be conveniently located and near office entrances if possible. If office arrangements make it impractical to use the individual desktop holders, use the trays only.

d. Monitor and encourage improved performance of personnel in separating desired wastepaper items from other office trash. You will need to give this particular attention during the first few weeks as people try to overcome past habits and adjust to the new procedures.

2. During the week of 19-26 September, SMSgt Orlowsky and I will be visiting you to deliver the holders and trays and provide you with any further information and guidance needed. Our extensions are 5228/9, and we will be available to help resolve any problems that occur. This is a very important program, and the Base Commander is depending upon you to make it work.

ROBERT F. OLFENBUTTEL, Capt, USAF, BSC
Project Manager

3 Atch
1. 4756 ABG/CC Ltr, 12 Sep 77 (Kick-Off Letter, Figure 50)
2. Briefing Guide
3. 4756 ABG/CC Ltr to Participants

This Paper is Recyclable

Figure 52. Example - Briefing Guide for Project Coordinators
(Attachment 2 to Letter of Instruction, Figure 51)

Requirement for Program:

- Presidential memo and DOD directive to recycle wastepaper whenever:

  -- there is a buyer for the paper, and

  -- the recovery program can support itself without additional funding.

Goals and Benefits of a Full-Scale Program:

- Reduction of our total solid waste which

- Will assist Bay County by extending the useful lifetime of the existing sanitary landfill disposal site, which Tyndall AFB uses, and

- Thereby will reduce the cost of dumping our wastes there.

  -- Importantly - any monies remaining after expenses can be used to fund energy and environmental improvement project on base.

  -- In addition, every ton of wastepaper recycled saves

    --- an average of 17 trees from being cut and

    --- 70 percent of the energy normally required to make the product from virgin material.

Implementation Date: 3 October 1977:

Procedures:

- There are three steps which are of prime concern to the participant.

  -- Step one: Each employee using a desk (or countertop) will be given a desk-top holder in which he or she will place white ledger wastepaper.

  -- Step two: When a holder is filled, the individual will empty it into specifically designated office area intermediate containers/trays. Individuals using computer paper may find it easier to place that paper directly into the tray/box marked "For Computer Paper Only."

  -- Step three: The office area trays should be periodically emptied by personnel into centralized containers, which will then be emptied by custodial/recovery program contract personnel.

This Paper is Recyclable

Figure 52. Example - Briefing Guide for Project Coordinators (Attachment 2 to Letter of Instruction, Figure 51) (Concluded)

- There will be little change to existing custodial functions and schedules.

<u>Acceptable Items</u>:

- Recycle: White paper
  Tablets, reports (without glue bindings)
  Letterhead paper
  Tissue copies (white manifold, only)
  Xerox, other bond copies
  Forms and computer paper
  Manila-colored tab cards

<u>Non-acceptable Items</u>:

- Discard: Newspapers, glossy paper (e.g., magazines)
  Solid colored writing, report and copy papers
  Carbon and carbon-backed paper
  Cardboard, blueprints
  Envelopes, gummed labels, coated copies
  Rubberbands, paper clips

- Why no newspapers: They are too bulky and do not produce enough revenue to justify recovery.

- Why we can't mix grades of paper (e.g., colored paper with white paper): Only white ledger is high value; colored paper, etc, lowers value and produces insufficient income.

This Paper is Recyclable

2.2.4 Instructions to Participants

2.2.4.1 Figure 53 illustrates a letter of instruction that should be given by the building coordinator to <u>every</u> employee who will be participating in the program. The letter should accompany the desktop container and/or other recycling containers as they are handed out to the employees. The letter illustrated in Figure 53 was used for a test program at Tyndall AFB, Florida. The test-related aspects of the document should be removed and the remainder of the letter appropriately adapted for use at installations pursuing wastepaper recovery as a permanent program.

2.2.4.2 The letter of instructions should be concise and clear and indicate the following:

- It should be signed by the Base Commander or similar authority, thereby showing command attention and support for the program

- It should be have a lead-in paragraph(s) that introduces the wastepaper recovery program and answers the "why" of having it on the installation. For example, Tinker Air Force Base, Oklahoma used the following introduction to get people's attention:

> "Over the past two years, Tinker AFB has been unable to implement environmental improvement and many energy saving ideas and projects due to lack of funds. DOD Directive 4165.60 ... provides a source of funds through the sale of...clean white office paper, ... IBM cards, and computer listings". (Reference 11)

- Provide <u>installation-specific</u> goals for the program (reference paragraph 1.1.2.1 of this Section)

- Provide a description of the procedures the employee will have to follow for saving and moving the paper. If unique procedures apply for any group of employees, a separate letter of instructions should be developed and provided to them

- Provide guidelines on what should be saved and what should be avoided

- Provide names and telephone numbers of recycling program personnel who can be contacted if questions arise

-- If producing the same letter for many employees in large buildings and/or many buildings, it is impractical and costly to generate many letters that differ from one another only in that they differentiate the names of specific buildings and/or area coordinators. The personnel identified in this letter should be those responsible for overall program management or processing and collection center activities; identification of individual area monitors should be accomplished by (1) having the monitors personally deliver the employee, (2) by instructing employees to call the centrally identified individuals and ask them for the name(s) and telephone number of the appropriate local monitor, and(3) by periodic office walk-throughs and monitoring of these areas by the building and area coordinators assigned

2.2.5 Slogans, Labels, Posters and Other Comments

2.2.5.1 Slogans, such as the "Use It Again Sam" developed by the Environmental Protection Agency, can be helpful in getting people's attention. They should be combined with label and poster graphics to continuously remind employees of the wastepaper recovery program and what is expected of them.

2.2.5.2 Labels

2.2.5.2.1 Labels are usually affixed to desktop and other recycling storage containers. They may be available from suppliers of the containers, (either the contracted paper buyer and/or the full-service-type contractor) or they can be easily made on the installation using large gummed mailing labels and magnetic memory typewriters of computer printout equipment (which is faster).

2.2.5.2.2 Figure 14 in Section VI illustrated installation made desktop container labels used with excellent success at Tyndall AFB,

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 4756TH AIR BASE GROUP (ADCOM)
TYNDALL AIR FORCE BASE, FLORIDA 32403

12 SEP 1977

REPLY TO ATTN OF: CC

SUBJECT: Wastepaper Recycling Program

TO: All Participants

1. Tyndall AFB has the potential for significant wastepaper recovery for recycling purposes. In order to determine the extent of this potential, your building is now being asked to participate in an exploratory program to recover white or natural-colored office paper. The results of this program are being monitored and, if successful, will serve to promote a full-scale recovery program on base. In addition, data collected will be combined with data obtained from other selected Air Force bases to produce improved recycling planning and implementation for all DOD installations.

2. The goals of our program are as follows: (1) reduce our overall waste; (2) extend the limited use period of the few acceptable landfill sites available in Bay County; and (3) reduce our rising waste disposal costs and generate funds for base energy and environmental improvement projects.

3. To make this an outstanding exploratory program and participation easier for everyone, the following procedures have been developed.

a. Everyone generating white office paper waste will receive a white desk-top holder which is a reminder of the program as well as a temporary receptacle instead of the wastepaper basket.

b. Each office and/or office area will also receive "recycling trays." If you generate a great deal of white wastepaper, make sure you receive a tray for your own use. These trays should be filled directly or from the accumulation of paper in your desktop holder. When the tray is full, start filling the next one (available from your building project officer). Offices will usually have one tray for computer print-out paper and another for white ledger paper.

c. At least once a week, recycling test personnel will collect the full trays and replace them with empty ones. If you prefer using a recycling tray only, rather than the desktop holder/recycling tray combination, please return the holder to your building project officer.

3. The following guidelines are provided regarding the types of paper to be saved.

This Paper is Recyclable

a. Save only white paper. DO NOT save colored paper since it lessens the salvage value of the white paper.

b. DO NOT save carbon paper, large reproduced drawings, cellophane window envelopes, newspapers, or gloss-finished magazines as these are contaminants.

c. DO NOT recycle classified material for obvious reasons. FOR OFFICIAL USE ONLY/LIMITED AND PRIVACY ACT MATERIAL can be recycled provided it is appropriately torn as required by regulations.

d. DO NOT bother removing staples.

e. DO NOT save facial tissues, napkins, or paper towels; they all contaminate the white office paper.

6. Hopefully this program will show that we can recover wastepaper sufficiently and have a full-scale base-wide program. Thank you for your cooperation.

7. If you have any questions or suggestions, please contact either Capt Olfenbuttel or SMSgt Orlowsky, CEEDO/ECE, Extensions 5228/5229.

James E. P. Randall

JAMES E. P. RANDALL, Colonel, USAF
Commander

Florida. They were typed up on a typewriter with magnetic memory and then pressed onto the plastic desktop containers; the "Use It Again Sam" labels were cut down to fit the container area. The shorter the label, the more durable it will be with respect to staying on the container without curling off; they must be thoroughly pressed on. (The "Use It Again Sam" label for the front side of the container has to be cut to a length of approximately 2½ inches in order to fit into the recessed area of that side.)

- Federal Stock Number of the gummed mailing label is: FSN 7530-00-082-2662 (measuring 4 inches by 1 7/16 inches)

2.2.5.2.3 Program identification and information telephone number should be stenciled into fiber drums and other large central containers.

2.2.5.3 Posters

2.2.5.3.1 Posters can serve as general reminders of the program and as markers for central container locations. The list of materials that should be recycled or discarded must be clear.

2.2.5.3.2 Posters can be used sparingly and should be placed with a great deal of discretion. They are effective and provide a good housekeeping image when placed on bulletin boards and on the storage containers themselves; as a general rule do not tape them on walls.

2.2.5.3.3 Figure 54 illustrates an attractive poster developed by the EPA; it is available through the Government Printing Office.

2.2.5.3.4 Another poster that can be developed by program personnel to promote understanding of what is recyclable or non-recyclable is the so-called "live" exhibit illustrated in Figure 55. A few of these placed in areas of high traffic throughput (such as near cafeteria entrances and main hallways) can be useful; however, consider the actual cost of making them vis-a-vis anticipated funding availability before committing installation resources to their development.

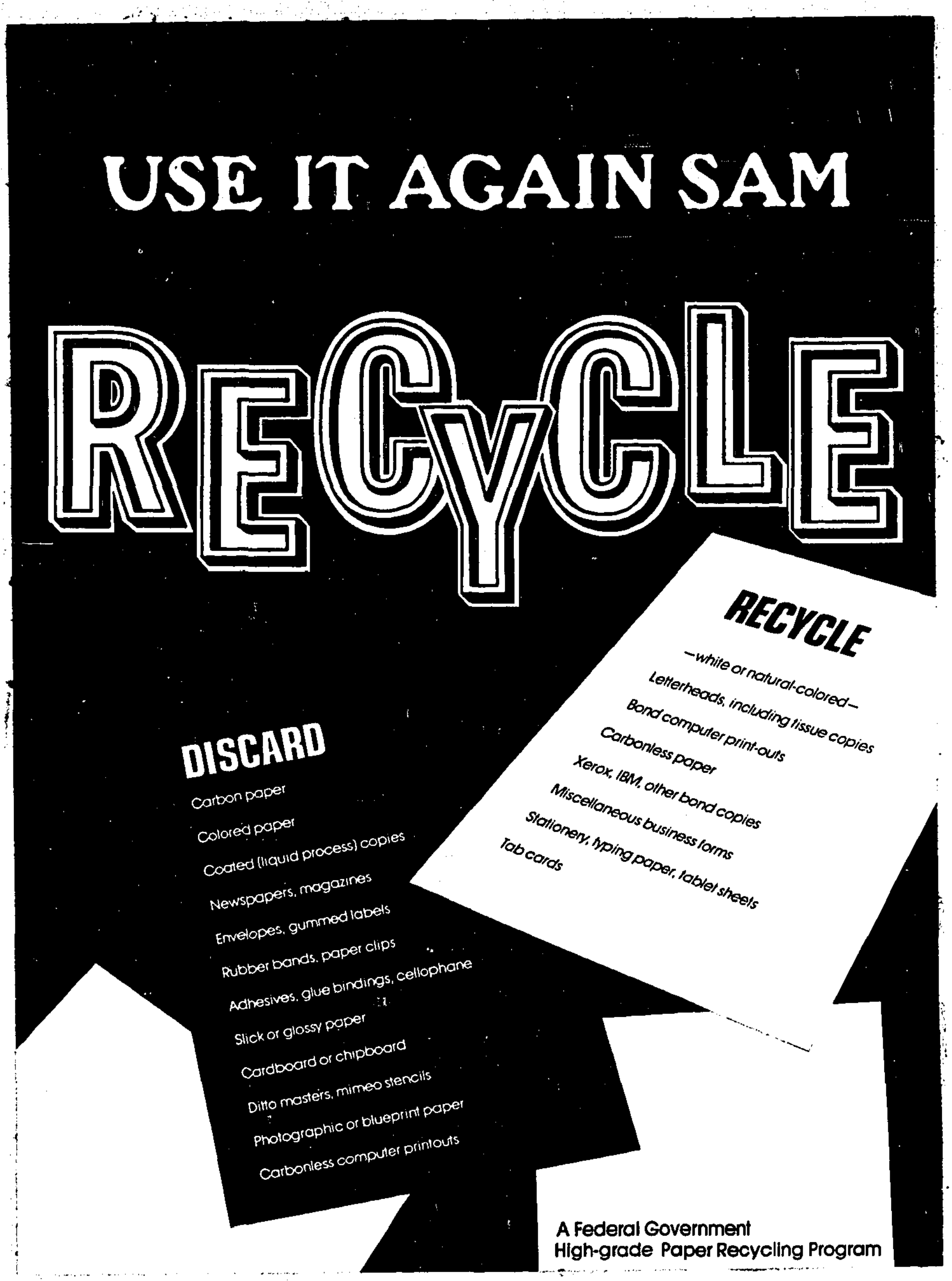

Figure 54. Slogan and Poster Developed by EPA for Office Recovery Program

2.2.5.4 Other Comments

2.2.5.4.1 Do not use the term "natural colored paper" in correspondence, labels or posters. Although the EPA does use the term to denote a recyclable paper, experience show that installation personnel become confused by it, particularly since it can describe the non-recyclable, groundwood content tablet paper frequently used by the Department of Defense. If off-white, 100 percent recycled paper is used by the installation and does not contain groundwood, identify it in the publicity so that employees will automatically set it aside with other recyclable paper.

2.2.5.4.2 The use of the term "carbonless paper" is also confusing. To some employees it means paper without carbon backing; however, to others it means computer paper or multi-copy papers that are impregnated with ink and allow multiple copy reproduction without the use of carbon paper. To other employees it simply means paper that cannot have any carbon-ink printing on it.

- Instead of using the term "carbonless," simply stress to employees that carbon paper is not recyclable.

- To minimize possible confusion with multi-copy, pressure sensitive paper, determine where this type of paper is used (during the preliminary investigations) and instruct the employees to discard the paper (it has a value of only colored ledger, not high grade white paper.

-- This type of paper is normally used in computer (e.g., in non-appropriated fund sales activities). See Section X for the federal stock number of computer paper falling in this category; use this identifier to identify the users.

-- Sometimes, it is difficult to recognize this type of computer printout paper, particularly when it is occasionally used in place of carbon-backed paper. Keep personnel alert for its use; apply a pressure test, using a hard pointed object, to determine if it (you'll need the top copy to make this test work, however).

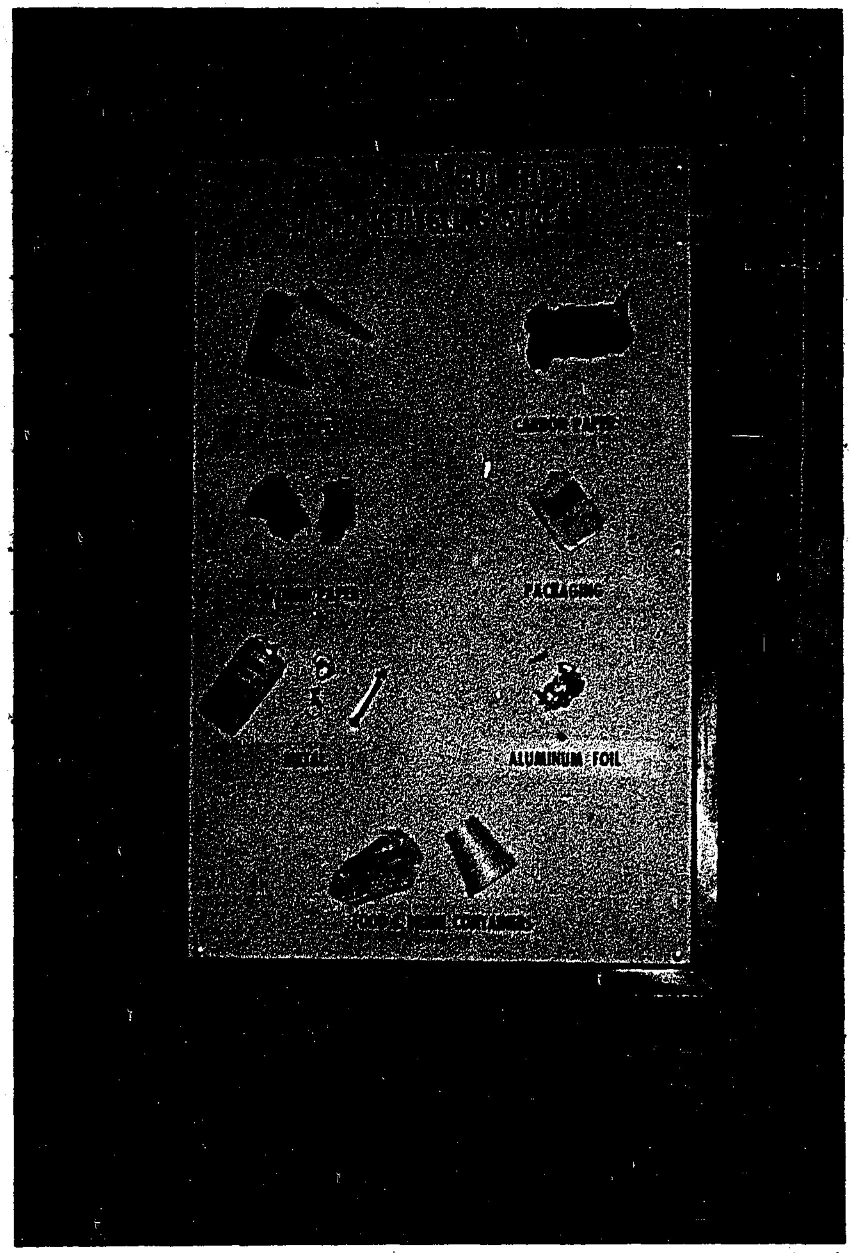

Figure 55. Example of "Live" Exhibit of
Recyclable/Nonrecyclable Items

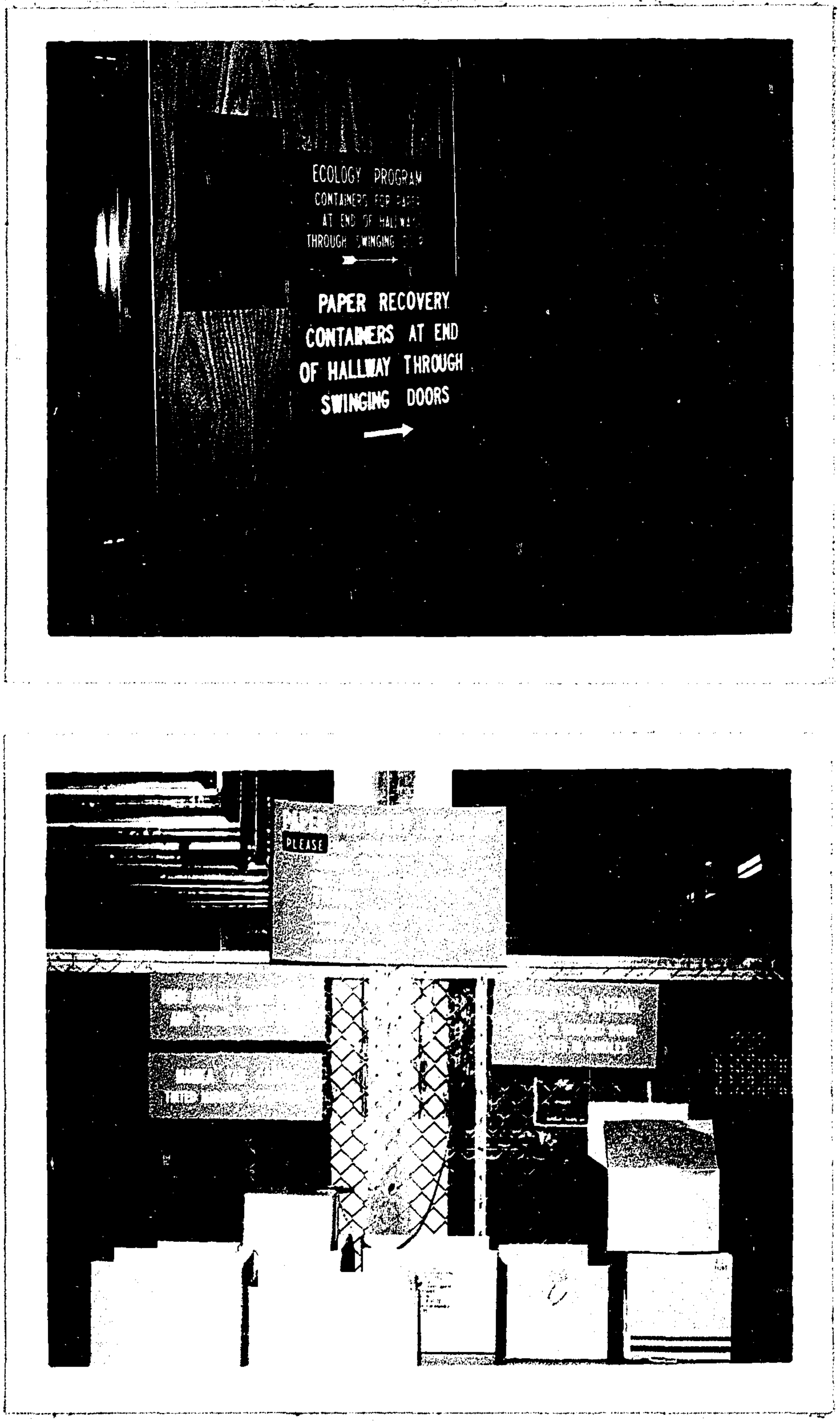

Figure 56. Example of Signs in Hallways and Floor Storage Area

2.2.5.4.3 The term "solid colored paper" confuses some people. Stress that this is paper completely impregnated with colored dyes/inks and not white paper with some colored ink design printed on <u>one</u> side.

2.2.5.4.4 "Sensitive paper," including diagnoses, reports, et. cetera., generated in a hospital should be recycled <u>if</u> they are usually thrown into the wastebasket anyway. If in doubt, tear up before recycling.

2.2.5.4.5 Encourage personnel to tear off colored covers of reports printed on recyclable ledger; this is a particular problem during files cleanout when employees are often bored with this task and not motivated to take the time to look behind the covers of those old manuals, reports, et. cetera. for paper that can be recovered for recycling.

2.2.5.4.6 Stress that even little pieces of paper, like memo routing slips, are important to the recycling program.

2.2.5.4.7 Beware that some typists will be reluctant to place paper in recycling containers that are discards resulting from typing mistakes; they become concerned that these discards are "too visible" and therefore, reflect a large number of errors that they may make. If this situation is noticed, a quiet, diplomatic approach should be taken to encourage them to participate.

2.2.6.1 As previously mentioned in this Section, large group meetings to promote the recovery program are not recommended. If, however, an installation wants to utilize such sessions, the following guidelines can help improve the chances of success.

2.2.6.2 Scheduling:

- Between: 9:00 and 11:30 A.M.
2:00 and 3:30 P.M.

- Do not schedule around lunch breaks, the beginning or end of the day, holiday or vacation periods when there is a tendency for many employees to be on leave.

- Provide a choice of two or more sessions to attend.

- Use first letter of employees surnames or other scheme that will minimize the tendency to empty any one office (Reference 12).

- If a contractor is used, ensure that he/she provides two-three weeks advance notice to the installation recovery program manager in order to ensure the latter has sufficient time to plan and organize the sessions. (Some inexperienced contractors believe that these actions can be accomplished on a moment's notice simply because it's on a military installation!) (Reference 13)

2.2.6.3 Session Size, Length

- Between 100-200 people

- Slide shows are the most effective tools for presenting the information.

- Length should be no longer than 15-20 minutes, including 5-10 minutes for questions and answers. (Reference 14) (Note: If a contractor is conducting the sessions, review his/her presentation beforehand and ensure the content is applicable to the local situation, not complex and not an overwhelming amount of information vis-a-vis the amount of time available to present it. The latter situation occurred at Headquaters Aerospace Defense Command and people simply "tuned out" on the presentation, thus negating any positive effects the sessions could have had. (Reference 15)

2.2.7 Coordination with Janitorial Personnel

2.2.7.1 It is especially important that the program management coordinate with janitorial supervisors and provide their personnel with a letter of instruction stressing locations of containers, methods of operation, et. cetera in order to ensure their fullest cooperation and minimize the potential for them mistakenly throwing out recovered wastepaper.

2.3 Post Program Implementation Feedback and Progress Reports

2.3.1 Feedback to building and area program coordinators should be provided within the first two weeks after implementation of the program; they need to know that program management cares about their efforts and they want to know about both the "good things" and problems, if any, in their area of responsibility. This means that program management representatives must spend the first couple of weeks visiting all recovery areas, observing and providing local coordinators with advice and/or encouragement.

2.3.2 Progress reports should be provided to all organization commanders, building and area coordinators monthly for at least the first three months after program implementation. Thereafter quarterly reports should help keep personnel "up to speed" and motivated. The initial reports should be signed by the installation commander.

2.3.3 Wastepaper collection crews should be briefed and able to answer questions posed to them by employees while they are collecting the paper. They should also be trained to spot potential problems and to make suggestions to resolve them. However, program management/recycling center management personnel should be primarily responsible for working with building coordinators to resolve problems and motivate employees. (See also Section VII).

2.4 Role of OI and Use of Other Media

2.4.1 The installation's Office of Information (OI) should be used to provide base and local newspaper, radio and television promotion and status reporting. The OI's role and responsibilities must be clearly established before the program is initiated.

2.4.2 Newspaper articles should be used to <u>supplement</u> other means of informing personnel; experience at installations such as Tyndall Air Force Base, Florida and the Naval Construction Battalion Center, California indicate that employees absorb more information through personal contact and instruction than through the media (Reference 16).

2.5 Maintaining the Recycling Habit

2.5.1 Employees usually develop a habit for recycling within one week after program implementation. (Reference 17) To sustain this habit, program management must ensure that:

- Frequent feedback is provided to coordinators and employees on program performance and requirements.

- Employees know who to call to ask questions and/or resolve problems; management must be quickly responsive to these inquiries.

- Collection schedules are closely followed and collection capacity is adequate to avoid excess accumulation of paper at central container locations.

- Central container locations are maintained in a good housekeeping manner.

- Newly arriving personnel learn about the recycling program through in-processing activities and through organizational meetings, periodic base newspaper articles and installation Official Bulletin items.

2.5.2 Do not use custodial/janitorial personnel to prompt recycling among employees who fail to support the program; this task belongs to local program coordinators and supervisors. Vandenberg AFB recycling personnel tried to use both military and civilian contract janitorial personnel in this manner but the effort was unsuccessful. (At Vandenberg, the janitors would not empty wastebaskets containing recyclable paper; they would leave a notice on the individual's desk requesting him/her to remove the paper from the wastebaskets. This approach was quickly dropped, however, because employees didn't like it and became negative towards the program; the janitorial personnel were caught in the middle and didn't like it; it didn't seem to increase effectiveness; its legality was in question; and janitorial personnel were not effective in recognizing recyclables, probably because they had no financial motivation.) (Reference 20)

2.6 Schedule Summary

2.6.1 A summary of scheduled publicity and education actions is reflected in Figure 57. This should be used in consonance with the Implementation Schedule, Figure 70, Section XII.

WEEK	ACTIVITIES
1	- Initial Staff Support Briefings and Commander's Letter requesting initial support.
37	- Commanders' Kick-Off Letter and Staff Briefings
38	- Instructions To Building Coordinators and Janitorial Personnel - Base Newspaper Article
39	- Instructions To Employees - Distribution of Posters, Containers - Base Newspaper Article
40	- Program Implementation
41	- Evaluation and Feedback To Coordinators
42	- Evaluation and Feedback To Coordinators
44	- Progress Reports (Letters and Newspaper Article)
48	- Progress Reports (Letters and Newspaper Article)
INDEFINITE	- Periodic Status Announcements and Reminders (Newspaper Articles, Commander's Calls, Newcomers Briefings)

Figure 57. Summary of Scheduled Publicity and Education Actions

REFERENCES

1. "Trip Report, TDY to Port Hueneme and Vandenberg AFB, California, June 1977," Letter Report, Det 1 ADTC/ECW, Tyndall Air Force Base, Florida, June 1977.

2. SCS Engineers, Office Paper Recovery: An Implementation Manual, SW-571c, Environmental Protection Agency, Washington DC, 1977, pp. 24-27; hereafter cited as Office Paper Recovery.

3. "Source Separation of High Grade Paper," Letter, HQ ADC/CS, 11 August 1977.

4. Interview with Mr Carl Lahser, HQ ADC/DEVQ, Colorado Springs, Colorado, 11 October 1977.

5. Interview with Mr Carl Lahser, HQ ADC/DEVQ, Colorado Springs, Colorado, 10 January 1978; hereafter cited as Lahser, January 1978.

6. Ward, Carter JPhD; and Miller, William V., Solid Waste Source Separation Experiment, NCBC, Port Hueneme, TN-N-1507, Civil Engineering Laboratory, Port Hueneme, California, December 1977, pp. 46-50; hereafter cited as Source Separation Experiment, Port Hueneme.

7. Personal observations and surveys of source separation tests at Vandenberg and Tyndall Air Force Bases, California and Florida, respectively, March 1977-August 1978.

8. Interview with Mr Robert Klausner, Marketing Consultant to Santa Barbara Community Environmental Council, Vandenberg Air Force Base, California, 1-3 August 1978; hereafter cited as Klausner, August 1978.

9. Interview with Mr Robert Starnes, Recycling Program Manager, Santa Barbara Community Environmental Council, Vandenberg Air Force Base, California, 1-3 August 1978; hereafter cited as Starnes, August 1978.

10. "What Big Company Chief Executives Think About Communicating," Air Force Policy Letter for Commanders, Washington DC, 15 December 1978, p. 3.

11. "Tinker AFB Solid Waste Management Program," Letter, Oklahoma City ALC/CV, 13 June 1978.

12. Office Paper Recovery, p. 24.

13. Lahser, January 1978.

14. Office Paper Recovery, p. 27.

15. Lahser, January 1978.

16. Source Separation Experiment, Port Hueneme, pp. 46, 48, 50.

17. Office Paper Recovery, p. 33.

18. Starnes, August 1978.

19. Klausner, August 1978.

20. Interviews with Mr Wendell Anderson, 4392 ASG/DEEC, and Mr Charles LeCair, Contractor Custodial Supervisor, Vandenberg Air Force Base, California, 2-3 August 1978.

SECTION X

STEPS TO DETERMINING WASTEPAPER SOURCES AND ESTIMATING RECOVERY

1.0 INTRODUCTION

1.1 This Section is dedicated to the important task of (1) effectively and efficiently identifying facilities most likely to generate wastepaper in sufficient quantities to make a recovery program worthwhile, and (2) estimating quantities of the wastepaper which can be reasonably recovered.

1.2 The steps described herein were developed for and successfully used at Tyndall Air Force Base, Florida. Derivation of the recovery estimating parameters used is described in Appendix I.

1.3 Phase One, below, references facility category codes. These codes are not unique to the Air Force: they are based on DoD Instruction 4165.3 which outlines facility classes for all real property facilities in the military departments and defense agencies. Consequently, they provide a common reference for identifying similar facilities on all military installations (Reference 1).

2.0 PHASE ONE-DETERMINE CANDIDATE FACILITIES

2.1 Request the Real Property/Estate Section of the installation's Civil Engineering organization to identify buildings with administrative-type space.

2.1.1 Utilize the "Real Property Inventory By Selected Category Code" listing.

2.1.1.1 Identify and list facilities listed under the category code 610XXX. The "610" discriminates the area within a facility as administrative-office type activity, and the last three digits, "XXX" further identify the function. For example, 610243 reflects HQ GROUP Space; 610711 refer to DATA PROCESSING. If a facility is scheduled for demolition, ensure it is "flagged" for later consideration.

2.1.1.2 If the Real Property Section also identifies office type functions under other codes, determine the applicable code(s) and identify and list the associated facilities. For example, Vandenberg AFB uses Category Code 310476, Msl/Space Resch Eng, to list contractor activities that are office-oriented.

2.1.1.3 Regarding educational and training facilities, Category Code 740XXX and 171XXX: Consider only those facilitites/areas housing curriculum faculty/administrative offices. Lecture hall and classroom activities fluctuate too widely to be accurately assessed and high grade waste-paper output will probably be too low to be worth recapturing.

2.1.1.4 The installation hospital should be included in the list, even though it may have no space listed under the 610XXX administration code. For example, at Tyndall AFB, FL, it is listed as 510001, Composite Med.

2.2 With the help of Real Estate personnel, identify the major occupant/ organization of each of the facilities picked out in the initial step. Usually the major occupant is responsible for the facility occupied.

2.3 Formalize a "Facilities Listing," such as illustrated in Figure 58 that groups the facilities according to the organizations responsible for them.

2.4 Print up a "Source Separation Questionnaire," Figure 59 in a quantity sufficient to cover surveys of every facility identified.

2.5 Send the Facilities Listing and an appropriate number of Questionnaires to the Commander of each organization associated with the facilities, requesting them to physically survey and complete the questionnaire for each of their buildings. (See Paragraph 3.5 for dealing with contractor occupied facilities.)

2.5.1 Figure 49, Section IX provides an example transmittal letter. It should be signed by the Base/Installation Commander.

FACILITIES LISTING

ORGANIZATION	FACILITIES
R&M	Bldg 6001
Boy Scouts	Bldg 3001
OSI	Bldg 1613
Test Squadron	Bldgs 224
	225
	243
	245
	260
	1801
ADG	Bldgs 1255
	1277
	1279
	1280
	1281
	1283
FAA	Bldg 1251
Honor Guard	Bldg 1126

Atch 1

Figure 58. Example of Initial Survey Facilities Guide Sheets

Questionnaire for Source Separation Planning

Facility Number ____________

1. Organization & Symbol: ______________________________

2. Organization Head (Name, rank/grade, telephone) ______________

____

3. Are you the major occupant of this facility? (Circle one)

   Yes No

   a. If you are not the major occupant, who is? ______________ N/A

   b. What ofhter organizations occupy this facility?

      (1) ____________________

      (2) ____________________

      (3) ____________________

      (4) ____________________

      (5) ____________________

   c. Please continue with this survey of <u>all</u> of the facility.

4. Number of floors in this facility: (Circle one) 1 2 3 more than 3 (exclude control tower)

5. Does the facility have an elevator(s)? (Circle one) Yes No

6. Is the following activity performed in this facility (Check, as applicable)

	Yes	No
a. Office-type work	___	___
b. Education/classroom training	___	___
c. Printing services	___	___
d. Documentation storage (other than routine office filing)	___	___

7. How many people work in this facility? ____________________

Figure 59. Example Questionnaire for Initial Facility Survey

EXAMPLE

8. What type and how many personnel work in this facility? (Do not include janitorial personnel or other similar transient personnel)

   a. Military Number ___

   b. Civil Service Number ___

   c. Contract Number ___

   d. Nonappropriated Fund Number ___

   (Circle one or more, and fill in the number of personnel, as applicable)

8. How many of the following are located in this facility? (Exclude those in storage)

   a. Number of desks: ____

   b. Number of wasterpaper baskets: ____

   c. Number of private (1 person) offices: ____

   d. Number of shared (more than 1 person) office areas: ____

10. Do you consider your offices cramped or comfortable?

   a. Private: ________

   b. Shared: ________

11. Do occupants in this facility generage and dispose of correspondence? (Circle one)

   Yes No

12. Is there computer hardware in this facility? (Circle one)

   a. Printer Yes No

      If yes: How many boxes of computer paper are used per month? _______ boxes/mo

   b. Card Reader Yes No

      (1) If yes: How many boxes of cards are used per month (there are 5 boxes/case) ______ boxes/mo

Figure 59. Example Questionnaire for Initial Facility Survey (Continued)

EXAMPLE

(2) Are the cards currently being collected for recycling? Yes No

13. Does any occupant in this facility use and dispose of computer printouts? (Circle one)

    Yes No

14. Does any occupant in this facility use and/or dispose of corrugated cardboard on a daily basis? (Circle one)

    Yes No

15. How many copying machines (only those machines capable of using bond paper) are in this facility?

16. What method of mail distribution is used by organizations within this facility? (Circle one)

    a. Base distribution Yes No

    b. Organizational courier Yes No

    c. Other: ____________ (specify) Yes No

17. What type of janitorial service exists in this facility? (Circle one or both, as appropriate)

    Contract Military

18. How frequent is janitorial wastepaper pickup in this facility? (Check as appropriate)

    a. Once per week ____
    b. Twice per week ____
    c. Three times per week ____
    d. Four times per week ____
    e. Daily ____

19. Is there controlled access to the facility? (Circle one) Yes No

20. Name, office symbol and telephone number of organization coordinator who can work with recycling authority on establishing wastepaper source separation for this facility. (If possible, request that this person be one who works in the facility.)

    ____

    ____

Figure 59. Example Questionnaire for Initial Facility Survey (Continued)

EXAMPLE

Name, office symbol, telephone number and signature of person who completed this questionnaire	Name, rank/grade and signature of Organizational Commander
______________________	______________________
______________________	______________________
______________________	______________________

Return to: 4756 CES/DEV, Tyndall AFB FL 32403

Refer questions to: Mr Arturo MacDonald, 4756 CES/DEV, ext 2496/7
Capt Robert F. Olfenbuttel, CEEDO/ECW, ext 5228/9

Figure 59. Example Questionnaire for Initial Facility Survey (Concluded)

2.5.2 If a facility is very large, (e.g., over 500 people) recommend that the organization work with other organizations within the facility to develop the required data; each of the latter organizations should also designate coordinators to assist the coordinator of the major occupant. Above all, ensure that all the administrative areas are surveyed.

2.5.2.1 In "maintenance" area (if encountered) don't count shop personnel who have non-desk-oriented tasks.

2.5.2.2 In hospital facilities, survey only administrative areas, not physicians offices, examination rooms, patient care/beds, et. cetera.

2.5.3 This action should result in the appointment of an organizational coordinator within each building to assist program organizers, and provide building characteristics that will allow further discrimination of potential recycling activity.

2.5.4 Follow-up the letter with telephone calls to the command section of each organization for which a completed facility questionnaire has not been received by the suspense date.

2.6 Concurrent with the previous step of distributing source separation questionnaires, determine quantities and users of computer tabulating cards (CC) and computer printout paper (CPO).

2.6.1 Computer Cards

2.6.1.1 In the Air Force, most tab cards are identified as printed forms and distributed through the installation publications distribution office (PDO). These "forms" range from the General Purpose Card to specialty cards such as the Aerospace Vehicle Data Card and a Time and Attendance Card.

2.6.1.2 Request the PDO to provide a listing of periodic (e.g., quarterly) tab card requirements, by cases, for each using organization. Be sure that the PDO checks to ensure that <u>all</u> forms requirements are identified. Identify any requirements that demand solid colored cards vis-a-vis the common manila form.

2.6.1.3 Check with the Base Service Store (BSS) (also known as the "local purchase" store) to determine if any tab cards are "sold" there, in what quantity and to whom. (Note: Quantity will be in cases; there are 5 boxes of cards per case.)

2.6.1.3.1 If the BSS is unable to identify users (there will be many users whose identity is only an account number), ask the personnel to have future users indicate their organization and building in which the tab cards are used. (There is no other easy way except by extensive survey to correlate account numbers with organizations.)

2.6.1.3.2 Utilize the 18 month inventory records of the BSS, or other long term inventory records, if available.

2.6.1.4 Check with the Defense Property Disposal Office (DPDO) for records of tab card sales. If available, obtain sales quantity data for sales within the last two years, and identify organizations supplying the cards, if known.

2.6.2 Computer Printout Paper

2.6.2.1 Most CPO is distributed through the Base Service Store. A box is the unit of issue. The CPO can vary from one part to six part paper. Table 3 lists the federal stock numbers and descriptions of the paper commonly used on military installations.

TABLE 3. COMPUTER PRINTOUT PAPER CATEGORIES

FEDERAL STOCK NUMBER	DESCRIPTION	UNIT OF ISSUE	NET WEIGHT PER BOX
7530 00 145 0414	PPR TAB EAM 1 COPY	BOX	41.75 lb
7530 00 145 0415	PPR TAB EAM 2 COPY	BOX	46.62 lb
7530 00 145 0416	PPR TAB 15x11 3 PT	BOX	49.75 lb
7530 00 145 0417	PPR TAB EAM 4 COPY	BOX	49.75 lb
7530 00 145 0418	PPR TAB EAM 5 COPY	BOX	49.75 lb
7530 00 145 0419	PPR TAB EAM 6 COPY	BOX	49.38 lb

2.6.2.2 If available, obtain an 18 month history of actual demand, in boxes, of each CPO type usage. (If only a shorter period is available, use it.) If a history is unavailable, request the BSS to hold onto existing BSS receipt copies and future copies for a total of at least three month's receipts, or longer if possible. As with computer tab cards (paragraph 2.6.1.3.1) ask the BSS to identify users and buildings in which the CPO will be used.

2.6.2.2.1 The following activities usually generate a large amount of computer products:

Maintenance headquarters
*Base supply headquarters
*Accounting and Finance Office
Data Automation
Military and Civilian Personnel Offices
Research offices

2.6.2.2.2 Ensure that "carbonless" copy CPO is <u>not</u> included in the inventory under the high grade paper categories listed in Table 3. This ink-impregnated pressure sensitive paper is usually acceptable for recycling only as a low grade, colored paper. It will be worthwhile, however, to obtain a demand history of it for possible future reference. The applicable federal stock numbers include 7530 00 185 6752 and 7530 00 185 6754, 3 and 4 part paper, respectively.

2.6.2.3 Check with the PDO for a listing of periodic CPO Forms requirements, by boxes, for using organization, if any.

2.6.2.4 Check with the DPDO for histories of CPO sales, if any, and the organizations providing the paper, if known.

2.7 Obtain a map of the installation which is of sufficient scale to identify all buildings within the major activity center(s) of the base, and of

---

*Possibly the most common and highest generators.

auxiliary areas if they are potential contibutors to the system.

2.8 Screen returned questionnaires to eliminate the least promising facilities.

2.8.1 Eliminate those facilities which have less than 100 people and do not indicate processing and/or usage of computer products.

2.8.1.1 Cross check computer product activity among the data received from the PDO, Base Service Store, the Source Separation Questionnaire and the individual who completed the Questionnaire.

2.8.2 Eliminate those facilities containing aircraft or ground vehicle maintenance activities, unless they also house the command and staff offices for the respective activity. Hence, most aircraft hangars and motor pool buildings would be eliminated under this criteria even though they contain some administrative office area.

3.0 PHASE TWO - SELECTION OF PROGRAM FACILITIES

3.1 Prepare to conduct a walk-through survey of the remaining candidate facilities.

3.1.1 Draw up a checklist similar to that illustrated in Figure 60. It should include the buildings to be surveyed, Questionnaire-identified coordinators, usage of paper, indoor/covered storage areas, and any other category of information that may be useful. A "General Purpose Worksheet" is useful for this task.

3.1.1.1 List the buildings, by number, in ascending order. This will tend to group the facilities and facilitate the surveys in a minimum period of time.

3.1.1.2 Check with the organizations using computer tab cards (CC) and computer printout (CPO) paper (as identified by the PDO and the Base Service Store) to determine if all their facilities are included on the checklist. Add those facilities not originally included.

3.1.1.2.1 For example, the base supply system includes warehouses and shipping and receiving areas that would not be identified under the 610XXX real estate inventory category code. However, some warehouses use large quantities of CPO, and Shipping and Receiving uses a significant amount of CC.

3.1.1.2.2 Other areas to check include software-computer programming functions associated with special activities that may not be inventoried under 610XXX category codes. For example, almost 8 percent of the waste CPO generated at Tyndall AFB came from an Air Defense Group listed under code 141XXX.

3.1.2 Plan out a survey schedule, first by geographical grouping, and then within these groupings by building number sequence.

3.1.3 Contact the coordinators and arrange for them to guide the surveyors through their respective buildings. The surveys can be conducted without the coordinators, but their presence is recommended. Numerous questions need to be answered while on the survey and a person familiar with the building and the people can save a lot of time by being present. (And it gives additional exposure to the coordinator which will be useful in case a recycling program is implemented within his/her facility.)

3.1.4 Conduct the walk-through survey paying particular attention to:

3.1.4.1 Is ground wood evident in the CPO used and is this type of CPO commonly used? What is the federal stock number?

3.1.4.2 If CC are being recycled, by what means are they transported to the installation's property disposal area?

3.1.4.3 Does there appear to be little generation of non-CPO/CC wastepaper?

3.1.4.3.1 Request knowledgeable personnel to provide estimates of the quantity of computer cards and printout wastepaper disposed of

Bldg Number	Contact/Ph.	No. Boxes CPO/MO	Ground Wood in in CPO?	No. Boxes CC/Mo	Recycle CC	Much other White Paper?	Classified Paper Used?	Indoor/Covered Storage?
713	MSgt Strelow X6133	None	N/A	None	N/A	No	No	Yes
745	Sgt Atchley X2850	3 - 4	No	4 - 5	Yes	No	No	Porch/Hallway
747	Msgt Herrington X2477	< 1	No	< 1	No	Yes	Small Am't	Yes
748	CMSgt Feest X2091	10	No	?	Yes	No	No	Yes
751	2Lt Rachel X6266							
757	SSgt Carbin X2737							
761	Mr Comstock X2017							
916	MSgt O'Brien X5281							
1277	CMS Flynn X2438							
1283	Capt Hines X2324							
1465	Mr Tucker X7690							

Figure 60. Example of Checklist for Follow-Up/Walk-Through Survey

each month (estimates can be given in terms of boxes of the wastepaper; e.g., 1 box of cards weighs 12 pounds (there are 5 boxes to a case when they are purchased), and 1 box of printouts can be estimated at around 40 pounds).

3.1.4.3.2 Account for amount of security classified wastepaper going to destruction (see paragraph 3.1.4.4.1, below).

3.1.4.3.3 Total the estimates at the end of the survey.

3.1.4.3.4 If desired and resources are available, conduct a two-four week sampling of the CPO output from buildings that seem to generate large quantities of the material. (Tests conducted at Tyndall AFB, Florida indicated that CPO output is fairly consistent from one two week period to another; hence, a two to four week sampling may provide reliable data for estimating the available CPO.)

3.1.4.4 Is much of the paper security classified (i.e., Confidential, Secret, etc.)?

3.1.4.4.1 If yes, get personnel to estimate the number of boxes of computer cards and computer printout paper set aside monthly for destruction. Cards should be easy to estimate; printout paper may have to be sampled before destruction; use weighing records, if available. (1 box of cards weighs 12 pounds; there are 5 boxes to a case; see Table 3 for weight of computer printout paper.)

3.1.4.4.2 For white ledger paper reference paragraph 3.1.4.5.1.

3.1.4.5 Are there controlled access areas that would pose a problem for recycling and/or would personnel dealing primarily with classified material be reluctant to separate non-classified wastepaper for recycling because they believe the potential for accidental disclosure is high?

3.1.4.5.1 For classified areas not candidates for recycling, determine the number of people that will not be involved.

3.1.4.6 Are there potential areas in hallways, stairwells, et. cetera that could contain centralized storage containers for wastepaper?

3.1.4.7 Is there a ramp and/or loading dock to the building that would facilitate roll-on containers?

3.1.4.8 Are there any areas near the building in which a CONEX, dumpster or other outdoor container could be placed for secure, outdoor storage of wastepaper products, and still be convenient to a building exit(s) and wastepaper collection vehicles?

3.1.4.9 Is the attitude of the building coordinator positive, uncaring, or negative?

3.2 Screen out potentially unproductive facilities.

3.2.1 Use 100 employees per building (Reference 2, 3) as a lower limit for eliminating those buildings that do not generate significant quantities of computer printout paper and/or cards (significance may have to be determined through economic analysis).

3.2.2 For buildings generating computer cards and/or computer printout paper, and white ledger, consider alternative plans for recovery, such as:

3.2.2.1 Computer cards only

3.2.2.2 Computer cards and computer printout only

3.2.2.3 Computer printouts and white ledger

- combined into one category

- separate categories

3.2.2.4 Computer printouts only

3.2.2.5 All three grades

- computer card category, plus

- computer printouts and white ledger

  -- combined into one category or

  -- separate category

3.2.3 Be sure and subtract out the number of employees working with classified material who will not participate in the recovery program.

3.3 Obtain data on Reproduction Center/Print Plant white ledger output.

3.3.1 Obtain data on the average monthly usage of white ledger paper used and best estimate of waste factor (from supervisor). Ensure it accounts for:

- Overrun waste
- Trimmings
- Amount recycled back into scratch pads, etc.

3.2.3 Data on usage should be available from the Center's records of purchase and/or derived from AF Form 806, Duplicating Control Register used to record number of original copies received and duplicated. One procedure that may be applicable to small reproduction center is described below.

3.3.2.1 Reproduction Centers indicate on the AF For 806 how many overrun copies are made to cover potential losses from machine malfunctions and cleaning of press parts.

3.3.2.2 Ask the supervisor for his/her estimates/ experience with respect to the waste factor associated with these overrun copies; i.e., on average, what percent of the overruns actually replace printed copies which then end up as waste. (Overrun copies left over will probably go to the customer as extra copies.)

3.3.2.3 This overrun waste average can then be applied against the overrun copies to determine net number of wasted copies. This can then be converted to pounds by conversion, such as:

(1) (Waste factor percent) x overrun copies = net copies
(2) (1) ÷ 500 copies-sheets/ream of 8 inch x 10½ inch = reams of waste
(3) (2) ÷ (10 reams/case) = cases of waste
(4) (4) x (46.5 pounds/case) = pounds of waste/month

3.3.3 The determination procedures can be straight forward or complicated depending upon the sophistication of the operation and the cooperation of plant personnel. Calculation procedures described in Part C, Figure 61 illustrate the type of data needed.

3.4 Do not consider Records Staging Area as a source of high recoverable high grade paper. The waste is too heterogeneous and efforts to pull out the high grade paper are not economically justified. Try to sell it as low grade, mixed paper.

3.5 Note on Investigating Contractor - Occupied Builgings

3.5.1 "All solid waste generated on a DOD installation shall be considered Government property for purposes of disposal..." (Reference 4). This statement from DOD Directive 4165.60 clearly indicates that the high grade wastepaper produced in contractor-occupied buildings should be available for recovery under an installation sponsored program.

3.5.2 Realistically, obtaining cooperation and participation of these contractors may be difficult because of contractor attitudes and the need to work through Administrative Contracting Officers (ACOs) responsible for coordinating and directing contractor efforts. To save time do the following:

3.5.2.1 Coordinate with the local Contract Management Division (CMD) commander on the proper channels for dealing with contractors on base.

3.5.2.2 Request the CMD to write up and send <u>one</u> letter, if possible, of authorization to all contractors occupying buildings of recovery program interest. This letter should authorize them to coordinate with specified recovery program personnel and vice versa. It should also outline program objectives and projected procedures if the program is implemented in the building(s) and request the names of individuals who know their building's layout and functional arrangement and can work with recycling personnel. Don't expect them to have much time for this, however!

3.5.2.2.1 Program personnel will probably have to write up that portion of the letter dealing directly with the program.

3.5.2.2.2 If recovery program personnel are being supported by their own consulting/service contractor, the letter will first have to be coordinated through the installation's Procurement Office.

3.5.2.3 Proceed with these actions as soon as possible. Allow one month for coordination, if there are many contractors involved.

4.0 PHASE THREE - ESTIMATE HIGH GRADE WASTEPAPER GENERATION

4.1 Calculations of the amount of recoverable wastepaper components will be dependent upon the data collected in the surveys described in the preceding paragraphs. The estimation procedures are described in Figures 61, 62, 63. The factors used in those procedures are based on analysis of test programs at Tyndall AFB, Florida; Vandenberg AFB, California; and other recovery programs for which the data was applicable. Appendix I comprehensively describes the Tyndall and Vandenberg analysis procedures and results.

4.2 Experiences of organizations involved with wastepaper recovery programs show that conservative estimates of recoverable paper lead to better scoped programs, realistic expectations and diminished risks in economic decision making. It should be noted that the calculations delineate between the common but primary activities found on an installation (Reference Table 4) and unique mission activities, particularly those that are contractor supported functions and which the walk-through surveys reveal an output seemingly higher than is characteristic of the functions listed in Table 4. If in doubt, use the 0.25 pounds/employee/day factor and a higher recovery factor than indicated in Paragraph A, Figure 61.

TABLE 4. TYPICAL PRIMARY INTALLATION OFFICE ACTIVITIES

- Wing (Airfield Operations) Headquarters Staff
- Base Headquarters Staff
- Accounting & Finance
- Procurement
- Civilian Personnel
- Military Personnel
- Non-Appropriated Fund Staffing
- Data Automation
- Base Supply Headquarters
- Base Transportation Staff
- Base Civil Engineering Staff
- Aircraft Maintenance Hqtrs
- Hospital Administration

4.3 Some difficulty may be experienced in developing estimates of "recovery availability" of computer cards (CC)and printout paper (CPO).

4.3.1 The Tyndall Recovery Availability of 0.88 can be used for CC, and 0.65 for CPO; or

4.3.2 A direct estimate can be made from totaling the estimates made during the walk-through survey of buildings or sampling thereof (Reference paragraph 3.1.4.3).

4.4 Perform calculations in accordance with alternative recovery plans suggested in Paragraph 3.2.2.

High Grade White Ledger Wastepaper (WLP)

A. For Primary Installation Activities (Reference Table 4)

1. $WLP_{pound/day}$ = (0.25 pounds/employee/day) x (No. of employees) x (0.75 recovery factor)

2. $WLP_{ton/month}$ = ($WLP_{pound/day}$) x (22 day/month) ÷ 2000

B. For Unique Mission Support/Contractor Supported Activities

1. Choose lowest estimate from following three equations

   a. $WLP_{pound/day}$ = (0.39) x (No. of wastebaskets)

   b. $WLP_{pound/day}$ = (0.54) x (No. of wastebaskets) - [(0.00074) x (administrative square feet)*]

   * Obtained from base Civil Engineering real property inventory listings.

   c. $WLP_{pound/day}$ = (0.35) x (No. of employees)

   Note: The equations describe a steady state level of actual recovery quantities from high yield buildings; hence, the recovery factor is incorporated within the models, rather than expressed as a separate factor.

2. $WLP_{ton/month}$ = ($WLP_{pound/day}$)# x (22 day/month) ÷ 2000

Lowest estimate

Figure 61. Calculation Procedure for High Grade White Ledger Wastepaper

C. For Reproduction Center/Print Plant (use locally estimated waste factors)

1. $WLP_{tons/month}$ = (No. of cases used/month) x (average net weight;pounds) x (estimated overall waste factor) ÷ 2000, or

2. $WLP_{tons/month}$ = [(Avg No. of overrun sheets/month) x (overrun waste factor) ÷ (No. sheet/ream) x (net weight/case)] ÷ 2000

+ [(No. of cases used/month) x (avg net weight, pounds) x (estimated trim waste factor)

- (estimated waste quantity used for scratch pads, etc)] ÷ 2000

Figure 61. Calculation Procedure for High Grade White Ledger Wastepaper (Concluded)

Computer Cards (CC)

A. Use Historical Sales Records of the Servicing DPDO; or

B. Use Inventory Turnover and Estimated Recovery Factor

1. $CC_{pound/month}$ = [(No. of cases used/quarter) ÷ (3 month/quarter)] x (60 pound/case) x (Recovery Factor)

a. Recovery Factor = (Recovery Availability) x (Recovery Effectiveness*)

(1) Recovery Availability = percent of original cards that are waste cards available for recovery (a local estimate); use 0.90 if better data is unavailable,

(2) Recovery Effectiveness = percent of available waste cards effectively recovered*

* (at least 0.95 should be expected)

b. Example: $\text{Recovery Factor}_{\text{Tyndall AFB}} = (0.88) \times (0.98) = 0.86$

2. $CC_{ton/month} = (CC_{pound/month}) \div 2000$

Figure 62. Calculation Procedure for Computer Card Recovery

Computer Printout Wastepaper (CPO)

A. Use Inventory Turnover and Estimated Recovery Factor

B. Calculations

1. Inventory Turnover:

$CPO_{pounds/month}$ = (No. of boxes of 1 part CPO used/month) x (41.75 pound/box) x (1.0)#

+ (No. of boxes of 2 part CPO used/month) x (46.62 pound/box) x (0.74)#

+ (No. of boxes of 3 part CPO used/month) x (49.75 pound/box) x (0.74)#

+ (No. of boxes of 4 part CPO used/month) x (49.75 pound/box) x (0.74)#

+ (No. of boxes of 5 part CPO used/month) x (49.75 pound/box) x (0.74)#

+ (No. of boxes of 6 part CPO used/month) x (47.30 pound/box) x (0.74)#

- factor accounts for carbon paper content

2. Recoverable CPO:

$CPO_{tons/month} = (CPO_{inventory\ pound/month}) \times (\text{Recovery Factor}) \div 2000$

Recovery Factor - as defined for computer cards = (Recovery Availability) x (Recovery Effectiveness)*

Example: $\text{Recovery Factor}_{\text{Tyndall AFB}} = (0.65) \times (0.97) = 0.63$

. * Recovery effectiveness of at least 0.90 should be expected

. Use (0.65) for Recovery Availability if better local data is unavailable

Figure 63. Calculation Procedure for Computer Printout Wastepaper

REFERENCES

1. Department of Defense Facility Classes and Construction Codes," Department of Defense Instruction Number 4165.3, Washington DC.

2. SCS Engineers, Solid Waste Management Master Plans, MCAS Cherry Point, NCB Camp Lejeune, report for Naval Facilities Engineering Command, Norfolk, Virginia, September 1977, p. 71.

3. Mitchell, Gary L. and Peterson, Charles W., "Small-Scale and Low Technology Resource Recovery," paper presented at Solid & Hazardous Waste Research Division Fifth Annual Research Symposium" "Municipal Solid Waste Resource Recovery," 26-28 March 1978, Orlando, Florida, p. 15.

4. Solid Waste Management-Collection, Disposal, Resource Recovery and Recycling Program, DoD Directive 4165.60, October 4, 1976, p. 2.

SECTION XI

ECONOMIC ANALYSIS

1.0 INTRODUCTION

1.1 A comprehensive cost and benefit analysis is necessary to reach a decision on whether or not to implement a wastepaper recovery program through a source separation system. The analysis should be performed after the planning stage and should consider alternative approaches based on recovery of one, two or all three high grade wastepaper components (computer cards, computer printout paper and white ledger paper).

1.2 The analysis must be based on an accurate accounting of current waste gathering (janitorial), collection and disposal operations and reasonable estimates of the costs related to recovered wastepaper gathering, collection, processing and storage requirements, publicity/education and administrative costs. Benefits accruing from sales of material and cost avoidance will have to be estimated in order to determine if, on balance, the proposed program will be economically self-sustaining(an Air Force goal) or require subsidization.

1.3 The analysis should consider both contracted services (either full or partial service) and in-house requirements. Decisions will have to be made when or if fully allocated cost or actual costs are appropriate for the analysis.

1.3.1 Fully allocated costs after implementation of the waste paper recovery program are projected costs based on the theoretical requirement for labor, equipment and space.

1.3.2 On the other hand actual costs are estimates of actual budgetary changes that may be expected based on average costs experienced at EPA and other installation program study locations (Reference 1). For example, many organzations have found that the janitorial costs of gathering wastepaper within a building were offset or internalized by reduced trash handling costs resulting in no change in overall janitorial waste handling costs or incremental costs for gathering of recoverable material.

1.4 The analysis will have to cover cost and benefits over a multi-year period because (1) experience has shown that it is unrealistic to expect a program to be economically self-sufficient in 1 year (unless limited to collection of only computer cards) and (2) no program should be implemented unless the installation is committed to a long range effort. Three (3) years should be used, as a minimum.

1.5 The remainder of this section is concerned with accomplishing the economic analysis. Since an understanding of economic analysis terms and their uses is necessary for successful application of the process, paragraph 2.0 is deveoted to a review of the language of analysis as it pertains to resource justification and allocation. Paragraph 3.0 provides a more detailed description of the process. General guidance on these areas was derived from the U.S. Navy's Economic Analysis Handbook, NAVPAC P-442 and the Economic Analysis Handbook, prepared by NORAD/ADCOM, (Reference 2, 3).

2.0 THE BASIC ELEMENTS OF ECONOMIC ANALYSIS

2.1 Basic Cost Concepts

2.1.1 Nonrecurring/One-Time Costs.

2.1.1.1 Investment Costs - These are costs associated with the acquisition of equipment (e.g., a scale, baler, truck), real property, nonrecurring services (e.g., a consultant's fee), nonrecurring operations and maintenance (start-up costs and other one-time investiment costs). Investment costs need not occur in a single year. They include:

2.1.1.1.1 The cost of rehabilitation, modification or addition of land, buildings, machinery and equipment. (Example: rehabilitating a building to make it suitable for use as a wastepaper staging area and offices of recovery program personnel.)

2.1.1.1.2 The cost of rehabilitation, modification or other capital items such as furnishings and fittings required to put the project on a "ready-to-use" basis.

2.1.1.1.3 The costs of freight, foundations and installations required by the project (e.g., purchase, foundation and installation requirements for a scale).

2.1.1.2 Working Capital Changes, plus or (minus) - funds tied up in liquid funds or current assets on hand or on order. Includes inventories of consumable items and resources required for the project. (May have little relevance to a source separation program.)

2.1.1.3 Value of Existing Assets Replaced, (plus) or minus - Deductive costs (plus) may occur if the source separation program results in the elimination of an existing piece of equipment. If the property is redistributed to some other Federal agency, that agency benefits even though there may be no reimbursement or cash flow to the agency which controlled the property initially. The fair market value of these replaced assets (as measured by sale price, scrap value or alternative use) should be treated as a reduction in the required investment for decision-making purposes. (Example: reduced waste in trash stream because of recycling may lead to removal of outdoor bins and possibly, the removal of a refuse collection truck (although the latter is highly unlikely)). If an asset being replaced creates an additional cost, the figure should be indicated as additive rather than deductive.

2.1.1.4 Value of Existing Assets to be Employed - An investment for the program may consist of cost of assets already on hand. However, the value of such existing assets will be included in the investment costs only when the use of the existing asset will result in a cash outlay which would otherwise not be incurred on some other project or will deprive the Government of the cash planned to be realized by sale (e.g., from another project). These assets will be included at their fair market value (as measured by market price, scrap value, or alternative use) and the basis for arriving at the estimate should be documented.

2.1.1.5 Net Total Investment - This is the algebraic sum (plus and minus) of the one-time cost elements 2.1.1.1 through 2.1.1.4. Where the costs occur at a point in time significantly different from the starting project year, all costs shown must have been converted to the equivalent present value costs for the starting project year. (For example, if a source separation program is expected to reach a maximum or steady state level in one year, thereby leading to removal of some outdoor basing by the end of the second year, the associated deductive cost (savings) would be converted to a present value at the beginning date of the program).

2.1.1.6 Future Terminal Value - This is an estimate of the value of the proposed investment in the distant future. The present value of salvage would be included in this category.

2.1.2 Recurring/Annual Costs

2.1.2.1 Recurring costs are the day-to-day costs associated with the operations and maintenance of the wastepaper recovery program. This item includes personnel, material consumed in use, operating, overhead, and support services required on an annual basis and any other costs not considered investment costs. These cost categories are described in the following paragraphs.

2.1.2.2 Personnel Costs - Personnel costs include all direct and indirect costs associated with both civilian and military personnel. Reference paragraph 4.0 of this section for recommended procedures for conducting an analysis that fully accounts for the costs of using civilian and military personnel in these programs. (It is important to keep in mind that military personnel expenses may not be reimbursed from the proceeds of the recovery program (Reference 4).)

2.1.2.3 Other Operating Costs - Includes supplies, materials, utilities and other services. Maintenance and repair costs of buildings, grounds and equipment are also common recurring costs items. Capital improvements should not be included in this category, but should be included as an investment costs. TAble 9 provides an itemization of annual operating costs that should be considered in analysis of a wastepaper recovery program.

2.1.2.4 Overhead - Itemize and show estimates of any overhead costs attributable to the recovery program. Chief among these should be the costs of administering the wastepaper recovery program.

2.1.2.4.1 Experience with installation and civilian sector programs shows that a considerable effort is required of program management personnel to ensure its satisfactory operation; where this effort and time is not put forth on both an initial and continuous basis the recovery programs, which have rarely succeeded on any military installation (except for computer card recovery) will fail. Consequently, overhead expenses for insallation personnel must be included "in order to emphasize that supplemental administrative time must be spent on the program to ensure its (best chances for) satisfactory operation" (Reference 5).

2.1.2.4.2 Overhead costs should also include the costs of terminating or cancelling any existing arrangements which will become due as a result of undertaking the wastepaper recovery program. (e.g., there is potential for this happening if the refuse collection is altered or reduced in scope because of the impact of recovering recyclable wastepaper; however, the program is likely to be economically marginal and making changes in arrangements that would, in effect, add penalty costs to the program would be ill-advised.)

2.1.3 Sunk Costs - Are costs that have been expended prior to the beginning of the time frame of comparison (economic life, plus lead time where applicable). They <u>should not be included</u> in a cost comparison, but should be shown separately as supplementary information.

2.1.3.1 Sunk costs will rarely, if ever, be associated with recovery program analysis <u>except</u> in the case where an old piece of equipment like a truck or baler is going to be used in the program.

2.1.3.2 If the old equipment is going to be used, the value of the equipment today without discounting, would be shown as an addition to the present value of the new investment. This would be shown on Line 16, Format A-1 (Reference Table 7).

2.1.4 Life-Cycle Costs - Include all associated costs from inception through implementation and operation for the entire useful life of the program. Economic life, described in paragraph 2.3, is considered the life-cycle for determining costs and benefits of program alternatives.

2.1.5 Cost Allocations - Allocation of costs is associated with overhead or other costs that are comingled with other functions or operations. Cost allocations are usually made on the basis of one or more of the following and should be described as such in the analysis.

2.1.5.1 Direct Labor Hours - "Probably one of the most commonly used methods," overhead is allocated based upon program manhours as a proportion of the total.

2.1.5.2 Direct Labor Costs - Costs are allocated based on direct labor costs as a percentage of the total.

2.1.5.3 Direct Material Used - Costs based upon the amount of materials or supplies used as a percentage of the total.

2.1.5.4 Space Related - Overhead costs, particularly utilities, may be based upon area covered, number of square feet, etc.

2.1.5.5 Activity Related - Overhead costs allocated on the basis of production volume.

2.2 Benefit Analysis

2.2.1 An economic analysis of the waste materials recovery program should have both a cost side and a benefit side. Benefits are defined as outputs, products, services, yields, worth, et cetera. Benefits should not be confused with dollar savings; these are reductions in costs that should be reflected in the cost side of the cost/benefit comparison.

2.2.2 Benefits must be determined in a comprehensive and consistent manner, i.e., all benefits must be considered and double counting avoided. No activity should be included under two benefit elements or be reflected in both benefit and cost calculations. A good example of this would be potential manhour reductions (cost avoidance) in regular refuse management operations: the reductions should not be cited as a benefit for the recovery program if they also enter into determination of program operating costs.

2.2.3 Provide full documentation of the benefit calculations, including rationale, calculating methodology, and basic data sources. In this regard wastepaper sales revenues would be primary benefits requiring description: it will be critically important to ensure that market revenue projections made by representatives of the Defense Property Disposal Service (DPDS), through its regional (DPDR) and local office (DPDO), are fully documented for the analysis. (similarly cost avoidance estimates require careful and realistic appraisal and must be documented sufficiently enough to justify the conclusion sand serve as part of the implementation and operation plans (if recovery is implemented) in order to ensure that actions leading to cost avoidance are carried out.)

2.3 Economic Life

2.3.1 The economic life of a program is the period of time over which the benefits from a project may reasonably be expected to accrue to the Air Force. Benefits are limited ultimately by the physical life of the equipment, et. cetera utilized. Physical life may vary significantly depending upon the category of item and usage, such as operating hours for machines (baler, trucks) and years for facilities.

2.3.2 Economic life is the determinant for the number of years included in an economic analysis and is considered the life-cycle for determining costs and benefits of the alternatives addressed in the analysis. The economic life for a program alternative begins at the time when the program is implemented (and equipments are "started up").

2.3.3 If alteratives have unequal lies the costs and benefit analysis requires adjustment in order to allow direct comparisons between the alternatives.

2.3.3.1 The first and most common way is to base the time period of the analysis on the economic life of the alternative asset with the shorter period. Residual value of the asset with the longer economic life must be considered in the computation of the investment costs of that alternative. (Consider utilization in determination of residual value).

2.3.3.2 The second way is to treat alternatives with unequal lives by means of uniform annual costing.

2.4 Terminal Value/Depreciation

2.4.1 Terminal Value - Frequently referred to as residual or salvage value, it is the expected value of either existing facilities and assets, or facilities and assets not yet in being, at the end of their useful life. Document rationale for the estimate, if used.

2.4.2 Depreciation - Is an expense write-off accounting convention with application in the private sector where it impacts on income subject to taxes. It has no effect on cash flow for government investments and therefore not included in economic analysis.

2.5 Present Value (PV) and Discounting

2.5.1 Present value calculations provide a means for comparing dollar amounts to received or expended in different years. Fundamental to the concept of present value is the fact that money has time value. As a resource, money is productive and there is a strong preference for having a dollar today as compared with having a dollar at some future time. Payment of interest is required for the use of money and the interest rate is the necessary tool for converting costs and benefits occurring at different points in time into an equivalent cost and benefit occurring at the present time. The technique required to determine the present value of a cash flow is called discounting.

2.5.2 AFR 178-1 (and respective Army and Navy documents) specifies use of a 10 percent interest rate in present value calculations for all but a limited number of Air Force investments. This rate is intended to represent the opportunity cost of capital in the US's private sector of the economy. That is, the returns that are foregone by investing in federal projects rather than private projects. The rate does not incorporate considerations of uncertainty or inflation, but only the time value of money to the federal government. The discount factors in Table 5 are given for years 1-30.

TABLE 5. PROGRAM/PROJECT YEAR DISCOUNT FACTORS[1]

Table A 1/ — PRESENT Value of $1 (Single Amount - To be used when cash-flows accure in different amounts each year).

Table B 2/ — PRESENT Value of $1 (Cumulative Uniform Series - To be used when cash-flows accrue in the same amount each year).

Project Year	Table A 10%	Table B 10%
1	0.954	0.954
2	0.867	1.821
3	0.788	2.609
4	0.717	3.326
5	0.652	3.977
6	0.592	4.570
7	0.538	5.108
8	0.489	5.597
9	0.445	6.042
10	0.405	6.447
11	0.368	6.815
12	0.334	7.149
13	0.304	7.453
14	0.276	7.729
15	0.251	7.980
16	0.228	8.209
17	0.208	8.416
18	0.189	8.605
19	0.172	8.777
20	0.156	8.933
21	0.142	9.074
22	0.129	9.203
23	0.117	9.320
24	0.107	9.427
25	0.097	9.524
26	0.088	9.612
27	0.080	9.692
28	0.073	9.765
29	0.066	9.831
30	0.060	9.891

1/ Factors are based on continuous compounding of interest at the stated effecttive rate per annum, assuming uniform cash flows throughout stated one-year periods. These factors are equivalent to an arithmetic average of beginning and end of the year compound amount factors found in standard present value tables.

2/ Table B factors represent the cumulative sum of the factors in Table A and at the end of any given year.

1 Reference 7

2.5.2.1 Table A - discount factors are to be used when cash flows accrue in varying amounts each year.

2.5.2.2 Table B - factors are cumulative by year and can be used when cash flows accrue in the same amount each year.

2.5.3 Figure 64 gives an example of analysis that provides insight on the impact of discounting techniques on cash flow patterns of expected savings where investment costs are equal (Reference 7).

2.5.3.1 For illustration purposes, assume that projects A, B, and C require an equal investment ($37,000) but the schedule of quantifiable benefit by year varies over the economic lives of the three projects (alternatives). Figure 64 lists the calculation and results.

2.5.3.2 Present value is not the only tool to be used in determining whether or not a program should be undertaken; consider the risks in each program alternative and/or other factors (such as local/regional resource recovery plans) that may influence a final decision.

2.5.4 If alternatives have unequal lives, the direct comparison of present values will generally identify the longer-lived alternative as the more expensive. To avoid this penalty a measure of the average cost per productive year (uniform annual costs) is needed to compare the alternatives.

2.6 Inflation

2.6.1 Definition: "a period of generally rising prices and wages" (Reference 8) To detect the effect of changes in the purchasing power of a dollar both constant dollars (without future inflation) and "then year" dollars (with inflation) will be considered in analyzing and evaluating alternatives.

2.6.2 To ensure consistency in comparative studies, all estimates of costs and financial benefits for each year of the planning period (economic life plus lead time) will first be made in constant (without inflation) dollars - (i.e., in terms of the general purchasing power of the dollar at the time of the decision).

Figure 64. Example Use of Present Value Discount Tables

Investments are equal for all projects.

Project	(A)	(B)	(C)
Benefits:			
Year 1	$7,500	0	$5,000
Year 2	7,500	0	12,000
Year 3	7,500	0	16,000
Year 4	7,500	0	3,000
Year 5	7,500	$37,500	1,500
Total (constant dollar)	$37,500	$37,500	$37,500

At this point the analyst could not discriminate between the three projects on the basis of dollar value of benefits. However, assuming that money does have time value, one can readily discern that the differing schedule of benefits will impact upon his selection decision. Applying the 10 percent discount factors for the project year concerned, results are as follows:

Project A: (present value of benefits)

PV factor (Table B) 3.977 x $7,500 = $29,828

Project B: (present value of benefits)

PV factor (Table A) .652 x $37,500 = $24,450

Project C: (present value of benefits)

Project Year	PV Factor (Table A)		Amounts		Present Value
1	.954	x	$5,000	=	$ 4,770
2	.867	x	12,000	=	10,404
3	.788	x	16,000	=	12,608
4	.717	x	3,000	=	2,151
5	.652	x	1,500	=	978
			Total Present Value		$30,911

Recapping the three investments, we find that Project A will return benefits with a present value of $29,835; Project B will return benefits with a present value of $24,450; and Project C will return benefits with a present value of $30,911, when using a discount factor of 10 percent. On the basis of economics alone, we would invest in Project C since it was the alternative which provided us with the largest return in terms of present value.

2.6.3 Where inflation is important a <u>second</u> computation will be made in terms of current (inflated) dollares. Using constant dollar estimates of program or project costs as a baseline, inflation should be included, either by using price indices, or ("as a last resort") a uniform inflation rate.

2.6.4 The source of inflation factors used and the rates used must be documented as part of the analysis, and must be specific to each purchase or service.

2.6.5 Identify estimates by applicable fiscal year.

2.7 <u>Uncertainty Analysis</u>

2.7.1 <u>Discussion</u> - Uncertainty exists in almost all decision-making activities. It includes requirements uncertainty, estimating uncertainty, time-phased deployments, operating rates support considerations, and general political and economic uncertainties. All should be analyzed.

2.7.2 <u>Means-Sensitivity Analysis</u>

2.7.2.1 Consider factor values under different assumptions in order to ascertain the range of impact that changes in quantitative data have on the cost and benefits of each alternative.

2.7.2.2 Iterate calculations using different quantitative values for the key variables. (e.g., market values). Initiate the analysis by formulating pessimistic, optimistic and most likely estimates of values for the selected sensitivity variables.

2.7.2.3 Then, perform calculations using the <u>most likely</u> set of estimates.

2.8 <u>Standard Computations</u>

2.8.1 Uniform Annual Cost (UAC)

TABLE 6. DEPARTMENT OF DEFENSE DEFLATORS-FY 78 BASE YEAR

Department of Defense Deflators—FY 78 Base Year [1]

Fiscal Year	Mil Pay (3500)	Mil Pers Non-Pay (3500)	Mil Pers Pay & Non-Pay (3500)	Retired Pay	Civilian Pay (3400)	O&M (3400)	RDT&E [2] (3600)	Mil Con [2] (3300)	Proc [2] (3010/2080)	[3] C.P.I.	[4] W.P.I.	[5] G.N.P.
1945	.158	.273	.173	.130	.146	.244	.239	.206	.249	—	—	—
1946	.160	.281	.180	.153	.155	.264	.258	.223	.269	—	—	—
1947	.201	.300	.216	.200	.169	.313	.305	.264	.319	—	—	—
1948	.200	.313	.218	.212	.173	.360	.350	.303	.367	—	—	—
1949	.200	.317	.213	.213	.187	.381	.360	.322	.389	.386	.405	.363
1950	.227	.331	.238	.204	.195	.371	.356	.313	.378	.380	.387	.358
1951	.239	.358	.243	.329	.194	.407	.379	.332	.415	.403	.439	.381
1952	.238	.357	.253	.322	.206	.392	.390	.361	.400	.421	.444	.393
1953	.254	.360	.265	.327	.214	.398	.397	.364	.406	.428	.435	.399
1954	.253	.352	.265	.305	.224	.390	.402	.355	.398	.431	.435	.404
1955	.259	.363	.271	.324	.238	.416	.408	.349	.424	.429	.434	.410
1956	.272	.378	.286	.346	.254	.433	.419	.364	.441	.431	.442	.421
1957	.266	.394	.281	.360	.264	.466	.434	.388	.475	.443	.457	.437
1958	.281	.432	.300	.363	.298	.471	.444	.392	.481	.458	.467	.447
1959	.300	.439	.317	.388	.318	.482	.452	.387	.492	.464	.470	.455
1960	.304	.440	.321	.385	.327	.478	.462	.382	.488	.471	.470	.465
1961	.306	.447	.325	.384	.352	.488	.467	.382	.498	.477	.470	.470
1962	.304	.452	.323	.384	.360	.482	.474	.387	.492	.482	.469	.477
1963	.307	.452	.327	.381	.374	:484	.482	.396	.493	.488	.469	.485
1964	.334	.470	.353	.397	.390	.486	.489	.401	.495	.495	.469	.492
1965	.347	.487	.366	.403	.413	.491	.498	.413	.501	.501	.473	.501
1966	.382	.509	.402	.422	.428	.507	.511	.427	.518	.512	.488	.514
1967	.401	.544	.425	.437	.447	.526	.528	.442	.536	.528	.496	.531
1968	.421	.574	.449	.452	.463	.543	.547	.464	.554	.545	.502	.550
1969	.455	.585	.478	.476	.493	.561	.572	.497	.572	.572	.517	.576
1970	.525	.606	.538	.512	.551	.583	.604	.539	.594	.605	.539	.608
1971	.570	.632	.580	.566	.597	.609	.635	.588	.621	.637	.556	.639
1972	.663	.660	.663	.604	.645	.633	.664	.626	.645	.659	.577	.668
1973	.737	.691	.731	.641	.681	.659	.693	.664	.672	.686	.622	.698
1974	.796	.768	.793	.702	.739	.698	.748	.756	.716	.748	.722	.753
1975	.845	.871	.849	.801	.801	.803	.830	.899	.819	.830	.844	.836
1976	.889	.922	.893	.890	.860	.863	.885	.913	.880	.889	.889	.891
TQ76	.900	.941	.906	.904	.884	.891	.911	.921	.909	.919	.910	.916
1977	.942	.959	.944	.942	.937	.934	.943	.943	.943	.947	.945	.947
1978	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1979	1.060	1.042	1.058	1.048	1.053	1.053	1.055	1.055	1.054	1.053	1.061	1.056
1980	1.124	1.082	1.118	1.103	1.109	1.097	1.107	1.108	1.102	1.109	1.126	1.113
1981	1.190	1.114	1.180	1.157	1.172	1.139	1.152	1.163	1.145	—	—	—
1982	1.253	1.139	1.237	1.204	1.233	1.183	1.188	1.221	1.191	—	—	—
1983	—	—	—	—	—	1.228	1.225	1.282	1.239	—	—	—
1984	—	—	—	—	—	1.275	1.263	1.346	1.289	—	—	—
1985	—	—	—	—	—	—	1.302	1.414	1.340	—	—	—
1986	—	—	—	—	—	—	1.342	1.484	1.394	—	—	—
									1,453			

Data Source: "Department of Defense Deflators," OASD (C), January 1977.
Department of Labor's Bureau of Labor Statistics.
Department of Commerce, Bureau of Economic Analysis.

OPR: HQ USAF/ACMC.

2.8.1.1 The UAC of an investment "is the amount of money, which if budgeted each year for the economic life of the investment, would have a present value cost for each year, such that the sum of these present value costs would equal the total present value of the project if it were paid for according to its planned schedule of costs" (Reference 9). The UAC remains constant no matter how many times the original investment is repeated. It can be viewed as a constant amount, which if paid yearly, would keep the investment alive.

2.8.1.2 To determine the UAC divide the total present value cost by the sum of the discount factors for the years an alternative yields benefits, the economic life.

2.8.1.3 Where economic lives are different employ the residual (salvage) value approach to achieve equivalency. (i.e., dtermine the present value of the salvage value and subtract the PV from the PV of that alternative.)

2.8.2 Savings/Investment Ratio (SIR)

2.8.2.1 $$\text{SIR} = \frac{\text{PV Savings \& Benefits}}{\text{PV Investment Cost}}$$

2.8.2.2 At SIR = 1.0, "one would usually elect to continue with the present alternative ... unless in the judgment of the decision-maker there are other compelling benefits associated with the proposed alternative that would offset the uncertainty (associated with the new venture)" (Reference 10).

2.8.2.3 This criteria will be crucial to the decision-making; if breakeven (SIR = 1.0) or SIR > 1.0 go with the source separation program. If, SIR < 1.0, it is up to the local installation and/or the host command to make the decision to proceed or not (i.e., agree to subsidize the proposed program). A less intensive recovery program should be considered, if possible.

2.8.2.3 The SIR is calculated for the economic life of the program or project. Therefore, it should be calculated for the shortest economic life of any piece of equipment used. Given uncertainties in forecasting market conditions, a 3-year payback period should then be utilized if the SIR = 1.0. This criteria is also based upon the fact that 3 percent of new business starts are still surviving after 3 years of operation and that it may be unreasonable to expect a breakeven posture in less than that period. In addition, contract periods may only go up to 3 years.

2.8.3 Payback/Present Value Payback

2.8.3.1 The payback "yardstick" is the number of years required for the savings and benefits generated by a project to equal the investment. The determination of payback depends upon whether the present value technique is required.

2.8.3.1.1 Normally the present value technique will be used except for programs or projects that are specifically exempted from the requirement for discounting. For example:

(1) Military construction projects with payback period of three years or less.

(2) Fast-Payback Capital Investment Program projects, the investment criteria being payback in two years or less (Reference 11).

2.8.3.1.2 Given these exemptions to the discounting requirement, each installation should coordinate with its respective command headquarters to determine if (1) a payback period greater than one (1) year is acceptable (and how many years is acceptable), and (2) whether discounting under a payback period of 3 (or 2) years can be ignored.

2.8.3.2 Calculation of Payback

2.8.3.2.1 Without discounting, assuming equal amounts of annual savings,

$$\text{Payback} = \frac{\text{Investment}}{\text{Annual Savings/Benefit}}$$

2.8.3.2.2 Without discounting, and savings accrue in unequal amounts,

Payback = finding the year in which cumulative savings equal the investment.

2.8.3.2.3 With discounting apply present values to the savings/benefits.

2.9 Documentation

2.9.1 Satisfy the following basic criteria:

- State all assumptions
- State all sources
- Full disclosure (e.g., of methods used to develop estimates).
- Consistency

2.9.2 "Key" supporting data to the summary formats used so that reviewers can readily find the supporting data for any particular cost figures or assumption.

2.10 Suggested Format Descriptions

2.10.1 To ensure completeness and consistency, AFR 178-1 provides standard formats for documenting the required information. The formats described in the following paragraphs have been modified slightly to accomodate recovery program uniqueness, particularly the benefit from sales revenues.

2.10.2 Format A-1 (Table 7) involves the comparison of the existing janitorial, solid waste management and recycling operations (if any) with the proposed source separation - waste management program alternative. It is arranged only to show that savings and benefits realized from the investment justifies its cost.

TABLE 7. EXAMPLE FORMAT FOR SUMMARY OF COSTS FOR ECONOMIC ANALYSIS/PROGRAM EVALUATION
FORMAT A-1

1. Submitting DOD Component: ______________________________

2. Date of Submission: ______________________________

3. Project Title: ______________________________

4. Description of Project Objective: ______________________________

5a. Present Alternative: ____________ 6a. Economic Life: ____________

b. Proposed Alternative: ____________ b. Economic Life: ____________

7. PROJECT YEAR	8. RECURRING (OPERATIONS) COSTS		9.* DIFFERENTIAL COST	10. DISCOUNT FACTOR	11 * DISCOUNTED DIFFERENTIAL COST
	a. Present Alternative	b. Proposed Alternative			
1.					
2.					
3.					
.					
.					
25.					
12. TOTALS					

* will be plus (for cost savings) or minus (for cost additions)

SAMPLE FORMAT A-1

TABLE 7. EXAMPLE FORMAT FOR SUMMARY OF COSTS FOR ECONOMIC ANALYSIS/PROGRAM EVALUATION FORMAT A-1 (Continued)

13. Present Value of New Investment:

    a. Land and Buildings ______________

    b. Equipment ______________

    c. Other (identify nature) ______________

    d. Working Capital (Change-plus or minus) ______________

14. Total Present Value of New Investment (i.e., Funding Requirements). ______________

15. Plus: Value of existing assets to be employed on the project ______________

16. Less: Value of existing assets replaced ______________

17. Less: Discounted Terminal Value of new investment ______________

18. Total New Present Value of Investment $______________

19. Present Value of Cost Savings (+), or additions (-), from Operations (Col 11) ______________

20. Plus: Present Value of Benefits (from Format B) ______________

21. Total Present Value of Savings and Benefits $______________

22. Savings/Investment Ratio

    (Line 21 divided by Line 18) ___________

23. Discounted Payback Period ___________

24. Source/Derivation of Cost Estimates: (Use as much space as required)

    a. Investment Costs:

    (Itemize Project Costs)

    1.) Changes in Working Capital

    2.) Net Terminal Value

TABLE 7. EXAMPLE FORMAT FOR SUMMARY OF COSTS FOR
ECONOMIC ANALYSIS/PROGRAM EVALUATION
FORMAT A-1 (Concluded)

b. Recurring Cost (Operations):

1.) Personnel

2.) Operating

3.) Overhead Costs

c. Other Considerations

---

25. Name & Title of Principal Action Officer Date

2.10.2.1 Not all costs need be shown. Only show those costs which result in savings/benefits between the present and proposed alternative.

2.10.2.2 Another characteristic of Format A-1 is the computation of a savings/investment ratio. This ratio will indicate whether or not the source separation projects will provide sufficient future savings/benefits to offset the cost of the investment, taking into account the time value of money.

2.10.3 Format B, Table 8 can aid in describing benefits (particularly sales revenues) accruing from the source separation project that aren't described in the cost data documentation. The description of benefits can be particularly important when cost analysis reveals marginal acceptability for the project and/or a guarded degree of confidence in the analysis resulting from uncertainties associated with estimates and assumptions (e.g., uncertainties related to long term wastepaper markets and prices.)

2.10.4 The format described above and in the accompanying tables may have to be supplemented with other documentation that breaks out each of the janitorial, recovery program, and solid waste management cost elements. If required by the EPA, command headquarters, et cetera, they should be no trouble since that type of data will have to be considered anyway. The important thing is to meet the basic criteria stated under paragraph 2.91 above.

3.0 THE ECONOMIC ANALYSIS PROCESS

3.1 Define the Objective

3.1.1 Establish what is to be investigated and the constraints imposed (e.g., must be economically self-supporting).

3.2 Determine Alternatives

3.2.1 There is normally more than one way to achieve a given objective and wastepaper recovery is no exception.

3.2.2 Alternatives to be considered could include combinations of the following (see also Section X, Paragraph 3.2.2):

TABLE 8. EXAMPLE FORMAT FOR SUMMARY OF OUTPUTS
FOR ECONOMIC ANALYSIS/PROGRAM EVALUATION
FORMAT B

1. Submitting DOD Component: ______________________________

2. Date of Submission: ______________________________

3. Project Title: ______________________________

4. Description of Project Objective: ______________________________

5. Alternative: ______________ 6. Economic Life: ______________

7. Outputs:

   a. Expected Benefits, Output, and Indicators of Effectiveness:

      (Describe and justify)

   b. Non-Quantifiable Benefits: (Describe and justify)

   c. Present Value of Revenues: (Describe and justify)

8. Source/Derivation of Outputs: (use as much space as required)

   a. Benefits, Performance and Indicators of Effectiveness:

   b. Non-Quantifiable Benefits:

   c. Present Value of Revenues:

9. Name & Title of Principal Action Officer Date

SAMPLE FORMAT B

- Recover all high grades (computer cards, printout and white ledger)

- Recover only one high grade (e.g., computer cards)

- Manage the program with separately hired personnel

- Utilize a full-service contractor

3.3 <u>Formulate Assumptions</u>

3.3.1 Assumptions are used to define the problem, establish alternatives, provide a means of treating the unknown and difficult to quantify elements, perform calculations, and report the study results.

3.3.2 Various state-of-nature assumptions include:

3.3.2.1 Time: Basic is the assumption of the economic lives of the system and its components, and of resource availability. Where different economic lines are included, assumptions must be made on the terminal value of at least one of the components, unless the uniform annual costing technique is employed (which is not recommended for wastepaper recovery program economic analysis).

3.3.2.2 Quantity: How much or how many pieces of equipment, personnel, and material are required and/or available.

3.3.2.3 Activity Levels: Operating costs will usually be highly dependent on assumed activity levels or usage rates. For example, the rate of utilization of a wastepaper baler will directly impact on its utility consumption and maintenance schedule.

3.3.2.4 Degree of Support. The out-of-pocket costs required to implement a proposed investment are reduced to the extent that the investment can make use of inherited assets; i.e., existing facilities, equipment, and personnel. They also are reduced to the extent that required activities can be performed by existing organizations or installations. This might occur in the area of administration, for example, where an activity is scheduled to be satellited on a host installation.

3.2.3 Guidance concerning inheritance of physical assets and imputation of any costs therefore is explicit, as is shown in the following excerpt (DODI 7041.3):

> The investment for a given project may consist of assets to be acquired plus existing assets; i.e., assets already on hand. However, the value of such existing assets will be included in the investment costs only when the existing asset is currently in use (or has an alternative, planned use) or some other project or is intended for sale. When such alternative use of the existing asset results in a cash outlay for some other project which would otherwise not be incurred or will deprive the government of the cash planned to be realized by sale, the value will be included in the analysis (Reference 12).

3.3.3.1 A pertinent example of these inherited assets would be storage space. If such space can be found on the installation and utilized in a manner that will not be detrimental to required support activities and does not require additional investments to find alternate storage space, no investment cost is included for the space to be used.

3.4 Determine Costs and Benefits

3.4.1 Cost Analysis

3.4.1.1 Four factors must be considered:

3.4.1.1.1 Specifications: the process of determining the facilities, equipment, and manning requirements. It is often necessary to specify at a more aggregative level than is desired because of a lack of complete criteria to address the uniqueness of local physical and operating characteristics.

3.4.1.1.2 Chart of Accounts: displaying the breakdown of total project costs into component categories and elements. The Format A-1 helps structure the display. Table 9 provides an outline of typical cost and benefit elements that must be considered in wastepaper program economic analysis. Generally, a chart of accounts would break out into the following:

Investment Costs	Operating Costs
Equipment	Personnel
Facilities	Pay & Allowances (Reference Para 4.0)
Initial Training	Replacement Training
	Maintenance
	Routine Maintenance
	Major Repairs & Overhaul
	Parts
	Labor
	Janitorial

3.4.1.1.3 Calculating Methods: Use of cost factors, analogy, engineering estimates and cost estimating relationships. A cost factor represents dollars per specified unit. They include averages derived from empirical records, published planning factors (such as AFR 173-10), and standard prices listed by the Air Force or contractor sources.

Examples:

. facilities maintenance cost per square foot.

. annual pay and allowances. (Reference paragraph 4.0 for procedure to fully account for civilian (and military) personnel costs.)

. annual vehicle repair costs per mile; etc

3.4.1.4 Data Evaluation: Locating good, reliable data in sufficient quantity is a problem. It usually requires more time and effort than any other aspect of the economic analysis process. Experts should be employed to help obtain needed data and for assistance in utilizing "tools," such as price indices, for adjusting costs subject to variations caused by different sources and different time periods. Experts may include Defense Logistic Agency marketing personnel (DPDR's), installation industrial engineers, manpower specialists, comptroller, personnel, et cetera.

3.4.2 Table 10 lists specificatiions and factors that may be used as program planning and cost analysis guides. They are based on EPA-Sponsored studies and data gathered from various installation programs under test and non-test conditions. Some of the data are derived from time-motion studies and others from system records review and analysis effort.

4.0 PERSONNEL COST ANALYSIS - RECOMMENDED PROCEDURES

4.1 <u>Recommended Data Sources</u>

4.1.1 Comment: The installation's supporting Accounting and Finance Office should be used to obtain current, accurate data on salary rates and overhead costs. The Classification and Wage Section of the Civilian Personnel Office should be used to verify planned wage grade levels. Reference documents available in these offices will include the following.

4.1.2 For Civilian Employees:

4.1.2.1 U.S. Civil Service Commission Salary Table No. 64. (Intended for General Schedule (GS) employees. This table contains salary rates established by the President under Section 5305 of Title 5, United States Code, to be effective on the stated date of the Table.)

TABLE 9. EXAMPLE OF WASTEPAPER RECOVERY PROGRAM
COST, COST SAVINGS AND BENEFIT ELEMENTS

I. Solid Waste Management - Collection Costs

A. Government Operations

. Labor

. Materials, Supplies, Utilities and other Services

. Vehicle Maintenance and Repair

. Vehicle Fuel

. Container Maintenance and Repair

. Overhead

. Insurance

B. Contract Operations

. Transportation

. Contract Administration and Related Costs

. Government Furnished Materials and Supplies

. Contractor use of Government Owned Equipment and Facilities

. Standby Maintenance Cost

. Contract Cost (identify disposal fee, if any)

II. Solid Waste Management - Dosposal Costs

A. On-Base

. Cost of Land

. Equipment Fuel

. Equipment Maintenance and Repair

. Labor

. Administration

. Materials, Supplies, Utilities and other Services

TABLE 9. EXAMPLE OF WASTEPAPER RECOVERY PROGRAM COST
COST SAVINGS AND BENEFIT ELEMENTS (Continued)

B. Off-Base

. Disposal Fee

III. Janitorial Services - Costs

. Cost of Office Waste Gatherings

. Contract Administration and Related Costs

IV. Wastepaper Recovery Program (In-House and Contract) - Costs

A. In-building Gathering Costs

. Central Container Emptying

. Sorting

. Equipment Investment

b. In-building Storage Costs

. Container Investment

. Container Maintenance and Repair

C. Outdoor Storage

. Container Investment

. Container Maintenance and Repair

D. Interbuilding Collection

. Labor

. Vehicle Fuel

. Vehicle Maintenance and Repair

. Support Equipment

E. Processing and Storage

. Labor

. Equipment

TABLE 9. EXAMPLE OF WASTEPAPER RECOVERY PROGRAM COST, COST SAVINGS AND BENEFIT ELEMENTS (Continued)

- Investment
- Installation

. Equipment Operations

- Fuel/Utilities
- Maintenance and Repair

. Facilities

- Modification
- Maintenance and Repair
- Utilities

F. Administration

. Program Manager (if applicable)

. General Overhead

. Planning and Implementation Phase

. Operations Phase

. Contract Administration Overhead (if applicable)

G. Publicity and Education Materials

V. Wastepaper Recovery Program - Potential Cost Savings/Avoidance

. Janitorial Waste Collection Labor

. Outdoor Container Ownership and Maintenance

. Vehicle Collection Labor

. Collection Truck Ownership and Maintenance

. Disposal Fee, or

- Landfill Operating labor

TABLE 9. EXAMPLE OF WASTEPAPER RECOVERY PROGRAM
COST, COST SAVINGS AND BENEFIT ELEMENTS (Concluded)

- Landfill Equipment Ownership and Maintenance

- Landfil Real Estate

VI. Wastepaper Recovery Program - Benefits

. Wastepaper Sales Revenues

- (less administrative/commission fees)

4.1.2.2 Department of Defense Wage Fixing Authority letter, subject: "Federal Wage System Regular and Special Production Facilitating Wage Rate Schedules for the Wage Area of (installation locale)." (These pay rates are intended for supervisory (WS), leader (WL), and non-supervisory (WG) wage rate employees. Unlike General Schedule salaries which are not geographically dependent, the wage rate schedule is unique to the locale in which the installation is located.)

4.1.2.3 USAF Budget Manual Policies and Procedures, AFM 172-1, Vol I. (Provides guidance for Government contributions not included in salary and wage rate tables.)

4.1.3 For Military Personnel:

4.1.3.1 "Standard Rate Table for Costing Military Personnel, (date)." (Does not include permanent change-of-station travel costs; retirement pay liability; medical costs; and cost of Government-furnished quarters.)

4.1.3.2 USAF Cost and Planning Factors (FOUO), AFR 173-10, Vol 1. (Also provides composite standard rates; does not include all Government contributions.)

4.1.3.3 Basic Systems at Base Level, AFM 177-101. (Provides guidance for Government contributions not included in standard rate tables.)

4.1.4 For Both Civilian and Military Personnel: "Average Cost of Military and Civilian Manpower in the Department of Defense" document prepared by the Office of the Assistant Secretary of Defense (Comptroller). (Provides average annual cost of military and civilian personnel, by grade and classification, including Government's contributions. Although useful, this document may not be available at the local installation.)

4.2 Procedures

4.2.1 Comment. Policies to reduce the size of the Federal work force, and in particular to reduce DOD personnel requirements to only those considered "mission essential," dictate that cost analysis include both basic pay rates and the Government's contributions. Only by including both elements can a true picture of the resource recovery program's economic feasibility be realized. Obviously, it is also the only way that an accurate comparison with a contract operation can be accomplished.

4.2.2 For Civilian Personnel

4.2.2.1 If the DOD document, reference 4.1.4 above, is available:

4.2.2.1.1 Look up the appropriate pay grade cost schedule to determine the total cost of the proposed program personnel hire. These cost schedules are divided according to categories of employees (e.g. GS, WS, WL, WG) and are listed in Exhibits entited "Manpower Cost of Wage Rate Personnel - Air Force." Exhibits are also provided for each of the other military services.

4.2.2.1.2 From the appropriate "Exhibit" record the total manpower cost for the grade under consideration. For example (Reference Figure 65) if a WS-1 position is being considered, Exhibit C of the DOD document, dated December 1977, shows a total cost of $18,749.

4.2.2.1.3 If the first year of the planned program starts beyond the base period covered by the Exhibit use an escalation factor to project the personnel cost to the starting date. Table 49, AFR 173-10, contains escalation factors under the title of "Department of Defense Deflators - FYXX Base Year." (Reference Table 6)

4.2.2.2 If the DOD Document is not Available:

4.2.2.2.1 Determine the annual salary rate from Salary Table No. 64, or the DOD Wage Fixing Authority Wage Rate Schedules, as appropriate.

4.2.2.2.1.1 For General Schedule employees, use Step 4 of the grade to estimate the annual salary baseline.

MANPOWER COST OF WAGE RATE PERSONNEL-AIR FORCE

Supervisory	Average Base Pay	Overtime & Holiday	Retirement *	Life Insurance	Health Benefits	Terminal Leave	O&M Support	Training	Workmen's Compensation	Unemployment Compensation **	Total
19	$32,177	$418	$7,948	$161	$360	$260		$80	$160	$283	$41,847
18	29,022	377	7,168	145	360	234		80	160	283	37,829
17	27,096	352	6,693	135	360	218	See	80	160	218	35,312
16	25,680	333	6,343	128	360	207		80	160	222	33,513
15	25,240	328	6,234	126	360	204		80	160	217	32,949
14	23,609	306	5,831	118	360	190	Part II	80	160	261	30,915
13	22,540	293	5,567	113	360	182		80	160	263	29,558
12	21,901	284	5,410	110	360	177		80	160	261	28,743
11	21,457	278	5,300	107	360	173	B.7.	80	160	260	28,175
10	20,727	269	5,120	104	360	167		80	160	159	27,144
9	19,900	258	4,915	99	360	161		80	160	158	26,091
8	19,146	248	4,729	96	360	155		80	160	158	25,132
7	18,338	238	4,529	92	360	148		80	160	157	24,102
6	17,865	232	4,413	89	360	140		80	160	285	23,624
5	17,358	225	4,287	87	360	134		80	160	143	22,834
4	16,570	215	4,093	83	360	129		80	160	144	21,834
3	15,985	207	3,948	80	360	119		80	160	146	21,085
2	14,743	191	3,642	74	360	115		80	160	121	19,486
1	14,266	185	3,524	71	360			80	160	103	18,749

* The accrued cost to the U.S. Government is computed at a rate of 24.7 percent of base pay of which 7 percent is deposited to the Civil Service Retirement Fund from DoD appropriations and the remainder, 17.7 percent, derived from other appropriations when the benefit is paid.

** The entire cost is paid by the Department of Labor.

EXHIBIT C
Page 4 of 4

Figure 65. Example Exhibit-Manpower Cost[1]

[1] Reference 13.

4.2.2.2.1.2 For Wage Rate (WS, WL, WG) employees use Step 2 of the grade to estimate the annual salary baseline.

4.2.2.2.2 Calculate total actual cost by applying the current percentage figure for the Government's contributions. This figure is given in AFM 172-1, Vol 1. For example, actual cost may be defined as the annual cost plus 29 percent of this cost to cover annual leave, holidays, sick leave and contributions for group life insurance, Civil Service retirement and health benefits. The total cost of civilian personnel services will therefore be 129 percent of the baseline salary.

4.2.2.3 If appropriate, escalate the annual cost as described in paragraph 4.2.2.1.3 above.

4.2.3 For Military Personnel:

4.2.3.1 If the DOD document, reference Paragraph 4.1.4 above, is available, determine costs as described for Civilian Personnel, paragraph 4.2.1.

4.2.3.2 If the DOD document is not available:

4.2.3.2.1 Determine the annual composite standard salary rate from the "Standard Rate Table," or Table 20, AFR 173-10, Vol 1, entitled: "(AF) Annual Composite Standard Rates." (Reference Figures 66 and 67,respectively)

4.2.3.2.2 From AFM 177-101, Chapter 2, "Standard Rates for Military Personnel Services," determine the Permanent-Change-of-Station (PSC) standard rate applicable to the grade(s) under study. (Reference Figure 68)

4.2.3.2.3 From AFM 177-101, Chapter 2, determine the "Acceleration of Standard Rates" percentages that cover Government contributions which are not included in the standard rates. These contributions include "Retirement." For example, AFM 177-101, dated 2 May 1977, listed a retirement acceleration factor of 17 percent for officers and enlisted personnel. Multiply

STANDARD RATE TABLE

FOR COSTING MILITARY PERSONNEL

1 OCTOBER 1978

GRADE		ANNUAL	MONTHLY	DAILY	HOURLY
Gen	O-10	53,968	4,497	207.57	25.95
L/Gen	O-9	52,638	4,387	202.45	25.31
M/Gen	O-8	49,734	4,145	191.28	23.91
B/Gen	O-7	44,361	3,697	170.62	21.33
Col	O-6	40,387	3,366	155.33	19.42
LtCol	O-5	34,275	2,856	131.83	16.48
Major	O-4	28,408	2,367	109.26	13.66
Capt	O-3	24,341	2,028	93.62	11.70
1Lt	O-2	17,596	1,466	67.68	8.46
2Lt	O-1	12,940	1,078	49.77	6.22
CWO-4	W-4	28,708	2,392	110.42	13.80
CMSgt	E-9	22,650	1,888	87.12	10.89
SMSgt	E-8	19,222	1,602	73.93	9.24
MSgt	E-7	16,433	1,369	63.20	7.90
TSgt	E-6	14,106	1,176	54.25	6.78
SSgt	E-5	11,749	979	45.19	5.65
Sgt	E-4	10,197	850	39.22	4.90
A1C	E-3	8,510	709	32.73	4.09
Amn	E-2	7,773	648	29.90	3.74
AB	E-1	6,951	579	26.73	3.34
Cadet		5,535	461	21.29	2.66

Figure 66. Standard Rate Table For Costing Military Personnel
1 October 1978

Table 20. Annual Composite Standard Rates[1] (FY 1977–Effective I Oct 76)

GRADE	BASIC PAY	BASIC ALLOWANCE FOR QUARTERS	MISCELLANEOUS EXPENSE	INCENTIVE AND SPECIAL PAY	ANNUAL COMPOSITE STANDARD RATE
O–10	$39,600	$ --	$9,210	$1,226	$50,036
O–9	39,600	643	5,700	1,340	47,283
O–8	39,492	1,308	4,178	1,619	46,597
O–7	34,340	1,277	3,322	1,628	40,567
O–6	28,821	2,260	3,031	2,050	36,162
O–5	23,563	2,540	2,493	1,925	30,521
O–4	19,167	2,309	2,124	1,642	25,242
O–3	15,687	1,955	2,371	1,468	21,481
O–2	12,211	1,340	1,969	965	16,485
O–1	8,777	888	1,777	506	11,948
W–4	19,037	1,600	6,248	150	27,035
E–9	15,458	1,526	2,502	120	19,606
E–8	12,940	1,353	2,284	139	16,716
E–7	10,974	1,235	2,169	131	14,509
E–6	9,233	1,147	2,019	110	12,509
E–5	7,490	1,112	1,969	75	10,646
E–4	6,291	923	2,081	47	9,342
E–3	5,365	628	1,542	28	7,563
E–2	5,008	457	1,512	19	6,996
E–1	4,493	298	1,508	14	6,313
Cadets	4,140	--	1,308	--	5,448

[1] *Revised 15 October 1976. Rates are valid 1 October 1976–30 September 1977. They include the full 1 October 1976 pay increase (4.83%)*

Data Source/OPR: HQ USAF/DPPPB

Figure 67. Table 20. Annual Composite Standard Rates[1] (FY 1977-Effective 1 Oct 79)

the composite rate by this percentage to determine the Government's contribution to retirements.

4.2.3.2.4 Calculate total cost by adding up 2.4.2.1 thru 2.4.2.3 above.

4.2.3.2.5 If appropriate, escalate the annual cost as described in paragraph 4.2.2.1.3 above (Reference 14).

5.0 DISCUSSION OF COST AVOIDANCE

5.1 Introduction

5.1.1 Theoretically, implementation of a waste materials recovery program can lead to reductions in operational resources needed to store, gather, collect and dispose of the wastes. In practice, installations will find it difficult to achieve tangible cost savings because many of the waste management activities are relatively insensitive to small changes in waste flows; contracts may not be amenable to near term changes/cost effective renegotiation; systems are probably not optimally efficient and absorb changes with little real positive or negative impact and installation personnel may find it difficult to take actions necessary to actually achieve resource reduction requirements.

5.1.2 In light of these reservations, the following paragraphs address the particular cost avoidance areas that program planners will want to consider as part of the overall economic analysis.

5.1.3 Whenever planners decide to incorporate costs avoidance in the economic analysis, they should (1) not include them in the first year's economics since such things do not happen instantaneously and (2) the proposed actions leading to the cost avoidance condition must be carefully documented as part of the implementation and operation plan in order to promote their chances of actually being carried out.

5.1.4 As will be discussed janitorial trash gathering operations and outdoor container removal present the most realistic potential cost avoidance areas.

Table 27. Permanent Change of Station (PCS) Cost Per Move (As of October 1976).[1]

	FY 1977			FY 1978		
	Off	Enl	Cadet	Off	Enl	Cadet
PCS Move (overall avg)	$3148	$1168	$ 142	$3171	$1121	$ 143
Accession Travel Avg[2]	898	349	155	905	349	155
(To BMT or OTS)	—	124		—	124	
(To Basic Tech or UPT, UNT)	783	106		791	106	
General Training	1881	391		1903	390	
(Fm Basic Tech)	1749	114		1749	114	
(To/Fm Other Tech)[3]	1749	679		1749	682	
(To/Fm Other Professional)	2247	983		2247	983	
(To/Fm Other Flying)	1365	—		1364	—	
Operational Travel[4]	2640	1175		2640	1175	
Rotational Travel[5]	5721	2248		5851	2346	
Separation Travel	2462	747	110	2462	715	110
Travel of Organized Units	1722	1183		1721	1185	

[1] Data based on President's Budget for FY 78.
[2] Generally includes costs from home of record to BMT/OTS and then to Technical Training or the first permanent duty station.
[3] Advanced (skill) Technical or Lateral Training.
[4] Moves within CONUS or within overseas areas.
[5] Moves to or from overseas areas.

Data Source/OPR: HQ USAF/DPPPB

Figure 68. Table 27. Permanent Change of Station (PCS) Cost Per Move (As of October 1976).[1]

5.2 Wastebasket Ownership and Janitorial Gathering Labor

5.2.1 Wastebasket Ownership

5.2.1.1 Ward, of the Navy Civil Engineering Laboratory (CEL) demonstrated that the annual cost avoidance potential for wastebaskets is directly proportional to the percentage weight reduction of office waste stream (Reference 15). This cost avoidance potential (P_w) is expressed as:

$$P_w = C_{wo} N$$

where C_{wo} represents the annual cost of wastebasket ownership and N represents the percentage of waste (weight basis) removed from the office waste stream.

5.2.1.2 Ward also pointed out the minimum number of wastebaskets required can be more dependent on placement factors for convenience of office employees and the number of rooms than on the quantity of waste handled. Consequently, the achievable reduction would be "somewhat less" than that predicted through net waste reduction.

5.2.1.3 For all practical purposes it is doubtful that real wastebasket ownership savings can be realized. It depends upon a decrease in future procurement and/or repair of wastebaskets exhausted by use and old age; if replacements can be avoided because of reduced need resulting from the wastepaper recovery program, then savings will be real. However, unless reductions are done immediately the small savings possible will be spread out over time in a manner that will have an insignificant cost impact.

5.2.2 Janitorial Gathering Labor

5.2.2.1 If the office waste flow quantity is reduced by a wastepaper recovery program, the time required by the janitors to gather and transport the non-recovered portion of the waste will be reduced. This reduction results from a reduction in the number of runs to the outdoor container and the number of wastebaskets emptied.

5.2.2.2 In his cost analysis of janitorial operations during the Vandenberg AFB wastepaper source separation test, Ward showed that the number of wastebaskets emptied and the number of runs to the outdoor container are directly proportional to the quantity of waste disposed (Reference 16). Consequently, Ward expressed the cost avoidance potential (P_j) for this labor as:

$$P_j = C_{jo}N$$

where C_{jo} represents the annual cost for janitorial trash gathering labor before recovery program implementation and N represents the percentage of waste (weight basis) removed from the office waste stream.

5.2.2.3 To realize these savings, the additional time made available to the janitors must be constructively used (e.g., handling the recyclable materials) or the contracted cost per square foot for janitorial waste gathering must be reduced. If the additional time is spent in support of the recovery program, the associated cost must be included in the economic analysis of the program. (Reference Section VI; frequently organizations have obtained recovery program janitorial support for no extra fee.)

5.3 Refuse Collection Labor and O&M

5.3.1 The Challenge

5.3.1.1 The commercial and industrial waste collection function presents a genuine challenge to conducting a realistic assessment of impact caused by a waste materials recovery program. The reasons are manifold.

5.3.1.1.1 One must assume that the current operation is effective; that the number of trucks, employees and containers have been adjusted over time to meet the requirements for safe and sanitary waste removal, coupled with an accomodation of locally desired service levels; that existing resources can not only meet the requirements of "normal" operations but can also handle contingencies resulting from variabilities in refuse density and generation rates, and changes caused by on-base organizational relocations and mission change activities. The challenge arises as to how these contingencies can be best expressed quantitatively in order to assess the impact of a program which will change the amount of waste to be handled.

5.3.1.1.2 Additionally, one confronts an uncertainty with respect to the efficiency of the system. To what degree could the equipment and labor resources be made more productive? If the amount of waste being handled decreases, will additional time be freed up or will employees expand their task times to maintain a status quo? Or, if the waste decreases, can employees reduce their task times, accomplish more in less time and thereby permit the installation to remove a collection vehicle and crew from the system? In summary, how tolerant is the system to change?

5.3.1.1.3 Not all cost elements are equally sensitive to changes in refuse quantity. As will be seen, cost changes related to containers are directly proportional to changes in refuse quantities; on the other hand, total collection labor is not. Knowing how each element reacts to changes is critically important in properly assessing the cost avoidance potential.

5.3.1.2 Conclusions reached from modeling and anlyzing installation commercial refuse operations to obtain answers to the aforegoing questions are included in the following paragraphs (Reference also Appendix J).

5.3.2 Comments/Conclusions of Research Analysis

5.3.2.1 The commercial and industrial compactible waste collection system on an installation can be mathematically modeled to assist in estimating the cost impact resulting from implementation of a waste materials recovery program.

5.3.2.2 Proper assessment of cost impact requires comprehensive quantitative characterization of the local waste management system.

5.3.2.3 The highest potential for cost avoidance arises when a decrease in refuse quantity can be accompanied by removal of a collection vehicle and crew.

5.3.2.4 Some potential for cost avoidance exists when the decreased refuse quantity reduces the number of containers to be unloaded. However, the probability of achieving actual cost savings is low because of uncertainty associated with crew productivity (total collection time may remain constant under changing conditions) and the unlikelihood that any "freed up" hours can be gainfully employed for cost-offsetting tasks. Optimized collection operations are relatively insensitive (in terms of cost reduction) to small changes in equipment capacities and operating problems.

5.3.2.5 Some potential exists for achieving cost avoidance through reduction of the number of the outdoor containers used in the system, but only if they are actually removed from operation and value is received for them.

5.3.2.6 Cost avoidance is not achieved instantaneously. Phase out of equipment and labor is a gradual process that accompanies the growth-to-stability stages of the waste recovery program. Subsequently, predicted cost avoidance should not be included as first year savings in the cost analysis accompanying the feasibility studies for the recovery program.

5.3.3 Outdoor Container Ownership and Maintenance (O&M)

5.3.3.1 If the original number of outdoor containers is the "optimum" cost effective quantity for the office waste flow, the number of containers should decrease in direct proportion to reduced waste flow. Hence, the cost avoidance potential (P_o) for ownership and maintenance can be expressed by Ward's equation as follows:

$$P_o = C_{oo} N$$

where C_{oo} represents the life cycle annual cost of the containers and N represents the percentage of waste (weight basis) removed from the office waste stream (Reference 17).

5.3.3.2 To take advantage of this potential the outdoor containers must be removed! To maintain adequate collection service, removal should be done at locations served by more than one container or at locations where two or more buildings can "conveniently" share one container.

5.3.4 Vehicle Collection Labor, Ownership and Maintenance

5.3.4.1 Given the scope of commerical refuse collection activities and the insensitivity of optimized systems to small changes in capacities and operations it is <u>not recommended</u> that any attempt be made to quantitatively estimate potential cost avoidance unless reliable data characterizing the collection system is available. If it is, planners should use the guidance provided in paragraph 2.0, Appendix J of this document. If this data is unavailable, it will probably not be worthwhile to expend the resources to get if for economic analysis purposes.

5.3.4.2 As containers are removed from the system, the total time needed to unload the containers into the vehicles should decrease more significantly than any other labor cost element in the collection operation (e.g., greater than the time to travel to the landfill/ disposal site, time to dump, etc.). In addition, the degree of vehicle utilization will drop off because of less refuse to collect. (i.e., the collection trucks will not be carrying the same refuse loads per trip to the landfill over the course of a day, week et. cetera after recovery program implementation as they did before implementation). If enough refuse is removed from the collection system, a truck and crew can be removed from the operations.

5.3.4.2.1 Since some time elements, as indicated above, are not as sensitive to refuse reductions as others, application of the percentage-of-waste-removed formula used in the preceding cost avoidance discussions is only pratically applicable to those labor cost elements most directly affected by the container reductions, namely the total time needed to unload all containers into the trucks. Extension of the percentage formula to the entire labor cost would, therefore, provide too liberal an estimate of the crew time theoretically "freed up: and of the potential cost savings reflected thereby. The same argument would also apply to vehicle ownership and maintenance cost avoidance. The percentage method should, therefore, be used with caution.

5.3.4.2.2 Regardless of the method used, if it reflects that potential collection crew time saved approaches the length of the workweek, only then should serious consideration be given to including potential cost savings in the economic analysis because under these conditions real savings may result if a vehicle and crew can be removed from the operation.

5.3.4.3 If collection is accomplished by contract operation, governing Armed Services Procurement Regulation (ASPR) may not allow negotiation of cost reductions without incurring penalty costs that would offset potential cost savings, if any. (Reference ASPR 7-1903.33(d), Cancellation of Items - Service Contracts.) Therefore, any potential savings in this area would probably not be realizable, if ever, until a new contract is negotiated.

5.4 On-Base Landfill Labor, Ownership and Maintenance

5.4.1 Discussion

5.4.1.1 It is doubtful that real disposal cost savings can be achieved by diverting wastepaper away from the landfill if the installation landfill operation fails to meet the following economics of scale and experience guidelines.

5.4.1.1.1 Manpower - Is the landfill operated by more than one full-time person? If it is does the average daily tonnage exceed 46 tons per day? If the tonnage is less or equal to this figure (over 90 percent of USAF bases fall into this category) and more than one person is employed at the site chances are good that the site is overmanned, because in a survey conducted by the American Public Works Association (1970), data on landfill operations at 138 cities showed that all except 34 cities with less than 15,000 populations (46 ton per day equivalent tonnage) operated landfills with 1 person. The point at which it was necessary to convert from a 1 to 2 person operation varied widely, but that point was usually reached in cities in the 16,000 to 25,000 population category (over 46 tons per day) (Reference 18, 19).

5.4.1.1.2 Equipment - Is more than one tractor crawler or rubber-tired tractor or landfill compactor used at the site for daily tonnages below 46 tons per day? If there are more than are the landfill is probably overequipped and operates at a higher cost than necessary. For example, experiences of landfills in the civilian sector show that sanitary landfills with less than 155 tons per day can usually manage well with 1 piece of equipment, supported by standby equipment from other sources for use during breakdown and routine maintenance periods of the regular equipment (Reference 20). If two smaller machines are used in lieu of a larger unit in order to assure avaiability of unit, the cost of operating the two machines will be "significantly higher" than the operating costs of a single machine with equal capacity (Reference 21).

5.4.1.1.3 Cost Breakouts - Wages ordinarily make up 40-50 percent of the total operating costs, equipment 30-40 percent, and miscellaneous items which make up the remainder (Reference 22). Disproportionate costs in an installation's landfill operation relative to the above cost breakouts may indicate overmanning and/or overequipment support. Further cost inefficiencies in the operation may be revealed by comparing operating costs per ton with those of Figure 69 (cost data on the figure should be corrected to current year dollars before comparison). If the installation's cost per ton falls outside the range indicated on the figure, the operation probably could be more efficient.

5.4.1.2 If any of the above conditions occur any reductions in cost will be potentially greater by removing fixed and variable cost related inefficiencies than by reducing tonnage through a high grade wastepaper recovery program. The quantity reduction derived from such a recovery program will be small compared to the total installation generation and have little impact on fixed costs of the disposal system and little effect on variable costs, like part-time personnel, unless that resource is effectively applied elsewhere. Equipment and personnel that must be at the landfill, regardless of the waste quantity to be disposed, represent fixed costs and the annual cost of landfilling may not be decreased in direct proportion to a reduced load even though the facilities (and equipment) life may be extended (Reference 23). Consequently, from a practical standpoint, only the variable costs associated with equipment operation hour/ton and personnel man-hours/ton should be considered in cost avoidance estimates.

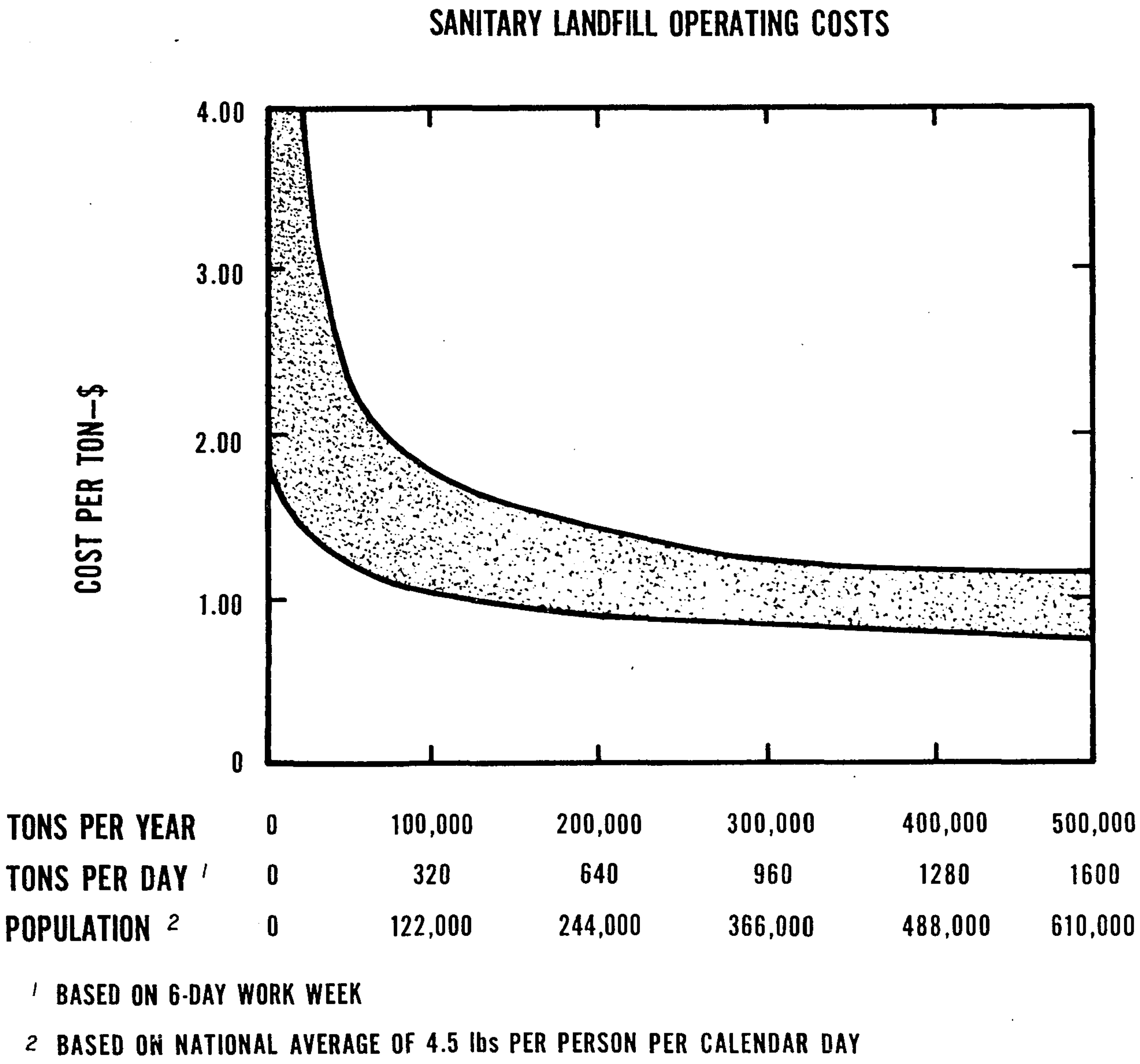

Figure 69. Sanitary Landfill Operating Costs (1970 $)

5.4.2 Recommendation

5.4.2.1 Labor - For those labor resources considered variable (i.e., labor that can be effectively applied elsewhere when not working at the landfill) determine how many hours are needed to handle one ton of refuse. Apply the tonnage removed by the recovery program against the hours/ton rate to determine how many hours will be saved and hence, the associated potential cost savings.

5.4.2.2 Equipment - Determine actual operating capacity (tons/hour) and apply tonnage removed to determine hours saved. To hours-saved apply operating (fuel, oil) and maintenance costs/hour to estimate potential variable costs savings. Do not attempt to determine impact on fixed costs of the equipment.

5.5 Off-Base Landfill/Disposal Site

5.5.1 It is doubtfull that off-base disposal costs can be realized in a timely manner and/or be reduced in direct proportion to the reduction of the waste stream tonnage flow.

5.5.1.1 If collection and disposal is accomplished by contract operation the governing Armed Services Procurement Regulation (ASPR) may not allow negotiation of cost reductions without incurring penalty costs that would affect potential cost savings. Consequently, potential cost savings could not be considered until it is time for negotiating a new contract.

5.5.1.2 If a contract collector also operates the disposal site, his/her fixed costs of system operation may not allow disposal cost reductions in direct proportion to reduced tonnage.

5.5.1.3 If the installation in-house collection forces dispose off-base under contractual agreement, the ASPR may preclude taking full advantage of the reduced waste flows.

5.5.1.4 In facilities studied by the EPA, disposal costs were reduced,on the average by one half the percentage that the waste stream was reduced (Reference 24). This 2 to 1 ratio indicates an inability by the generating activity to fully reflect the economic advantages of waste reduction for the reasons cited above.

5.5.2 In view of the above, planners should fully investigate current disposal arrangements and disposal fee reduction possibilities before attempting to estimate potential disposal fee reductions and the timing of those reductions.

TABLE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS

The data and information in this table was gathered from various literature sources and on-site visits and review of available records. They are presented in order to provide examples for guiding decisions on resource requirements.

I. Administrative Requirements

A. Planning and Implementation Time Requirements/Costs

1. Average: 10 hours/100 employees/building over period of 2 months (varies according to full-service contractor support, if used; contractor may provide up to 8 man-hours per 100 employees over period of 2 months). (Reference 24)

2. Can occupy 30-40 percent of program coordinator's time over course of 2-3 months.

(Use of consultant can reduce time commitment to approximately 10 percent) (Reference 25)

3. Time Requirements of Individual Building Coordinators - Tyndall AFB

a. Time spent completing building characteristics survey/ questionnaire.

Median: 0.8 minute/employee

Average: 0.8 minute/employee

b. Time spent on putting desk-top containers together and distributing them:

Median: 1.8 minute/container

Average: 2.7 minute/container

c. Time spent preparing for program and briefing employees (primarily through personal contact):

Median: 2.4 minute/employee

Average: 2.8 minute/employee

d. Time spent during first two weeks after implementation (answering phone calls on procedures; ensuring separation of recyclables; exhorting employees to transfer separated recyclables to floor central containers):

TABLE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS (Continued)

Median: 3.1 minute/employee

Average: 4.7 minute/employee

4. Publicity and Educational Material Costs

EPA found average of $7 per 100 employees (1977 dollars) (Reference 27).

B. On-Going Program Administration

1. EPA Average: 16 minutes per 100 employees per month (includes initial employee publicity and education as well as general administration time requirements; does not include requirements of a multiple building collection system and central processing area) (Reference 28).

2. In-House, Multiple Recyclables Program:

a. 10 percent of program coordinator's time/month - Ft Sill (recycling center concept - little collection resources utilized)

b. 65 percent of program coordinator's time/month - Ft lewis (program still growing; coordinator handles most supervisory functions)

c. 40 percent of program manager's time/month - March AFB (manager handled most management functions)

3. Full-Service Contract, Multiple Recyclables Program.

a. 5 percent of program coordinator's time/month - Vandenberg AFB

b. 15 percent of contractor monitor's time/month - Vandenberg (for comparison, approximately same percentage of time was given to residential refuse collection contract (VAFB) and janitorial contract administration at Tyndall AFB.)

4. Overhead Costs for Program Operation:

EPA found 10 percent of net actual costs after program implementation; (costs include those for equipment, storage space and gathering labor) (Reference 29).

5. Publicity and Educational Material Costs

EPA found average of $1 per 100 employees/month (1977 dollars) (Reference 30).

TABLE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS (Continued)

II. Manpower Grade Levels

(Note: DoD policy does not allow reimbursement of military personnel expenses; consequently, where military rank is indicated below, it should be used as a reference to establish a civilian grade equivalent.)

A. Processing Center Supervisor/Manager

1. E-7 - Carswell AFB, Fort Lewis, Fort Sill

2. \$185/week (1977-78 basic salary rates) - Vandenberg AFB

B. Forklift and Mechanical Baler Operators

1. WG-5 - Tinker AFB

2. WG-7 - Carswell AFB

3. WG-3/5 - Letterkenny Army Depot

4. E-4 - Fort Lewis, Fort Sill

5. \$3.00/hour (1977-78 basic hourly rate) - Vandenberg AFB

Military acceptable equivalent skill level (SKT): 3 (Reference 31)

(Note: For safety, need 2 people when baling mechanically; 1 person could be processor or otherwise employed in the baler area) (Reference 32).

C. Vehicle Collection Operations

1. WG-7 - Carswell AFB

2. E-5/6 - Fort Lewis, Fort Sill

3. \$3.75 and \$3.00/hour (1977-78 basic hourly rates) - Vandenberg AFB

4. WG-4 - MCAS Cherry Point (intra-building collection) (Reference 33)

D. Processing Center Commodity Workers/Sorters

1. WG-3 - Letterkenny Army Depot

2. E-4 - Fort Lewis, Fort Sill

3. \$3.00/hour (1977-78 basic hourly rate) - Vandenberg AFB

TABLE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS (Continued)

III. Manpower Training

A. Forklift and Mechanical Baler Personnel

3-5 days - Fort Lewis, Vandenberg AFB

B. Collection Vehicle Driver and Helper

5-10 days - Fort Lewis, Vandenberg AFB

C. Processing Center Commodity Workers/Sorters

3 days - Fort Lewis, Vandenberg AFB

IV. In-Building Wastepaper Separation and Gathering

A. Equipment Planning Factors - Examples

1 Desk-top container per desk employee

1 Intermediate tray per 5 employees

1 Central container per 20 employees

B. Wastepaper Removal - Effect on Janitorial Trash Gathering Requirements

1. EPA studies show average reduction of 12.5 percent of time spent gathering trash per 100 employees (under conditions whereas an average of 0.5 pound/employee/day is removed from trash stream) (Reference 34).

2. Test at Vandenberg showed reduction in trash gathering cost is directly proportional to percentage of waste (weight basis) removed from office waste stream. (Cost reduction = (cost) x (percent removed))

C. Wastepaper Gathering - Capability of Janitorial Personnel

1. EPA studies show janitorial requirements of:

7 hours/100 employees/month/janitor, regardless of building size.

2. EPA findings equate to a wastepaper gathering capability of 157 pounds/hour/janitor (Reference 35).

(Note: See also Section V.B.3 of this Table)

TABLE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS (Continued)

D. Sorting of Contaminants

HQ ADC found a capability to screen out contaminants during transfer of janitor-gathered wastepaper into floor central containers/ dumpsters amounting to:

10 pounds/person/minute (at 10 percent contamination)

V. Collection Activities

A. Collection Time - Pickup from One Location in Building

(Note: Times represent from the moment of the collection vehicle stop to restart.)

1. Operation: Transfer wastepaper from main storage bins, located at one point in building, into fiber barrels (200 pound capacity) which are then handtrucked to elevator (if present) and hence to storage or collection vehicle (equipped with a liftgate); sorting limited to obvious contaiminants like cardboard, metal, etc.

- Capability of 2 man crew - Vandenberg AFB

1000 pounds/hour/collector

2. Operation: Transfer wastepaper, stored in 1-1.5 cubic foot cardboard boxes at one location, into other cardboard boxes, moved by handtruck to collection vehicle (no liftgate) (all buildings were one-story):

- Capability of 2 man crew - Tyndall AFB

50 pounds/2.5 minutes/collector, or
1200 pounds/hour/collector

B. Collection Time - Multiple Pickup Points in a Building

1. Operation: Gathering of paper from intermediate trays, storage in handtrucked fiber barrels and transfer of barrels onto collection vehicle (with liftgate)

- Capability of 2 man crew - Vandenberg AFB

2 people/175 trays/hour

TABLE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS (Continued)

2. Operation: Gathering of wastepaper from intermediate trays, storage in handtrucked cardboard boxes and transfer of boxes onto collection vehicle (without liftgate).

- Capability of 2 man crew - Tyndall AFB

50 pounds/6.4 minutes/collector, or
469 pounds/hour/collector

3. Operation: Transfer of wastepaper from multiple central containers into barrels placed on platform trucks, and then emptied into large collection dumpsters (by janitor).

- Capability of 1 man crew - HQ ADC

190 pounds/hour/collector

C. Daily On-Base Collection

1. Vandenberg AFB

a. Average capacity: 2.2 tons/day/2 man crew

b. Operation: Used 1½ ton collection vehicle with liftgate; travel distances extensive; crew efficiency lowered by interruptions for special cardboard pickups, on-call pickup responses and intermediate tray service requirements in 10 buildings.

2. Fort Lewis

a. Average Capacity: 1 ton/day/2 man crew (Reference 36)

b. Operation: Used 1 ton collection vehicle, without liftgate; serviced multiple central containers in each building by transferring contents into barrels moved by handtruck; multistory buildings without elevators and lack of liftgate diminished efficiency.

VI. Processing Activities

A. Sorting Mixed Paper and Transferring Paper to Boxes/Pallets

1. 275 pounds/hour/processor - Vandenberg AFB

2. 200 pounds/hour/processor - (Reference 37)

3. 225 pounds/hour/processor (includes moving pallet to storage) - Fort Lewis (Reference 38)

B. Sorting manila colored computer cards from colored cards, boxing/palletizing, banding, weighing and storing.

TALBE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS (Continued)

4 man-hours/1500 pound pallet (Reference 39) and Letterkenny Army Depot

C. Sorting, Stacking, Palletizing and Banding

Boxed Computer Cards - 900 pounds/hour/processor

Stacked Computer Printout - 600 pounds/hour/processor

White Ledger - 300 pounds/hour/processor (Reference 40)

D. Sort, Bale/Palletize, Weigh and Store Office Paper

2 tons/day with 3 full time and 1 half time employee - Vandenberg AFB operating experience with vertical stroke baler capable of producing 1,300 pound non-corrugated paper bales, or 700 pound corrugated bales.

E. Mechanical Baling - Vertical

1. 3 bales/corrugated cardboard/day/operator

- Vandenberg AFB: 700 pound bales, includes hand strapping, placing on pallets, weighing, recording and storing.

2. 2.5 bales/non-corrugated paper/day/operator

- Vandenberg AFB: 1300 pound bales; includes hand strapping, placing on pallet, weighing recording and storing.

F. Mechanical Baling - Horizontal

1. 18 bales of corrugated cardboard/day/3 man crew (or, 2.25 bales/hour/3 man crew).

- Fort Lewis: 1,100 pound bales; 1 person loads cardboard into chamber with forklift; 1 person feeds cardboard; 1 person helps feed, tie-off bale, and keep cardboard from behind forklift.

2. 851 pounds of corrugated cardboard/hour/operator

- Recommendation for Offutt AFB: 1,000-1,500 pound bales (Reference 41)

TABLE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS (Continued)

VII. Storage Requirement - Examples

	Methods Of Storage		
	Pallets	Bales	Bulk Containers
Size	2.5 cu yd	6'x 3'x 3'	4 cu yd
Capacity	1500 lbs	800 lbs	2,000 lbs
Approx space req'ts per unit	20 sq ft	20 sq ft	30 sq ft

(Reference 42)

VIII. Miscellaneous Items

A. Time Required to Remove Carbon Paper from White Paper;

1. Supply Requisition Forms (DD Form 1348.1)

- 10 min/pound of carbon forms and white ledger/person

- Average white ledger content = 70 percent, per pound of typical combined carbon and white ledger from Base Supply trash.

2. Computer Printout Paper (CPO)

- 6 min/pound of carbon and white paper/person

- Average CPO content = 74 percent per pound of the combined paper.

B. Time Required to Label Desk-Top Containers

- at 3 labels/container - 10 minutes/case/person

where case contains 24 interlocking ends used to make 12 complete containers.

C. Steel Strapping Requirements - Palletizing

Use approximately 18 feet/band, 5 bands per pallet of computer cards, printout paper or white ledger = 90 feet per pallet.

D. Typical Economic Lives

TABLE 10. EXAMPLE RECOVERY PROGRAM RELATED FACTORS (Concluded)

	Life (years)
1. Outside Containers	8
2. Plastic, fiberglass, etc.-central containers	5
3. Handtruck	5
4. Canvas Collection Bags	1
5. Plastic Desk-Top Containers	5
6. Mechanical Baler	10
7. Posters	1

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SECTION XII

IMPLEMENTATION PLAN

1.0 GENERAL

1.1 Recovering office waste materials represents a unique activity for DoD personnel because it involves committing resources to generate products to sell rather than products and services to support the defense mission. In addition, in an era of limited fiscal availability, the selling of these products should be accomplished on an economically self-sufficient basis.

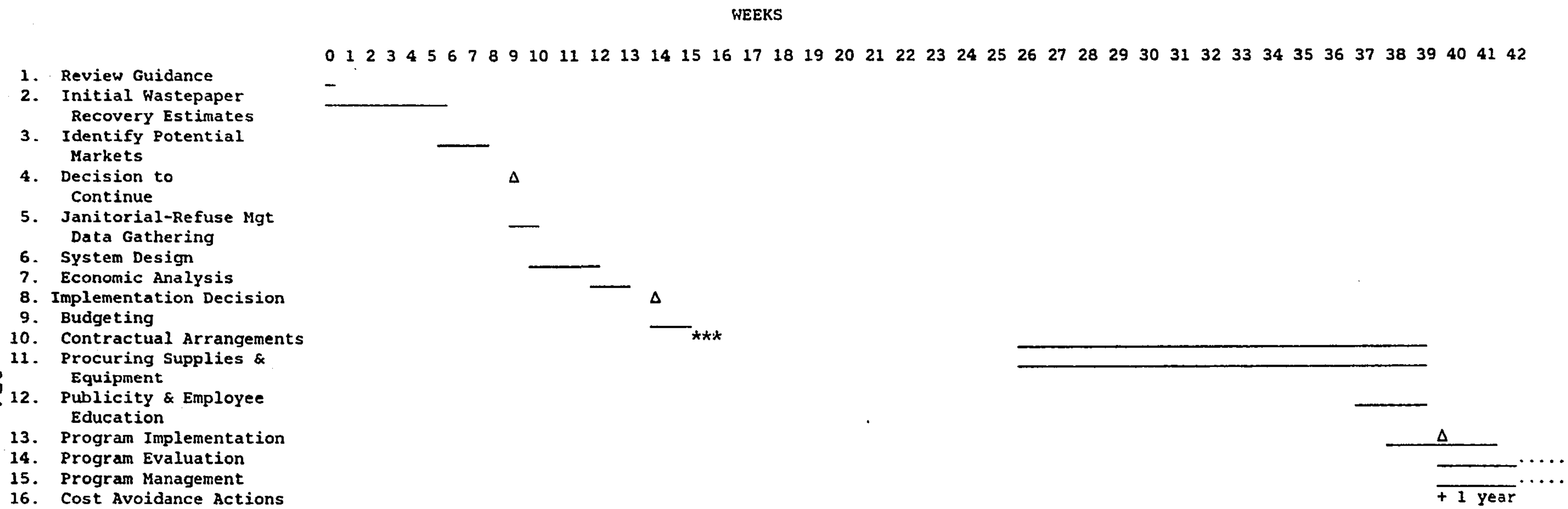
1.2 As such, it is a business and must be run accordingly. To quote an experienced consultant in the field, "This is a business which must be run under tight controls because the price you receive for the product, at minimum, allows no room for inefficiency" (Reference 1). Analyzing, planning, implementing and operating this "business" involves actions and commitments differing in scope and personnel attitude than the usual janitorial and refuse management activities of most military installations.

1.3 The purpose of this report has been to describe the sometimes complicated conditions and requirements under which a high grade wastepaper recovery program will be operated. That information should be used to effectively execute the planning steps outlined in this Section. In using this guidance it should be remembered that "there is no way to engineer a successful program;" successful planning requires <u>creative</u> planning and <u>simplified</u> implementation. The guidance provided herein will answer many questions but, ultimately, it will be hard work and creative thinking by the installation's program planner that will produce a realistic plan unique to that installation.

1.4 A graphic representation of the planning steps and timing of actions is presented in Figure 70.

2.0 INITIAL WASTEPAPER RECOVERY ESTIMATES

2.1 The first step of every program analysis is to estimate the potential



*** Period will be 24 weeks if installation prepares major contract rather than DPDO/DPDS; adjust remainder of schedule accordingly.

Figure 70. Installation Wastepaper Source Separation Implementation Shedule

quantities of each high grade wastepaper that can be recovered through a source separation program. The procedures listed in Section X should be utilized for this purpose.

2.2 Coordination with installation authorities and environmental protection committees should be accomplished in accordance with guidance of Section IX.

3.0 IDENTIFYING POTENTIAL MARKETS

3.1 The quantities of potentially recoverable wastepaper should be given to the servicing Defense Property Disposal Office (DPDO) for determination of potential markets, market values for each high grade wastepaper component, market requirements, and contractual arrangements (such as full-service contract possibilities). (The Defense Property Disposal Region (DPDR) office will actually assist/conduct in this determination.) Sections IV and V will be of assistance in working with the DPDO on this matter.

3.2 Coordinate with local and regional planning authorities to determine scope and details of current or planned activities in refuse resource recovery, if any, and potential involvement of the installation in these activities, if any.

4.0 DECISION TO CONTINUE ANALYSIS

4.1 If the DPDO indicates that potential markets are available further data gathering and analysis should be carried on. Correlate data with local and regional resource recovery programs/plans and work to design the installation recovery system as a complement to the current or planned programs. If these civilian programs involve refuse energy recovery the installation should continue to pursue wastepaper recovery, if economical, since the reduction in heating value of the waste stream would be in the vicinity of only 10 percent (Reference 2).

4.2 If no markets are available, the DPDO study results should be recorded, filed with other information already gathered and reported to higher headquarters, as required.

5.0 JANITORIAL-REFUSE MANAGEMENT DATA GATHERING

5.1 Gather together the most recent data on janitor, refuse collection and disposal operations that describes the amount of refuse managed and the costs of these operations. Include all data that will be needed to conduct an economic analysis along the lines of guidance reflected in Section XI.

5.2 Whenever contract operations are involved identify the period of required performance, specifications, costs and whether any potential cost reductions resulting from a wastepaper cost recovery program can be negotiated without encountering constraints from associated Armed Services Procurement Regulation (ASPR) clauses (e.g., ASPR 7-1903.33(d), Cancellation of Items - Service Contracts). Also, determine how much lead time is needed by installation procurement officials to negotiate changes in janitorial and/or refuse contracts, if the need arises.

6.0 SOURCE SEPARATION SYSTEM DESIGN

6.1 Using data and information gathered during the previous steps develop a plan to make best use of available markets, personnel and equipment resources, and storage space (if any). The plan must include detail on program management responsibilities/requirements; in-building operating procedures; collection routes and scheduling; central processing needs; equipment requirements; procurement of contract services; proposed sales contracts; proposed cost avoidance actions; and publicity and educational requirements. Develop alternative designs/plans of differing scope and requirements (e.g., recovering only computer cards, and printout paper and white ledger from the Reproduction Center versus recovering all of these plus white ledger from installation offices.)

6.2 When developing the system design coordinate closely with the building coordinators in those buildings affected. These personnel will have been identified during the wastepaper recovery data gathering step and can use their familiarity of activities within their buildings to help develop a local scheme for effective recovery. Allowing them to participate may also promote their enthusiasm for future support.

6.3 Check with the installation engineer's Real Estate/Property section to determine if, where, who and when any building occupancies will change that could impact the system design over the next 6 months or so. Incorporate changes into the design to accomodate the proposed building changes.

6.4 Use the information in Section V-IX and Table 69 of Section XI for assistance in developing the system design.

7.0 ECONOMIC ANALYSIS

7.1 A vigorous cost and benefit analysis must now be accomplished on each of the system designs/plans. This analysis will form the basis for deciding whether or not a source separation program should be implemented. It's important to remember that a program may not break even the first year and guidance should be sought from command headquarters regarding the extent to which the command would subsidize the program. It is recommended that the payback period be limited to 3 years or less.

7.2 When conducting the economic analysis consider the options of additional hiring to operate the program (reimbursed from program revenues and/or subsidy) and/or contract services. The particular contract service(s) considered feasible can be narrowed down by the initial DPDO/ DPDS marketing analysis, coordination with local civilian/federal waste recovery program officials and discussions with current custodial and refuse management contractors (the latter must be closely coordinated with and by appropriate installation contracting officers). Various contract possibilities are discussed in Section V and include the following:

7.2.1 Market obtained by modifying contractual specifications of current custodial and/or refuse management contracts.

7.2.2 Market obtained through a full-service contractor.

7.2.3 Market obtained whereby portions of the program are performed in-house and others are accomplished under a contractual service arrangement.

7.2.4 Operation of the program by in-house or additional employed personnel and sales of materials through long term (3-5 year) DPDO/Defense Property Disposal Service (DPDS) sales contract.

7.3 Section XI provides guidance related to the economic analysis. As indicated in that Section, be particularly cautious and conservative with potential cost avoidance estimating in order to avoid false economics that ultimately will be a disservice to the taxpayer and the reliability of engineering's capabilities.

7.4 Refer to paragraph 11.0 below regarding possible problems arising in the availability and timing of funds to support advance supplies and equipment procurement. These problems will impact on the timing and accounting of costs in the economic analysis.

8.0 DECISION TO IMPLEMENT

8.1 Completion of the economic analysis will produce a basis on which to make a decision regarding the extent to which a wastepaper recovery program can be implemented. If the decision made is not to implement beyond what is currently in operation, appropriate non-implementation information and data should be reported to command headquarters in accordance with current reporting format requirements. Data and calculations used in developing a decision position should then be filed away for future references.

8.2 If the decision is made to implement, an appropriate report should be made to command headquarters. The various remaining elements of the plan should then be finalized and coordinated with participating organizations. The plan's elements should include the following steps: budgeting; drawing up the appropriate contracts; processing necessary supplies and equipment procurements; and formulating an education and publicity program for all personnel who will be participating in the program. These remaining steps are discussed in the following paragraphs.

9.0 BUDGETING

9.1 Unless unique funding circumstances allow otherwise, the recovery program will be scheduled for implementation in the following fiscal year. In order to have adequate funding support and authority for funds expenditures, the installation will have to budget for the recovery program as part of its reimbursable program. The reimbursement budget should be sufficient to fund program proceeds, including those in <u>excess</u> of program <u>expenses</u> up to $50,000.00.

9.2 Some important aspects of the budgeting process and questions regarding expenses and proceeds related to it are briefly reviewed below in order to ensure program planners have the correct perspective when planning out the program's budget and related operational actions.

9.2.1 Illustration of How Budgeting Works

9.2.1.1 Installation personnel prepare the economic analysis. They estimate that expenses for equipment, containers, etc., are going to cost $400 for the source separation program. They also estimate that total proceeds will amount to around $500.

9.2.1.2 Personnel would then budget in their reimbursable account $500 in addition to what's already in there. When approved by command headquaters that will then give them the authority to spend money on this program. As the proceeds come back in, they'll be reimbursing that account. After they reimburse their $400, they have authority to spend an additional $100 for environmental improvement or energy conservation programs.

9.2.2 What Happens if After-expense Funds are not Obligated by the End of the Fiscal Year? The base loses it. Funds cannot be carried over from one year to the next. Work the programs out so that, if at all possible, proceeds are not received at the very end of the year and are thereby non-spendable. In effect, you don't want to end up with money at the end of the year!

9.2.3 What Happens if Proceeds Do Not Cover Expenses?

9.2.3.1 Program expenses in excess of proceeds must be funded from within available direct funding authority. Sustained requirement for direct funds will form a basis for requesting an exception to mandatory participation in the source separation program.

9.2.3.2 It is essential that the base Civil Engineering funds manager stay "on top of" the situation to insure that any direct funding needs are identified/predicted well in advance and that direct funds are available to fulfill recovery program obligations.

9.2.4 Is There A Dollar Limit to Equipment Purchased in Support of the trash and waste recycling (TWR) Program?

9.2.4.1 Normally, existing equipment will be used in establishing the recycling program. New/additional equipment will be procured through the appropriations (i.e., direct funds) normally available for equipment acquisition.

9.2.4.2 However, if the base believes after-expense funds will cover the cost of a new piece of equipment (such as a baler) and can be obligated <u>before</u> the next fiscal year, then purchase can be made from TWR proceeds. <u>Remember</u> that funds <u>cannot</u> be carried over from one year to the next, which means that there is no possibility of combining proceeds from more than one year to cover large capital investments.

9.2.4.3 Keep in mind, also, that the intent of the source separation program is to recover materials and dollars with minimum capital investment.

9.3 The timing of the budget submission is critical to obtaining timely approval and adequate funding support for the program without adversely impacting on funding needs for other installation programs and services.

9.3.1 To minimize this impact and provide command headquarters adequate time to review and align the recovery program's budget needs with other installation submissions, the budget should be submitted as part of the installation's Financial Plan/Budget Estimate update for the coming fiscal year. This may be required at command headquarters 9 months prior to the start of the new fiscal year, and require preparation at least 3-5 weeks before that submittal in order to allow time for local budget analysis, review and validation actions (Reference 3).

9.2.2 If conditions exist that make it difficult to predict market performance that far in advance or mission changes are contemplated that make it difficult to establish a system design 10-11 months in advance of the fiscal year, the final budget submission could be delayed but the delay should not extend beyond 6 months prior to the new fiscal year (Reference 4). Figure 69 is based upon this time frame.

10.0 CONTRACTUAL ARRANGEMENTS

10.1 The contracting process should be started early enough to ensure both the DPDO/DPDS and installation contracting authorities, as necessary, have sufficient processing time to obtain contracts signed and contractors ready to proceed when the implemetation is planned to start. The DPDO/DPDS will normally require up to approximately 100 days for processing and obtaining a contract; installation contraction officials generally prefer to have 6 months for the process, although changes can be made to current contracts in a much shorter period of time if economically desirable and consistent with the ASPR. Ensure possible funding availability requirements, such as discussed in paragraph 11.0 below, are considered in the start up date.

10.2 Information required by the DPDO/DPDS is discussed in Section V and should have been carefully reviewed by this time.

11.0 PROCURING SUPPLIES AND EQUIPMENT

11.1 It is important to act early to procure supplies and equipment needed to support the program upon implementation. In order to do this, however, program planners must balance the timing of these procurements with the availability of funds.

11.1.1 If the installation has already established a reimbursable funds account to receive proceeds from the sale of computer cards, these funds should be made available to support procurement needs.

11.1.2 If the installation has no proceeds to use, the program planners will have to identify funds from within available direct funding authority (i.e., funds originally authorized for some other purpose.)

11.1.3 If funds cannot be found from available direct funding authority, the installation will have to request additional funding authority to support procurement needs.

11.2 If current year funds cannot be found to support supplies and equipment needs, program planners may have to adjust their implementation start-up date to allow time to purchase the items under the upcoming fiscal year reimbursable funds authority; however, if coordinated closely, procurement officials may be able to time receipt of the items close enough to the start of the new fiscal year to allow payment from those funds, thereby minimizing program implementation delay.

12.0 PROGRAM PUBLICITY AND EMPLOYEE EDUCATION

12.1 Program publicity and employee education should begin 3 weeks before the start of the program and carry on into the first week of the program. Use of the Building Coordinators and the material and procedures described in Section IX are critical to the success of this effort and, therefore, the program.

12.2 On-going publicity and program progress feedback will be necessary throughout the duration of the program (hopefully, 3 years at the minimum). Again Section IX will be helpful in this regard.

13.0 PROGRAM IMPLEMENTATION

13.1 The program should be implemented on the scheduled, pre-publicized date in all buildings identified for participation.

14.0 PROGRAM EVALUATION AND REPORTING

14.1 The first couple of weeks of the program will be a learning period for everyone involved. Container locations, gathering and collection schedules may have to be changed or modified in some areas and employees will raise questions regarding the acceptability of various types of paper.

14.2 Program success, or lack thereof, will often be predicated upon the ability of program management personnel to be constructively responsive to problems or questions as they arise. To facilitate this ability management should:

14.2.1 Establish a central office contact and telephone number for inquiries. This information should have been included in the letter of instructions to all participants; by announcement in base media; on container labels; and through briefings to participants given by the Building Coordinators (Reference Section IX).

14.2.2 Encourage Building Coordinators to review their areas of concern frequently. Employee recommendations for improvements should be encouraged and acted upon by the Building Coordinators and other management personnel, as needed.

14.2.3 Walk through each building at least once during the start up period (first two weeks), accompanied by the appropriate Building and Area Coordinators, looking for possible areas of improvement and taking actions to do so.

14.2.4 Ensure that no excess accumulations of wastepaper occur at central container locations and that these locations are kept neat and orderly. In this regard be aware that many personnel will build up a pre-program inventory of wastepaper in anticipation of the program's implementation; consequently, when implemented this inventory will create a surge in quantities requiring pickup and the gathering-collection system will have to be prepared and flexible enough to handle it. It is very <u>important</u> that management not consider changes to the collection schedules until it is evident whether the initial quantities of wastepaper separated represent a real, constant output or whether they result from pre-program buildup.

14.2.5 Publicize common operational problems and/or questions and the soloutions/answers to them. Be positive also: publicize apparent successes and contributions.

14.3 Records should be kept on the quantities and quality of the materials recovered, per building and overall, on the value received and on costs. This data will help monitor program effectiveness and provide input for any reports required.

15.0 PROGRAM MANAGEMENT

15.1 Throughout the program, a single Program Manager/Coordinator will be needed to collect performance data, compile necessary reports, coordinate on publicity and assist in initiating contract revisions when needed. The Technical Representative of the Contracting Officer (TRCO) will be responsible for monitoring contractor performance, except for the DPDO/DPDS-hired contractor; in this situation the DPDO or its representative will be responsible for monitoring performance. It's possible that the DPDO and the installation will work out an agreement to have the TRCO also serve as the DPDO representative in this matter; in any case, it is recommended that the TRCO and the Program Coordinator work closely with the DPDO to ensure all contract elements fulfill their responsibilities.

15.2 Coordination and feedback must continue among all key participants of the program to ensure that the momentum of the program is maintained. Use of the Environmental Protection Committee or similar, widely represented working group, can provide an established forum for this prupose, although individual contacts should be made whenever particular problems arise.

15.3 Maintain a regular program of publicity and feedback to employees throughout the program.

16.0 COST AVOIDANCE ACTIONS

16.1 If any potential cost avoidance items/actions were included in the economic analysis of the implemented program, ensure that it/they are fully described and scheduled in the plan.

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SECTION XIII

STATUS OF HIGH TECHNOLOGY REFUSE ENERGY RECOVERY ALTERNATIVES FOR MILITARY INSTALLATIONS

1.0 GENERAL PROBLEM

1.1 Growing costs of solid waste management, decreasing availability of environmentally acceptable disposal sites, and increasing cost of limited boiler fuels pose significant problems for military installation managers. Coupled with these challenges are mandatory requirements to implement various forms of refuse materials and energy recovery wherever economically feasible.

1.2 Technological solutions to these areas of concern vary considerably in scope and degree of demonstrated capability. The most promising area of development appears to be in solid waste to energy conversion, either through modification of fossil fuel-fired boiler systems to directly fire waste processed into a refined solid refuse-derived fuel (RDF) or construction of new equipment specifically designed to thermally process waste materials. Thermal processing technologies include production of low-Btu gas through pyrolysis and direct combustion (incineration). While pyrolytic gas is potentially usable in boilers designed to fire oil and/or natural gas, the pyrolysis process is still far from commercialization (Reference 1).

1.3 Combustion ranks as the most proven process for converting wastes to less undesirable forms before ultimate disposal. The advantages of combustion include: applicability to gaseous, liquid and solid wastes; reduction of the putrescibility of organic solid wastes; reduction of the bulk of most solid and liquid wastes; conversion of most organic materials into gases which are already part of the natural atmosphere and can be released directly into it; use of readily available oxygen from air as its principal chemical agent; dependence on chemical processes that are relatively well understood; capability to be carried out on large quantities of materials in apparatus of comparatively simple design; and generation of useful heat (Reference 2). By capturing the heat liberated in combustion to produce either steam or hot water, substantial quantities of increasingly costly conventional fuels can be conserved.

1.4 Direction and support for the waste to energy concept have come from DOD and Congress. Military construction criteria published in 1972 reflects DOD policy that all heating or power plants over 100 MBtu/hr output use "solid fuel" as a primary fuel whenever possible to avoid consumption of increasingly costly and scarce natural gas and fuel oil (Reference 3). In 1976, DOD extended the definition of "solid fuel" to include not only coal but also solid waste as a fuel or fuel supplement; in directing the services to use locally available commercial recycling industries or joint or regional resource recovery facilities when they exist, DOD established groundwork for installation procurement of refuse-derived fuel (RDF) (Reference 4). In May, 1977, the Senate Committee on Armed Services reemphasized the goals of reducing natural gas and fuel oil consumption; recommended eliminating relying on these fuels in large energy plants by 1980, and endorsed the "concept of a long-term (10 year) contract for the disposal of waste and the purchase of derived energy." (Reference 5).

1.5 Use of RDF as a supplementary fuel in heating and power plants now is fully integrated into DOD guidelines for the Energy Conservation Investment Program, a military construction program for retrofitting existing DOD facilities to make them more efficient while saving utility costs. (Reference 6). The potential use of RDF has also been promoted by HQ USAF policy to convert all oil and natural gas consuming central heating plants, 50 MBtu per hour and larger, to coal-fired systems, and to utilize RDF as a supplementary fuel. (Reference 7).

1.6 There are presently two increasingly discussed means of applying the combustion process to solid waste; one involves direct incineration, and the other involves co-firing RDF in modified coal-fired boilers. These alternatives and their problems are discussed below.

2.0 ALTERNATIVES

2.1 Site-Erected Incineration Systems

2.1.1 The potential for incineration at military installations is high. At most installations solid waste is disposed of by sanitary landfill, both on and off the installation. However, as previously mentioned, growing pressures for better land utilization, rapid depletion of many current landfills, and increasingly stringent laws, regulations and guidelines bearing upon solid waste disposal operations all encourage incineration.

2.1.2 Site-erected incineration systems are usually more reliable than currently marketed modular systems which are predesigned for off-shelf availability to process average municipal/residentaial waste. When designed properly, site-erected incinerators will function in a way far superior to modular units and RDF at the current state of the art. There are, nevertheless, challenges: Areas of unknowns include slagging potential; grate fouling; whether to shred the waste or not; how to cope with the variability of input materials in design and practice; and process control and instrumentation methods.

2.1.3 However, the most significant obstacles to military implementation of field erected systems are scaling uncertainties and economics. Nearly all site-erected solid waste incineration systems currently in operation are on a municipal scale, processing as much as 2000 tons/day. The average military installation generates as much as 18-35 tons/day of solid waste. (References 8, 24). The fact that the military does not have to handle vast volumes and masses of waste is far offset by difficulties in downscaling successfully operating larger plants. In addition, economies of scale are lost with installation-sized site-erected systems, and the economics of implementation persuasively argue against their use.

2.2 Conventional Modular Incinerators

2.2.1 The recent trend has been to consider modular incinerators. Conventional units are predesigned for municipal/residential refuse; are highway-shippable and site-assembled; have a procurement time of usually less than 8 months; and, because of size limits for transportation, have mass through-put capacities rarely greater than 1 ton/hour. The modular incinerator in most widespread use is the controlled air type, a batch-fed horizontal cylindrical stationary bed furnace. An inherent problem with this incinerator is that it was predesigned for municipal/ residential refuse, which generally has a lower heat release rate than military solid waste. Therefore, it must usually be derated by as much as 30 percent in installation applications. This means that the average installation generating solid waste at a rate of 35 tons/day must have an installed controlled air incinerator processing capacity of 50 tons/day, and operate 3 units in parallel 3 shifts/day to process all its waste.

2.2.2 In addition to the derating problem and the concommitant and undesirable multiple work shift requirements, choice of commercially available modular units is risky because of a paucity of reliable data on parameters such as: routine operational and maintenance requirements and costs, cyclic maintenance needs, performance reliability, and length of economic life.

2.2.3 The choice of modular units is also made more difficult, if not impossible, by the fact that some states, such as Maryland, do not allow use of incinerators rated at 5 tons/hour or less throughput. (Reference 9) If not waived by the state involved, these requirements, which are often based on air pollution abatement criteria, will automatically preclude selection of commercially available 5 ton/hour or less modular incinerators.

2.3 Augered Bed Modular Incinerator

2.3.1 The recently developed modular augered bed incinerator claims a processing capacity of up to 5 tons/hour. (Reference 10). With a well operating unit, the average installation could process all its combustible solid waste in a 1 shift/day operation. The potential advantages of the augered bed incinerator include reduced labor requirements and less auxiliary fuel consumption than the controlled air unit. By integrating a waste heat boiler into the augered bed incinerator system, substantial quantities of conventional fuels can be saved. By reducing solid waste up to 90 percent by volume, and creating a less putrescible ash and residue, ultimate disposal may be made with less cost and adverse environmental impact.

2.3.2 The augered bed incinerator is still in the prototype stage and not commercially available and proven.

2.4 Central Steam Plant Boiler Modifications

2.4.1 RDF-alternatives available over the near term for installation use are limited to cofiring with coal in boilers equipped with travelling chain grate or spreader type stokers. Low-potential systems include suspension-firing shredded, classified "fluff" RDF and finely divided "dust" RDF, because the military has very few furnaces such as pulverized coal-fired boilers) with the large volume required for optimal use of these fuels. In the more promising case of grate firing, RDF must be pelleted into densified form (DRDF) to provide physical compatibility with the coal with which it is mixed and cofired.

2.4.2 The high potential for using DRDF as a supplementary fuel with coal in military boilers has been indicated in short-term burn tests performed by the USAF at Wright-Patterson AFB (July 1975) and the USA Construction Engineering Research Laboratory at Chanute AFB (September - October 1975) (References 11-13). However, while the Wright Patterson test is laudable for its initiative and the fact that it demonstrated an ability to successfully co-fire a densified refuse-derived fuel (DRDF) with coal at that particular installation, it did not produce design type data required to support engineering feasibility studies at other locations.

2.4.3 The justification for using DRDF at a given location is based upon economic tradeoff. It may be less costly to process solid waste into a beneficiated solid fuel for supplementary use in an existing boiler plant, or it may be less costly to procure and install new equipment to fire unprocessed solid waste (i.e., energy-recovery incineration). The correct choice depends upon complete information about the technical and economic aspects of alternative systems. In the case of using DRDF in military-scale boilers, a comprehensive set of techno-economic data does not exist, and what information does exist at a wide variety of sources has yet to be consolidated.

2.4.4 Examples of problems in attempting to confidently design boiler modifications to co-fire DRDF include the following:

2.4.4.1 RDF does not have the mechanical properties of coal and current research indicates that most coal handling and storage systems will require redesign to reliably handle the bulk solids for which they were not originally made to accommodate. While some existing systems might successfully handle DRDF and or DRDF/coal mixtures, this appears to be attributable to good luck and the available data and not the type on which contemporary engineering design is customarily based. (Reference 14)

2.4.4.2 Similarly, little scientific research has been performed on the behavior of DRDF in a boiler. We know that DRDF has a lower energy value and ignition temperature than nearly all coals, and usually burns with a cooler and larger flame. It also has a much higher rate of reaction than coal. However, data on how DRDF will react in a furnace environment is lacking, particularly with regard to mixtures of DRDF and coal in different proportions. Not until the technical impacts of using waste-derived fuels as a coal supplement are known and translated into economics can sound decisions be made regarding the use of these fuels. (Reference 15).

3.0 CONCLUSIONS

3.1 The use of refuse-derived fuel holds promise of reducing consumption of all conventional boiler fuels, reducing installation waste disposal costs, and increasing the environmental compatibility of ultimate disposal methods such as landfill. However, significant technological and economic uncertainties and data gaps exist which must be resolved before military engineers and managers can confidently plan, design and operate heat recovery systems utilizing solid waste as a primary or supplemental fuel.

3.2 The U.S. Environmental Protection Agency has acknowledged that a substantial research, development, test and evaluation effort is required before DRDF can be given unqualified recommendation for use on the municipal and industrial (military) scales alike. (Reference 16). Nevertheless, while numerous research efforts are now underway to determine the technical and economic efficacy of alternative technologies for producing and using all forms of RDF in large-scale steam-generating operations, few current projects are oriented toward the scale of operation and the type of waste generated at typical military installations. (Reference 17). Recent investigations into military-scale waste-to-energy systems have underscored the need for accelerated investigative and developmental work across the entire RDF spectrum before the benefits of base-level use of solid waste as a fuel can be realized. (Reference 18-23). Such studies have clearly indicated the need for research, test and evaluation that will provide information required by the military to make sound decisions in selecting alternative energy recovery systems. Research recommendations are listed in the following paragraph.

4.0 RESEARCH RECOMMENDATIONS FOR THE MILITARY SERVICES

4.1 Develop, test and evaluate design criteria, specification and economic data needed to cost effectively modify, replace or install new boiler systems that can use refuse derived fuel as a primary or supplemental fuel.

4.2 Evaluate conventional modular incinerator operations to determine the applicability of individual systems to military installations based upon military refuse inputs, energy requirements, and incinerator unit operational, maintenance and cost characteristics.

4.3 Promote development and field testing of the non-conventional prototype augered bed modular incinerator to determine technical and economic feasibility of utilizing it on military installations as an alternate means of solid waste processing and energy-for-steam recovery.

4.4 Investigate utilization of special industrial waste resources as supplemental energy resources.

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APPENDIX A

Department of Defense Directive
Number 4165.60

October 4, 1976
NUMBER 4165.60

ASD(I&L)

Department of Defense Directive

SUBJECT Solid Waste Management - Collection, Disposal, Resource Recovery and Recycling Program

References: (a) DoD Directive 6050.3, "Resource Recovery and Recycling Program - Solid and Other Waste Material," November 19, 1974 (hereby cancelled)
(b) through (u) are listed in enclosure 1

I. PURPOSE AND CANCELLATIONS

A. This Directive incorporates the provisions of reference (a), updating Department of Defense policies and procedures relative to the DoD comprehensive program of solid waste collection, disposal, material recovery, and recycling in consonance with the guidelines published by the U.S. Environmental Protection Agency (EPA) (references (b), (c), (d), and (e)), the National Environmental Policy Act (reference (f)), the Solid Waste Disposal Act (reference (g)), and DoD Directive 5100.50 (reference (h)).

B. Reference (a) and Report Control Symbol DD-H&E(SA) 1359 are hereby superseded and cancelled.

II. APPLICABILITY AND SCOPE

A. The provisions of this Directive apply to the Office of the Secretary of Defense, the Military Departments, and the Defense Agencies (hereinafter referred to collectively as "DoD Components").

B. The processing and selling of scrap and similar material, except high grade paper, as defined in DoD Manual 4160.21-M (reference (i)) and generated from military and industrial-type activities, are excluded from the provisions of this Directive.

III. DEFINITIONS

For the purposes of this Directive, the definitions contained in enclosure 2 apply.

IV. OBJECTIVES

A. The preservation and protection of the environment.

B. The conservation of natural resources through:

1. Judicious collecting and disposing of solid waste;

2. Reducing the amount of material wasted; and

3. Recovering and recycling materials and/or energy from solid waste products as an alternative to burial in landfills, incineration or environment-menacing dispositions.

V. POLICIES

A. The criteria listed in the "requirement" section(s) of published EPA Solid Waste Management Guidelines (references (b), (c), (d) and (e)) are mandatory for minimum acceptable levels of performance and shall be implemented by the DoD Components. The "recommended" section(s) of the Guidelines, representing current techniques and practices, shall be implemented when feasible and contributory to the effectiveness of the program. Waste disposal on Federal property will be in accordance with appropriate material criteria. Local permits may not be mandatory for Defense installations; however, State and local criteria, if more stringent than EPA Guidelines and/or Defense practices, shall be applied when feasible. Resource recovery facilities established in accordance with the provisions of this Directive will be compatible with appropriate State and local plans.

B. All solid waste generated on a DoD installation shall be considered Government property for purposes of disposal under the provisions of this Directive except in those instances where Military Exchanges and Commissary Stores salvage and dispose of their recoverable resources.

C. Commercial, residential, and institutional solid and other waste materials shall be recovered and recycled to reduce environmental pollution and conserve resources, consistent with guidelines prescribed herein.

D. The quantities of solid waste materials shall be reduced at the source, whenever possible.

E. Contracts for solid waste material disposal services shall include provisions for recycling, whenever feasible.

F. A DoD facility that generates 100 tons or more per day of residential, commercial and institutional solid waste after complying with waste reduction and source separation policies, shall establish and/or utilize resource recovery facilities to separate and recover materials or energy, or both, from solid waste.

G. DoD facilities located within a Standard Metropolitan Statistical Area (SMSA) are required to participate with other DoD Components and Federal facilities in the establishment and/or utilization of a single resource recovery facility if: (1) any one Federal facility generate 50 tons or more of residential, commercial, and institutional solid waste per day after complying with waste reduction and source separation policies; and (2) the combined total of this solid waste for all Federal facilities within the SMSA is 100 tons per day. The Federal Agency having jurisdiction over a Federal facility that generates the largest quantity of residential, commercial and institutional solid waste in the SMSA will be designated the lead agency in the planning, programing and budgeting for the resource recovery facility in accordance with EPA Guidelines (reference (b)).

H. Joint or regional civilian community resource recovery facilities/systems shall be utilized whenever possible, in lieu of establishing separate DoD facilities/systems.

I. DoD Components shall not compete with a locally available commercial recycling industry which offers a total resource recovery system. Every effort shall be made to use the established commercial industry in accordance with DoD Directive 4100.15 (reference (j)).

J. The separation of used newspapers at the source of residential generation, in conjunction with separate collections, shall be carried out at all DoD installations in which more than 500 families reside. The newspapers shall be recycled or, alternatively, used as an energy resource.

K. Any installation generating 10 or more tons of waste corrugated containers per month shall segregate and separately collect for purposes of recycling or, alternately, used as an energy resource.

L. High grade paper generated in office buildings of over 100 workers shall be separated at the source of generation and collected for the purpose of recycling.

M. At facilities where resource recovery is not mandatory as required by this Directive, optional programs are encouraged. In these instances, the annual cost to the Government should be less when compared to the normal solid waste procedure or disposal.

N. All actions to implement the requirements of this Directive will first be assessed to determine the necessity for preparing an environmental impact statement in accordance with DoD Directive 6050. 1 (reference (k)).

VI. PROCEDURES

A. General

1. Solid waste collection, disposal and resource recovery programs will be implemented in the most cost effective manner and periodically reviewed to assure continuing cost effective operation (DoD Instruction 7041. 3 (reference (l)). The programs, proposed or ongoing, shall be evaluated under the provisions of DoD Instruction 4100. 33 (reference (m)).

2. Alternative methods to processing solid waste through Federally established resource recovery facilities shall be considered in the establishment of local programs and implemented, singly or in combination, if beneficial.

a. Sale through the Defense Supply Agency (DSA).

b. Use as fuel or fuel supplement.

c. Local reuse of recovered waste materials.

d. Joint or separate efforts by contractors handling solid and other waste material to recover recyclable materials.

e. Participation in a joint or regional resource recovery program operated by the civilian community.

3. Prior to implementing procedures for segregating or processing specific waste material for sale, it shall be determined that adequate markets do exist and will continue to exist for a reasonable length of time. Such determination shall include sufficient detailed market analyses and economics to ensure that an economical analysis can be made by the DoD Components.

4. Exceptions to the requirements prescribed by this Directive may be made after appropriate analysis has determined that markets for recovered products are not available or that costs are so high as to be economically impracticable. Analysis in accordance with VI. E. 2., below, must be made and will serve as the basis for required reporting which concern actions taken by the DoD Component pursuant to the EPA Guidelines. Such analyses will be reviewed at least every 3 years.

5. Waste and debris not otherwise utilized in accordance with these procedures are to be disposed of by prescribed EPA Guideline procedures (reference (d)) in authorized landfills and/or incinerators.

B. Organization

1. The DoD Components shall develop the organization for the management and operation of their resource recovery programs. Management of these programs at the installation level will generally be accomplished by the element which is already functionally responsible for refuse collection and disposal (DoD Directive 4165.2 (reference (n)). Recyclable/marketable materials shall be referred to DSA for sale.

2. Duplication of effort shall be avoided in the collecting, sorting, and transporting of recoverable waste by combining new and existing efforts. However, Military Exchanges and Commissary Stores which purchase or lease processing equipment may salvage and dispose of their recoverable resources.

3. The managing activities shall be provided market information for the studies or the sale of recoverable waste material within a reasonable time period.

C. Financial Management

1. Sale of marketable items from solid waste materials shall be administered through DSA under the provisions of DoD Directive 4160.21 (reference (i)). This procedure does not apply to waste materials turned over to voluntary organizations or civilian communities for recycling. The procedure also does not apply to Military Exchanges and Commissary Stores where the activity owns or leases its own processing equipment.

2. Net proceeds from the sale of solid waste materials shall be deposited to the account designated by the managing activity to reimburse the following expenses incurred in operating the solid waste resource recovery programs:

   a. The acquisition of replacement equipment for recycling purposes. The provisions of DoD Instruction 4160.1 (reference (o)) apply in the financing of replacement equipment.

   b. The acquisition and identification of containers and container stands for proper segregation of solid waste material.

   c. The collection of waste materials from the containers.

   d. The separating, baling, compacting, shredding, pulping, or otherwise altering the size, shape or form of the waste materials.

   e. The transfer of marketable items to the accountability of the property disposal office. Transfer of physical custody is not required; such property shall be moved only when it is most economical and effective to do so.

f. The installation-level administration and support of the above functions by the managing activity.

3. Elements of expense as charged to all activities by the installation-level accounting system are included, but military personnel expense may not be reimbursed from the net proceeds. Any net proceeds after expenses and replacement equipment costs have been reimbursed may be made available by the managing activity to finance special projects for environmental improvement and energy conservation. The amount of such financing for such projects shall not exceed $50,000 per DoD installation. Should any balance be left in the designated account, after the environmental and energy conservation projects are financed, it will be transferred to Budget Account 97-F 3860.5191, "Proceeds from the Sale of Scrap, Salvage, or Surplus Materials, Defense Supply Agency."

4. Solid waste material recycling expenses that are not offset from net proceeds are eligible for reimbursement from any net proceeds remaining in Budget Clearing Account 97-F 3860.5191, "Proceeds from Sale of Scrap, Salvage or Surplus Materials, Defense Supply Agency," after reimbursement of all other categories of disposal expense.

5. Expenses incurred by DSA that are related to the sale of recovered materials shall be deducted from gross sales proceeds. Accounting and reporting procedures for property disposal expenses shall be in accordance with DoD Instruction 7310.1 (reference (p)).

D. Construction Projects and Equipment Procurement

1. Construction projects for resource recovery programs shall be planned and programmed in accordance with DoD Instruction 7040.4 (reference (q)): such projects shall be included in the reports submitted pursuant to OMB Circular A-106 (reference (r)). (See section VIII., this Directive.) Proceeds of sale shall not be used to finance these projects.

2. Each resource recovery facility will be designed with sufficient capacity to process (a) all of the residential,

commercial and institutional solid waste generated by the DoD facilities that will utilize the resource recovery facility, and (b) at least 65 percent by wet weight of the input solid waste into recycled material, fuel or energy. If inability to meet the 65 percent criteria is based on costs so high as to be economically impracticable or lack of market circumstances, then the processing percentage shall be as great as practicable within those circumstances.

3. Use of existing facilities and equipment shall be considered in planning and establishing recycling programs. Equipment, such as balers, available at a Defense installation or activity shall be shared whenever possible to reduce costs.

4. Equipment items for the establishment of recycling programs will be procured through the appropriations normally available for equipment acquisition. The acquisition of replacement equipment, related solely to recycling of solid and other waste materials, is eligible for financing from net proceeds generated by the sale of waste materials. Annual programs for the acquisition of such equipment will be coordinated with the Assistant Secretary of Defense (I&L). The provisions of DoD Directive 5126.15 (reference (s)) shall apply to the acquisition of equipment.

5. The financing of equipment that is jointly used or shared with such activities as the Defense Property Disposal Office or a Commissary store, shall be governed by the procedures applicable to the activity that owns or is accountable for the equipment or facility.

E. EPA Guidelines Implementation

1. Within 1 year from the respective dates of promulgation of the EPA Guidelines (references (b), (c), (d) and (e)), DoD Components shall make a final determination as to what actions shall be taken to comply with them and with the requirements of this Directive and submit to the ASD(I&L) a schedule of said actions. Where prescribed by the individual Guidelines, DoD Components shall submit a report to the ASD(I&L) annually thereafter outlining the actions taken pursuant to the applicable Guidelines.

2. Where the determination is made not to adopt the mandatory

requirements prescribed by the applicable EPA Guidelines (references (b), (c), (d) and (e)), the complete analysis and rationale used by the DoD Component in reaching that determination shall be included in the initial submission to the ASD(I&L). The required analysis shall be conducted at least every 3 years thereafter as appropriate and forwarded to the ASD(I&L) in accordance with section VIII., below. The following points will be addressed in the analysis:

a. A description of ongoing actions, and actions taken or proposed, not in compliance with this Directive. Include a brief description of how specific DoD facilities will be affected.

b. A description of the alternative actions considered. Emphasize those alternatives which, if taken, would be in compliance with this Directive.

c. An analysis in support of the action chosen by the DoD Component. Include technical data, market studies, and policy considerations utilized in arriving at the determination.

3. Following a technical review of the DoD Component's schedule/analysis, the ASD(I&L) shall submit the determination and/or schedule for required interagency coordination.

VII. <u>RESPONSIBILITIES</u>

A. The Assistant Secretary of Defense (Installations and Logistics) shall have primary staff responsibility for this Directive and shall be responsible for:

1. Formulating, developing and monitoring policy for the DoD solid waste management program.

2. Developing implementing policy and monitoring the storage and disposal of recovered materials generated from solid waste materials.

3. Programing, planning, approving design criteria, and

conducting technical reviews of facilities for resource recovery and recycling.

4. Establishing a Joint Service Committee to act in an advisory capacity on solid waste management, resource recovery and recycling matters.

5. Providing necessary interagency coordination with EPA and other Federal Agencies involved in resource recovery and recycling.

6. Providing technical guidance to the other DoD Components concerning the environmental consequences of their solid waste activities that (a) significantly affect the quality of human environment or (b) are environmentally controversial.

B. The Director of Defense Research and Engineering shall be responsible for:

1. Establishing a Defense research, development, test and evaluation (RDT&E) plan to identify interim and long range programs in the resource recovery and conservation areas.

2. Coordinating the RDT&E efforts of the DoD Components in developing systems, equipment and techniques for solid waste management, recycling and resource recovery.

3. Coordinating DoD resource recovery and recycling research with the work of other Federal Agencies.

4. Assuring that consideration is given to resource recovery and recycling in other RDT&E projects and programs.

C. The Secretaries of the Military Departments and the Directors of Defense Agencies shall be responsible for:

1. Identifying those installations which should establish resource recovery programs in accordance with the policies and procedures set forth in this Directive.

2. Budgeting and financial planning for approved programs which provide for solid waste management, collection, disposal, recycling and resource recovery, consistent with the provisions of this Directive and with mission requirements.

D. The Director of the Defense Supply Agency, in addition to VII. C., above, shall be responsible for:

1. Determining market availability for recoverable resources, as well as estimated length of market availability, and furnishing this information to DoD Components within a reasonable time period prior to the establishment of recycling programs.

2. Negotiating sales contracts for marketable materials recovered from the solid waste as well as contracts for sale of solid waste to public or commercial resource recovery operations.

VIII. REPORTS

A. The reporting requirements prescribed by OMB Circular A-106 (reference (r)) and further outlined in VI. D. 1., have been determined to be exempt from interagency approval pursuant to subparagraph 7. d. (2)(a), OMB Circular A-40 (reference (t)). Construction projects prescribed for resource recovery programs under the provisions of this Directive shall be included with the OMB Circular A-106 (reference (r)) projects reported under RCS DD-I&L(SA)1383.

B. Requirements concerning the solid waste management program implementation and operation reporting are summarized in VI. E. above. For DoD management and control, the assigned Report Control Symbol is DD - I&L (A&AR) 1435 for submission of the required reports to ASD(I&L).

C. The statutory language of Section 612 of Public Law 93-552 (reference (u)) has been interpreted to mean the proceeds from the sale of recyclable material recovered from solid wastes as encompassed within the provisions of the Directive. Accordingly, the Secretary of each Military Department shall report to Congress annually concerning, as a minimum, the proceeds received from sales of the recovered materials, expenses incurred in this program, the number and costs of projects for environmental improvement and energy conservation, and any remaining proceeds transferred to the prescribed

Budget Account 97-F 3860.5191. A copy of this report shall be provided ASD(I&L) concurrently with its formal transmission to Congress. For DoD management and control, the assigned Report Control Symbol is DD - I&L (A) 1436 for submission of the required reports to Congress.

IX. EFFECTIVE DATE AND IMPLEMENTATION

This Directive is effective immediately. Three copies of implementing instructions shall be forwarded to the Assistant Secretary of Defense (I&L) within 90 days.

W. P. Clements Jr.
Deputy Secretary of Defense

Enclosures - 2
1. References
2. Definitions

REFERENCES, Continued

(b) U.S. Environmental Protection Agency, "Solid Waste Management Guidelines - Resource Recovery Facilities," 40 CFR 245, September 21, 1976

(c) U.S. Environmental Protection Agency, "Solid Waste Management Guidelines - Solid Waste Storage and Collection," 40 CFR 243, March 15, 1976

(d) U.S. Environmental Protection Agency, "Solid Waste Management Guidelines - Thermal Processing and Land Disposal," 40 CFR 240 and 241, August 14, 1974

(e) U.S. Environmental Protection Agency (EPA), "Solid Waste Management Guidelines-Source Separation for Materials Recovery," 40 CFR 246, May 24, 1976

(f) National Environmental Policy Act of 1969, 42 U.S.C. 4321 et, seq.

(g) Solid Waste Disposal Act, as amended, 42 U.S.C. 3251 et seq. (1970)

(h) DoD Directive 5100.50, "Protection and Enhancement of Environmental Quality," May 24, 1973

(i) DoD Manual 4160.21-M, "Defense Disposal Manual," June 1973. Authorized by DoD Directive 4160.21, February 23, 1972

(j) DoD Directive 4100.15, "Commercial or Industrial Activities," July 8, 1971

(k) DoD Directive 6050.1, "Environmental Considerations in DoD Actions," March 19, 1974

(l) DoD Instruction 7041.3, "Economic Analysis and Program Evaluation for Resource Management," October 18, 1972

(m) DoD Instruction 4100.33, "Commercial or Industrial Activities - Operation of," July 16, 1971

(n) DoD Directive 4165.2, "DoD Real Property Maintenance Activities Program," February 21, 1976

(o) DoD Instruction 4160.1, "Nonexcess Personal Property to be Sold or Exchanged for Replacement Purposes," March 23, 1971

(p) DoD Instruction 7310.1, "Accounting and Reporting for Property Disposal and Proceeds from Sale of Disposable Personal Property and Lumber or Timber Products," July 10, 1970

(q) DoD Instruction 7040.4, "Military Construction Authorization and Appropriation," July 16, 1971

(r) OMB Circular A-106, "Reporting Requirements in Connection With the Prevention, Control, and Abatement of Environmental Pollution at Existing Federal Facilities," December 31, 1974

(s) DoD Directive 5126.15, "Delegation of Authority with Respect to Facilities and Equipment for Metal Scrap Baling or Shearing, or for Melting or Sweating Aluminum Scrap," March 13, 1970

(t) OMB Circular A-40, "Management of Federal Reporting Requirements," May 3, 1973

(u) Public Law 93-552, "Military Construction Authorization Act, 1975," December 27, 1974

DEFINITIONS

A. Commercial Solid Waste. All types of solid waste generated by stores, offices, clubs, cafeterias, mess halls, warehouses and other such nonmanufacturing activities, and nonprocessing waste generated at industrial facilities such as office and packing wastes. Construction and demolition wastes are not included in this category.

B. DoD Facility. Any building, installation, structure, land or public work owned by or leased to a DoD Component. Ships at sea, aircraft in the air or forces on maneuvers are not subject to this Directive.

C. High grade Paper. Includes letterhead, dry copy papers, miscellaneous business forms, stationery, typing paper, tablet sheets and computer printout paper and cards, commonly sold as "white ledger," "computer printout," and "tab card" grade by the wastepaper industry. Consistent with EPA guidelines, high grade paper is included within commercial solid waste category.

D. Institutional Solid Waste. Solid waste originating from educational, health care, correctional and other such facilities.

E. Managing Activity. An administrative element assigned to manage the recycling program (including personnel, funds and equipment) for the purposes of carrying out the objectives of this Directive.

F. Office Waste. Solid wastes generated in the buildings, room, or series of rooms in which the affairs of a business, professional person, branch of government, etc., are carried on; excludes waste generated in cafeterias, snack bars, or other food preparation and sales activities.

G. Recycling. The process by which recovered materials are transformed into new/usable products.

H. Resource Recovery. The process of obtaining materials or energy from solid waste.

I. Residential Solid Waste. Includes garbage, rubbish, trash and other solid waste resulting from the normal activities of households.

J. Resource Recovery Facility. Any physical plant that processes residential, commercial or institutional solid waste, biologically, chemically or physically, and recovers useful products, such as shredded fuel, combustible oil or gas, steam, metal, glass, etc., for resale or reuse.

K. Recoverable Resources. Materials that have useful physical or chemical properties after serving their original purpose and can be reused or recycled for the same or other purposes.

L. Sludge. The accumulated semiliquid suspension of settled solids deposited from waste waters or other fluids in tanks or basins.

M. Solid Waste. Includes garbage, refuse, and other discarded solid materials, including solid waste materials, resulting from residential, institutional, industrial, commercial, and agricultural operations, and from community activities. Mining and agricultural solid wastes, hazardous wastes, sludges construction and demolition wastes, and infectious wastes are not included in this category.

N. Source Separation. The separation of recyclable materials at their point of generation by the generator.

APPENDIX B

Paper Stock Standards and Practices

PAPER STOCK INSTITUTE OF AMERICA

A Commodity Division of

NATIONAL ASSOCIATION OF RECYCLING INDUSTRIES, Inc.

Paper Stock Standards and Practices

CIRCULAR PS-74

Effective January 1, 1974

Issued from
ASSOCIATION HEADQUARTERS
330 Madison Avenue, New York, N.Y., 10017

PREAMBLE

These standards and practices apply to paper stock for repulping only and are for use in the United States and Canada. Transactions covering shipments to or from other countries shall also be in accordance with these standards and practices, unless modified by mutual agreement between buyer and seller.

Basic to the success of any buyer-seller relationship is an atmosphere of "good faith."

In keeping with this, the following underlying principles have been accepted as necessary to the maintenance of amicable dealings:

1. Seller must use due diligence to ascertain that shipments consist of properly packed paper stock and that shipment is made during the period specified.
2. Arbitrary rejections, deductions and cancellations by the buyer are counter to acceptable good trade practice.
3. Seller shall deliver the quality of paper stock agreed upon but shall not be responsible for its use or the paper or paperboard manufactured therefrom.

I. The Purchase Agreement

Each transaction covering the purchase or sale of paper stock should be confirmed in writing and include agreement on the following items:

1. Quantity

   Where possible the quantity shall always be specified in terms of a definite number of tons of 2,000 lbs. each.

   a. If the quantity is specified in tons, the order shall be considered completed when aggregate shipments are 5% under or over the quantity ordered.

   b. If the quantity is specified in carloads, a carload is defined as not more than 10% above minimum weight agreed upon.

   c. If the quantity is specified in truckloads, unless otherwise agreed to, a truckload is defined as:

   A motor truck loaded to full visible capacity but the weight of the load shall not exceed legal limits.

2. Grade

   Where possible, each grade purchased shall be specified in accordance with the grade as defined in SECTION VI hereof.

3. Packing

   Whether units are to be bales, skids, rolls, pallets, boxes, or bundles should be stated. Where possible, approximate sizes or weights should be specified.

4. Price Units

   The price agreed upon shall be clearly stated in dollars and cents per 2,000 lb. ton or in dollars and cents per hundredweight.

5. Transportation Charge

   This shall be clearly indicated with the use of the phrases "f.o.b. shipping point" or "delivered destination" or "f.o.b. shipping point—($$$) freight allowed."

6. Shipping Instructions

   Shipping instructions should clearly specify shipping schedule, route, delivering carrier and destination.

7. Shipping Period

   The shipping period shall be understood to be within 30 days of date of order unless otherwise specified.

8. Terms

   Terms shall be "net cash 30 days after date of shipment" unless otherwise agreed upon.

9. Method of Invoicing

   Invoicing instructions shall be clearly stated.

II. Fulfillment By The Seller

Practices of the seller shall be in accordance with the following:

1. Acceptance

   An order is confirmed if verbal or written agreement or initial shipment is received by the buyer.

2. Grading

   Paper stock which is sold under the grade names appearing in SECTION VI shall be warranted to conform to those grading definitions.

3. Baling

   Each bale must be secured with a sufficient number of bale ties drawn tight to insure a satisfactory delivery.

4. Tare

   Sides and headers must be adequate to make a satisfactory delivery of the packing but must not be excessive, nor can they consist of prohibitive materials. The weight of skids or iron cores should be deducted from a gross invoice weight.

5. Identification

   The shipper should mark each individual bale as to weight and grade when possible.

6. Loading

   Paper stock shall be loaded as follows:

   a. Before they are loaded, cars and trucks shall be free from objectionable materials, odors, and have sound floors.

   b. Grades should be loaded in straight loads unless otherwise agreed to. When two or more grades are included in the same shipment, units of each grade should be kept together in a separate part of the car or truck.

   c. Paper stock must be loaded in a manner that will minimize shifting and breakage. Excessive breakage due to improper loading shall be cause for rejection.

7. Shipping Notice

A shipping notice or an invoice showing the date of shipment, car number and contents shall be mailed to the buyer within 24 hours of shipment. On request, a bill of lading should also be furnished.

8. Invoicing

Invoicing should conform to instructions on the order and include the following data:

a. Date of Shipment	f. Number of Bales, Rolls, etc.
b. Car or Truck Number	g. Quantity and Grade
c. Customer's Order Number	h. Price and Extension
d. Shipper's Invoice Number	i. Terms
e. F.O.B. Point	

9. Rejection

When a seller has been notified of a rejection, he must within 48 hours advise the buyer as to which of the following procedures he has decided upon:

a. Order reshipment of the material.

b. Require the opportunity to inspect the quality of the rejected material within three business days and during such period give buyer final disposition.

c. Agree with the buyer to a compromise acceptance and settlement.

d. Request the buyer to agree to submit the rejected shipment to arbitration.

III. Fulfillment By The Buyer

The practice of the buyer shall be in accordance with the following:

Unloading

After arrival of the shipment the buyer is to inspect the contents so far as possible while it is still loaded.

If the shipment appears to be in accordance with the order and shipping notice, the buyer shall proceed with the unloading.

Where the bales are tagged or labeled, the buyer shall keep an accurate tally by identifying each bale by number, grade and weight.

If the shipment does not appear to be in accordance with the order and shipping notices, or if the quality of the stock is not in accordance with specifications as agreed, the buyer shall immediately notify the seller of such rejection before unloading.

If during the process of unloading, any portion of the shipment not visible in the original inspection is not in accordance with specifications, shipping notice and order, that portion shall be set aside and the seller immediately notified of its rejection.

If at any time within 21 days after receipt of shipment the buyer upon opening the bales finds objectionable materials heretofore not visible, he shall have the right to reject the stock and shall immediately notify the seller.

In the event of any rejection, the buyer shall use due diligence to protect all controversial paper stock from external deterioration or contamination.

Settlement

In the event that the buyer does not intend to make settlement in accordance with the seller's shipping notice or invoice for reasons OTHER THAN QUALITY,

— the buyer shall within 10 days of unloading notify the seller of any necessary changes and shall furnish detailed information with regard to these changes.

IV. Miscellaneous Practices

1. Ownership

a. If the shipment is purchased "f.o.b. shipping point" and is in accordance with the agreement covering the transaction, it becomes the property of the buyer upon date of shipment.

b. If the shipment is purchased on a "delivered destination" basis and is in accordance with the agreement covering the transaction, it remains the property of the seller until it is delivered to the buyer by carrier.

c. If the shipment is purchased on an "f.o.b. shipping point-specified freight allowed" basis and is in accordance with the agreement covering the transaction, it becomes the property of the buyer upon date of shipment.

2. Demurrage Charges

a. Any demurrage accrued on a shipment due to the failure of the seller to ship in accordance with the order, except with respect to quality, is the liability of the seller.

b. In the event that a rejection for quality stands, any demurrage accruing on the shipment prior to notification to the seller shall be the buyer's liability.

c. In the event that negotiation of a substantiated rejection for quality results in agreement by the buyer to accept the shipment, then only the demurrage, following notification of rejection and including 24 hours after the agreement, becomes the liability of the seller. Demurrage accruing prior to and including the day of notification becomes the liability of the buyer.

3. Switching and Freight Charges

Any extra switching or excess freight charges accruing on a shipment due to the failure of the seller to protect the agreed upon minimum rail rate or to ship in accordance with the agreement, is the liability of the seller.

4. Weight Discrepancies

No debits, credits or adjustments shall be issued on any shipment of paper stock when the weight variation is 1% or less.

In the event that a discrepancy exceeds those mentioned above as 'allowable,' the buyer and seller shall exchange copies of unloading and loading records showing individual bale weights. In the event that both parties have such records, and errors cannot be determined, it is recommended that the weight closest to the public carrier's scale weight shall be assumed to be correct. In the absence of such records on the part of one of the parties, the records of the other party shall govern.

5. Moisture Content

a. All paper stock must be packed air dry. Where excess moisture is present in the shipment, the buyer has the right to reject it.

6. Replacement of Shipment

a. In the event that any shipment is rejected due to quality,

Whether or not the shipment is to be replaced is to be decided by mutual agreement between buyer and seller.

7. Promptness of Shipment

a. In the event that shipments are postponed,

(1) on instructions of the BUYER the seller shall have the option of extending the time limit of the order by the same number of days of the postponement, or of cancelling that portion of the order on which shipment was postponed. Seller shall promptly notify buyer of option selected.

(2) on instructions of the SELLER the buyer shall have the option of extending the time limit of the order by the same number of days of the postponement, or of cancelling that portion of the order on which shipment was postponed. Buyer shall promptly notify seller of option selected.

8. Outthrows

a. Outthrows shall be understood to be all papers that are so manufactured or treated or are in such form as to be unsuitable for consumption as the grade specified.

9. Prohibitive Materials

a. Any materials which by their presence in a packing of paper stock, in excess of the amount allowed, will make the packing unusable as the grade specified.

b. Any materials that may be damaging to equipment.

FOR EXAMPLE

It is important to note in connection with Items 8 and 9 above that a material can be classified as an "Outthrow" in one grade and as a "Prohibitive Material" in another grade.

Carbon paper, for instance, is "UNSUITABLE" in #2 Mixed Paper and is therefore classified as an "Outthrow"; whereas, it is "UNUSABLE" in White Ledger and in this case is classified as a "Prohibitive Material."

V. Arbitration

1. In the event of a total disagreement between buyer and seller, the dispute should be submitted to arbitration by a mutually satisfactory third party.
2. In all cases the cost of arbitration shall be borne by the party found to be at fault.

VI. Grade Definitions

The grade definitions described are definitions intended to define grades as they should be packed and graded. CONSIDERATION SHOULD BE GIVEN TO THE FACT THAT PAPER STOCK AS SUCH IS A SECONDARY MATERIAL PRODUCED MANUALLY AND MAY NOT BE TECHNICALLY PERFECT.

Any reference in these definitions to the word "soft" shall refer to short fibered stock consisting of predominantly soda pulp and/or hardwood fibres.

Any reference to the word "hard" shall refer to long fibered stock predominantly sulphite or sulphate made of softwood fibres.

OUTTHROWS

The term "Outthrows" as used throughout this section is defined as "all papers that are so manufactured or treated or are in such a form as to be unsuitable for consumption as the grade specified."

PROHIBITIVE MATERIALS

The term "Prohibitive Materials" as used throughout this section is defined as:

a. Any materials which by their presence in a packing of paper stock, in excess of the amount allowed, will make the packing unusable as the grade specified.

b. Any materials that may be damaging to equipment.

(See example under Section 9, Article IV)

Note: The maximum quantity of "Outthrows" indicated in connection with the following grade definitions is understood to be the TOTAL of "Outthrows" and "Prohibitive Materials."

(1) #2 — MIXED PAPER

Consists of a mixture of various qualities of paper not limited as to type of packing or fiber content.

Prohibitive materials may not exceed 2%

Total Outthrows may not exceed 10%

(2) #1 — MIXED PAPER

Consists of a baled mixture of various qualities of paper containing less than 25% of groundwood stock coated or uncoated.

Prohibitive materials may not exceed................1%
Total Outthrows may not exceed......................5%

(3) SUPER MIXED PAPER

Consists of a baled clean sorted mixture of various qualities of papers containing less than 10% of groundwood stock coated or uncoated.

Prohibitive materials may not exceed....½ of 1%
Total Outthrows may not exceed......................3%

(4) BOXBOARD CUTTINGS

Consists of baled new cuttings of paperboard such as are used in the manufacture of folding paper cartons, setup boxes and similar boxboard products.

Prohibitive materials may not exceed.... ½ of 1%
Total Outthrows may not exceed......................2%

(5) MILL WRAPPERS

Consists of baled wrappers used as outside wrappers for rolls, bundles or skids of finished paper.

Prohibitive materials may not exceed.... ½ of 1%
Total Outthrows may not exceed......................3%

(6) #1 — NEWS

Consists of baled newspapers containing less than 5% of other papers.

Prohibitive materials may not exceed....½ of 1%
Total Outthrows may not exceed......................2%

(7) SUPER NEWS

Consists of baled sorted fresh newspapers, not sunburned, free from papers other than news, containing not more than the normal percentage of rotogravure and colored sections.

Prohibitive materials......................None permitted
Total Outthrows may not exceed......................2%

(8) SPECIAL NEWS DE-INK QUALITY

Consists of baled sorted, fresh, dry newspapers, not sunburned, free from magazines, white blank, pressroom over-issues, and paper other than news, containing not more than the normal percentage of rotogravure and colored sections. This packing must be free from tare.

Prohibitive materials......................None permitted
Total Outthrows..¼ of 1%

(9) OVER-ISSUE NEWS

Consists of unused over-run regular newspapers printed on newsprint, baled or securely tied in bundles, containing not more than the normal percentage of rotogravure and colored sections.

Prohibitive materials......................None permitted
Total Outthrows............................None permitted

(10) SOLID FIBRE CONTAINERS

Consists of baled solid fibre containers having liners of either jute or kraft.

Prohibitive materials may not exceed................2%
Total Outthrows may not exceed......................5%

(11) CORRUGATED CONTAINERS

Consists of baled corrugated containers having liners of either jute or kraft.

Prohibitive materials may not exceed................1%
Total Outthrows may not exceed......................5%

(12) NEW CORRUGATED CUTTINGS

Consists of baled corrugated cuttings having two or more liners of either jute or kraft. Non-soluble adhesives, butt rolls, slabbed or hogged medium, and treated medium or liners are not acceptable in this grade.

Prohibitive materials may not exceed................1%
Total Outthrows may not exceed......................5%

(13) NEW DOUBLE KRAFT LINED CORRUGATED CUTTINGS

Consists of baled corrugated cuttings having all liners of kraft. Non-soluble adhesives, butt rolls, slabbed or hogged medium, and treated medium or liners are not acceptable in this grade.

Prohibitive materials......................None permitted
Total Outthrows may not exceed......................2%

(14) NEW KRAFT CORRUGATED CUTTINGS

Consists of baled corrugated cuttings having all liners of kraft. The corrugated medium must be either semi-chemical or other similar uniform medium. Non-soluble adhesives, butt rolls, slabbed or hogged medium, and treated medium or liners are not acceptable in this grade.

Prohibitive materials......................None permitted
Total Outthrows may not exceed......................2%

(15) #1 — USED BROWN KRAFT BAGS

Consists of baled brown kraft bags free of objectionable liners or contents.

Prohibitive materials......................None permitted
Total Outthrows may not exceed...........½ of 1%

(16) MIXED KRAFT BAGS

Consists of baled used kraft bags free from twisted or woven stock and other similar objectionable materials.

Prohibitive materials may not exceed................2%
Total Outthrows may not exceed......................5%

(17) SORTED BROWN KRAFT

Consists of baled clean sorted brown kraft papers free from twisted or woven stock, sewed edges and heavy printing.

Prohibitive materials....................None permitted
Total Outthrows may not exceed.....................2%

(18) NEW COLORED KRAFT

Consists of baled new colored kraft cuttings, sheets and bag waste, free of sewed or stitched papers.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(19) NEW BROWN KRAFT CUTTINGS

Consists of baled new unprinted brown kraft cuttings or sheets entirely free from sewed edges, twisted or woven stock.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(20) NEW BROWN KRAFT BAG WASTE

Consists of new brown kraft cuttings and sheets, including misprint bags. Stitched or sewed papers are not acceptable in this grade.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(21) NEW BROWN KRAFT ENVELOPE CUTTINGS

Consists of baled new unprinted brown kraft envelope cuttings or sheets.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(22) MIXED SHAVINGS

Consists of baled trim of magazines, catalogs and similar printed matter, not limited with respect to groundwood or coated stock, and may contain the bleed of cover and insert stock as well as beater-dyed papers and solid color printing.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................2%

(23) #1 — GROUNDWOOD SHAVINGS

Consists of baled trim of magazines, catalogs and similar printed matter free from beater-dyed papers, and may contain not over 5% of solid color printing.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(24) WHITE NEWSBLANKS

Consists of baled unprinted cuttings and sheets of white newsprint paper or other papers of white groundwood quality, free of coated stock.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(25) SUPER WHITE NEWSBLANKS

Consists of baled unprinted cuttings or sheets of white newsprint of uniform brightness and quality, free of coated stock.

Prohibitive materials....................None permitted
Total Outthrows may not exceed...........½ of 1%

(26) PUBLICATION BLANKS

Consists of baled unprinted cuttings or sheets of white coated or filled white groundwood content paper.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(27) #1 — FLYLEAF SHAVINGS

Consists of baled trim of magazines, catalogs and similar printed matter. It may contain the bleed of cover and insert stock to a maximum of 10% of dark colors, and must be made from predominantly bleached chemical fibre. Beater-dyed papers may not exceed 2%. Shavings of novel news or newsprint grades may not be included in this packing.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(28) #1 — SOFT WHITE SHAVINGS

Consists of baled shavings and sheets of all-white sulphite printing papers, free from printing. This grade may contain sulphite and sulphate papers having a small percentage of groundwood.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................1%

(29) SUPER SOFT WHITE SHAVINGS

Consists of baled shavings and sheets of all-white sulphite and sulphate printing papers of reasonably uniform brightness free from printing, but may contain not more than 5% of coated papers.

Prohibitive materials....................None permitted
Total Outthrows may not exceed...........½ of 1%

(30) HARD WHITE SHAVINGS

Consists of baled shavings or sheets of all untreated white bond ledger or writing papers. Must be free from printing and groundwood.

Prohibitive materials....................None permitted
Total Outthrows may not exceed...........½ of 1%

(31) HARD WHITE ENVELOPE CUTTINGS

Consists of baled envelope cuttings or sheets of untreated hard white papers free from printing and groundwood.

Prohibitive materials....................None permitted
Total Outthrows may not exceed...........½ of 1%

(32) SUPER HARD WHITE ENVELOPE CUTTINGS

Consists of baled cuttings or sheets of untreated white envelope papers of reasonably uniform brightness free from printing, groundwood and coated stock.

Prohibitive materials....................None permitted
Total Outthrows may not exceed...........½ of 1%

(33) NEW COLORED ENVELOPE CUTTINGS

Consists of baled untreated colored envelope cuttings, shavings or sheets of bleachable colored papers, predominantly sulphite or sulphate, free from all printing.

Prohibitive materials....................None permitted
Total Outthrows may not exceed......................2%

(34) SEMI BLEACHED ENVELOPE CUTTINGS

Consists of baled envelope cuttings, shavings or sheets of manila-colored papers predominately sulphite or sulphate, free from all printing.

Prohibitive materials......................None permitted
Total Outthrows may not exceed......................2%

(35) SUPER SEMI BLEACHED CUTTINGS

Consists of baled cuttings and sheets of untreated sulphite or sulphate papers free from printing.

Prohibitive materials......................None permitted
Total Outthrows may not exceed...........½ of 1%

(36) COLORED TABULATING CARDS

Consists of printed colored or manila cards predominantly sulphite or sulphate which have been manufactured for use in tabulating machines. Unbleached kraft cards are not acceptable.

Prohibitive materials......................None permitted
Total Outthrows may not exceed......................1%

(37) MANILA TABULATING CARDS

Consists of printed manila-colored cards, predominantly sulphite or sulphate, which have been manufactured for use in tabulating machines. This grade may contain manila-colored tabulating cards with tinted margins.

Prohibitive materials......................None permitted
Total Outthrows may not exceed........................1%

(38) #1 SORTED COLORED LEDGER

Consists of printed or unprinted sheets, shavings, and cuttings of colored or white sulphite or sulphate ledger, bond, writing, and other papers which have a similar fibre and filler content. This grade must be free of treated, coated, padded, or heavily printed stock.

Prohibitive materials......................None permitted
Total Outthrows may not exceed...................2%

(39) MANIFOLD COLORED LEDGER

Consists of sheets and side trim of new printed or unprinted colored or white sulphite or sulphate papers such as are used in the manufacturing of manifold forms, continuous forms, register forms, and similar printed papers. Those forms used once for machine data processing may be included. All stock must be untreated and uncoated.

Prohibitive materials......................None permitted
Total Outthrows may not exceed...................2%

(40) #1 SORTED WHITE LEDGER

Consists of printed or unprinted sheets, shavings, and cuttings of white sulphite or sulphate ledger, bond, writing, and other papers which have a similar fibre and filler content. This grade must be free of treated, coated, padded, or heavily printed stock.

Prohibitive materials......................None permitted
Total Outthrows may not exceed...................2%

(41) MANIFOLD WHITE LEDGER

Consists of sheets and side trim of new printed or unprinted white sulphite or sulphate papers such as are used in the manufacturing of manifold forms, continuous forms, register forms, and similar printed papers. Those forms used once for machine data processing may be included. All stock must be untreated and uncoated.

Prohibitive materials......................None permitted
Total Outthrows may not exceed...................2%

(42) #1 GRADED MAGAZINES

Consists of a mixture of dry, clean magazines only; free from newsprint magazines, pulpy magazines, novel news, comic books, pocket books, and all coarse or shivy papers. Movie magazines, television magazines, detective magazines and similar publications are not acceptable.

Prohibitive materials......................None permitted
Total Outthrows may not exceed...................2%

(43) #1 BOOK STOCK

Consists of bleached sulphite or sulphate papers, printed or unprinted in sheets, shavings, guillotined books, or quire waste. A small percentage of papers containing fine groundwood adulteration may be included.

Prohibitive materials......................None permitted
Total Outthrows may not exceed...................2%

(44) PRINTED BLEACHED SULPHATE CUTTINGS

Consists of printed bleached sulphate cuttings free from misprint sheets, printed cartons, wax, greaseproof lamination, gilt, and inks, adhesives or coatings that are non-soluble.

Prohibitive materials may not exceed....½ of 1%
Total Outthrows may not exceed......................2%

(45) MISPRINT BLEACHED SULPHATE

Consists of misprint sheets and printed cartons of bleached sulphate free from wax, greaseproof lamination, gilt, and inks, adhesives or coatings that are non-soluble.

Prohibitive materials may not exceed...............1%
Total Outthrows may not exceed......................2%

(46) UNPRINTED BLEACHED SULPHATE

Consists of unprinted bleached sulphate cuttings, sheets or rolls free from any printing, wax, greaseproof lamination or adhesives or coatings that are non-soluble.

Prohibitive materials......................None permitted
Total Outthrows may not exceed......................1%

SPECIALTY GRADES

The grades listed below are produced and traded in carload and truckload quantities throughout the United States and because of certain characteristics (i.e. the presence of wet strength, polycoatings, plastic, foil, carbon paper, hot melt glue) are not included in the regular grades of paper stock. However, it is recognized that many mills have special equipment and are able to utilize large quantities of the grades listed below. Since many paper mills around the world do use these specialty grades, they are being listed below with appropriate grade numbers for easy reference.

The Paper Stock Institute is not establishing specific specifications, which would refer to such factors as the type of wet strength agent used, the percentage of wax, the amount of polycoating, whether it is on top of or under the printing, etc. The specification for each grade should be determined between buyer and seller, and it is recommended that purchase be made based on sample.

These specialty grades are as follows:

1—S White Waxed Cup Cuttings
2—S Printed Waxed Cup Cuttings
3—S Plastic Coated Cups
4—S Polycoated Bleached Kraft—Unprinted
5—S Polycoated Bleached Kraft—Printed
6—S Polycoated Milk Carton Stock
7—S Polycoated Diaper Stock
8—S Polycoated Boxboard Cuttings
9—S Waxed Boxboard Cuttings
10—S Boxboard Cuttings containing Foil
11—S Waxed Corrugated Cuttings
12—S Wet Strength Corrugated Cuttings
13—S Asphalt Laminated Corrugated Cuttings
14—S Beer Carton Waste
15—S Kraft Carrier Cuttings, Wet Strength Treated
16—S White Wet Strength Waste
17—S Brown Wet Strength Waste
18—S Printed and/or Colored Wet Strength Waste
19—S White Glassine
20—S Chocolate Glassine
21—S Red Glassine
22—S Printed and/or Mixed Colored Glassine
23—S Flyleaf Shavings containing Hot Melt Glue
24—S Manifold Ledger containing Carbon Paper
25—S Books with covers
26—S Manila and Colored Tabulating Cards in small boxes on skids—unsorted (rubber bands, clips, and correction stickers not removed; percentage of manila cards to be predetermined by buyer.)

Official Copies of this Classification always carry the Association's Seal

APPENDIX C
to Section III

CONUS PAPER RECYCLING PLANTS

Excerpted from Condensed Report on DPDS-MMR Project C-75-34;
Recycled Paper, 1975

CONUS PAPER RECYCLING PLANTS

LOCATION	COMPANY	*PRODUCTS
Alabama		
Anniston	National Gypsum Co.	Gypsum board liner
Mobile	GAF Corp.	Roofing felt
	National Gypsum Co.	Insulation board
	Scott Paper Co.	Printing paper Specialty board Food board Tissue
	Stone Container Corp.	Boxboard, linerboard
Arkansas		
Bearden	Bear Brand Roofing Inc.	Roofing felt
Camden	Celotex Corp.	Roofing felt
Little Rock	A. R. Felt Mills Inc.	Roofing felt
California		
Antioch	Fibreboard Corp.	Corrugating medium, boxboard Boxboard
City of Industry	Sonoco Products Co.	Core and tube
Compton	Lloyd A. Fry Roofing Co.	Roofing felt
Los Angeles	Container Corp. of America	Box-linerboard, corrugating medium
	Federal Paper Board Co.	Boxboard
	Fibreboard Corp.	Containerboard, Boxboard
	Los Angeles Paper Box & Board Mills	Boxboard
Pittsburg	Johns-Manville Products Corp.	Roofing felt
Pomona	Sierra Tissue Co.	Wadding
Port Hueneme	Western Kraft Corp.	Corrugating Medium
Richmond	Certain-Teed Products	Roofing felt
	Sonoco Products Co.	Tube board
San Leandro	Kaiser Gypsum Co., Inc.	Chip-liner-box-board
Santa Clara	Container Corp of America	Boxboard
	Georgia-Pacific Corp.	Corrugating medium
South Gate	Anchor Paper Mills Inc.	Roofing felt
	U.S. Gypsum Co.	Felt newsboard, chipboard
Stockton	Fibreboard Corp.	Boxboard, linerboard
Vernon	The Flintkote Co.	Boxboard, Wallboard felt
Colorado		
Denver	Packaging Corp of	Linerboard boxboard

CONUS PAPER RECYCLING PLANTS CONTINUED

LOCATION	COMPANY	*PRODUCTS
Connecticut		
Manchester	Colonial Fiber Co.	
	Manchester Plant	Fiberboard
	Lydall & Foulds Div.	Combination boards
Montville	Federal Paper Board Co.	Folding boxboard
	Robertson Paper Box Co.	Folding boxboard
New Haven	Federal Paper Board Co.	Boxboard
	Simkins Industries Inc.	Folding boxboard
Rogers	Rogers Corp.	Fiberboard
Seymour	Seymour Paper Mills Inc.	Tissue
Stratford	Tilo Co., Inc.	Roofing felt
Versailles	Federal Paper Board Co.	Coated board
Florida		
Blountstown	Abitibi Corp.	Hardboard
Jacksonville	Lloyd A. Fry Roofing Co.	Felt
	United States Gypsum Co.	Gypsum board liner
Miami	Lloyd A. Fry Roofing Co.	Roofing felt
	Simkins Industries Inc.	Boxboard
Georgia		
Atlanta	Sonoco Products Co.	Tube board
Austell	Austell Box Board Corp.	Boxboard
Cedartown	Alton Box Board Co.	Boxboard
Savannah	Certain-Teed Products	Felt
	GAF Corp.	Felt
Illinois		
Alton	Alton Box Board Co.	Corrugating medium
Chicago	Bird & Son, Inc.	Felt
	Container Corp. of America	Liner, box container board
	Lloyd A. Fry Roofing Co.	Felt
	Western Electric Co.	Cable paper
East St. Louis	Certain-Teed Products	Felt
Freeport	Minnesota Mining & Mfg.	Cellulose specialties
Joliet	GAF Corp	Felt
Marseilles	Nabisco Inc.	Boxboard
Morris	Federal Paper Board	Paper board
Mount Carmel	The Flintkote Co.	Felt
Pekin	Quaker Oats Co.	Boxboard
Peoria	Bemis Co. Inc.	Kraft papers
Quincy	Celotex Corp	Felt
	Celotex Corp	Gypsum board

CONUS PAPER RECYCLING PLANTS CONTINUED

LOCATION	COMPANY	*PRODUCTS
Illinois (cont'd)		
Rockton	Sonoco Products Co.	Newsboard
Waukegan	Johns-Manville Products	Felt
Indiana		
Brookville	Lloyd A. Fry Roofing Co.	Felt
Brownstown	Keiffer Paper Mills Inc.	Chip & specialty board
Eaton	Clevepak Corp.	Chipboard
Indianapolis	Beverdige Paper Co.	Industrial specialty paper
Lafayette	Alton Box Board Co.	Laminated industrial board
Vincennes	Vincennes Paper MIlls	Tube stock
Iowa		
Tama	Packaging Corp. of America	Boxboard
Kansas		
Hutchinson	Packaging Corp. of America	Corrugating medium, linerboard
Lawrence	Kansas Fibreboard Inc.	Liner-container board
Phillipsburg	Royal Brand Roofing Inc.	Felt
Louisiana		
New Orleans	Southern Johns-Manville	Felt
Shreveport	Bird & Sons Inc.	Felt
Slidell	Slidell Felt Mills Inc.	Felt
Springhill	International Paper Co.	Container board
Maine		
Gardiner	Yorktowne Paper Mills of Maine, Inc.	Kraft board
Millinocket	Great Northern Paper Co.	Newsprint mill wrapper
Massachusetts		
Boston	Perkit Folding Box Corp.	Boxboard
East Walpole	Bird & Son Inc.	Building papers
	Hollingsworth & Vose Co.	Spec. industrial paper
Erving	Erving Paper Mills	Tissue
Fitchburg	James River-Fitchburg Inc.	Kraft specialty paper
Haverhill	Haverhill Paperboard Corp.	Kraft specialty paper

CONUS PAPER RECYCLING PLANTS CONTINUED

LOCATION	COMPANY	*PRODUCTS
Massachusetts cont'd		
Holyoke	Sonoco Products Co.	Specialty board
Lawrence	Lawrence Paperboard Corp.	Boxboard
Natick	Natick Paperbaord Copr Corp.	Boxboard
West Dudley	West Dudley Paper Co.	Boxboard
West Groton	Hollingsworth & Vose Co.	Specialty industrial papers
West Sprinfield	Strathmore Paper Co	Writing papers
Michigan		
Battle Creek	Michigan Carton Co. (St. Regis Paper Co.)	Boxboard
Constantine	Simplex Industries Inc.	Chipboard
Kalamazoo	Combination Paperboard Division	Boxboard
	National Gypsum Co.	Gypsum board
Monroe	Consolidated Packaging Corp.	Test line Corrugating medium Boxboard
	Time Container Corp.	Linerboard
	Union Camp Corp.	Linerboard, corrugating medium
Niles	Simplicity Pattern Co.	Pattern tissue
Otsego	Mead Corp.	Boxboard
Palmyra	Simplex Industries Inc.	Binderboard boxboard
Rockford	Rockford Paper Mills Inc.	Boxboard
White Pigeon	Weyerhaeuser Co. Paperboard Div.	Boxboards
Minnesota		
Duluth	Superwood Corp.	Hardboard
Minneapolis	Certain-Teed Products	Felt
Shakopee	Certain-Teed Products	Felt
Tama	Packaging Corp. of America	Boxboard
MIssissippi		
Meridian	Masonite Corp.	Felts
Monticello	St. Regis Paper Co.	Linerboard Kraft papers
Missouri		
Joplin	Tamko Asphalt Products	Felt
Kansas City	GAF Corp	Felt
N. Kansas City	Lloyd A. Fry Roofing	Felt

CONUS PAPER RECYCLING PLANTS CONTINUED

LOCATION	COMPANY	*PRODUCTS
New Hampshire		
Ashuelot	Paper Service Mills Inc.	Tissue
Claremont	Coy Paper Co.	Tissue
Hinsdale	Paper Service Mills Inc.	Tissue
	G. E. Roberston & Co	Tissue
Tilton	Johns-Manville Products	Electrical products
W. Hopkinton	USM Corp.	Chipboard
New Jersey		
Camden	Kaiser Gypsum Co. Inc.	Kraft pulp boards
	Latex Fibre Industries	Specialty fiberboard products
Clifton	Whippany Paper Board Co.	Liner boxboard
Delair	Georgia-Pacific Corp.	Gypsum board liners
Garwood	National Gypsum Co.	Gypsum board liners
Gloucester City	GAF Corp.	Felts
Jersey City	John F. Boyle Co.	Newsboard
	U.S. Gypsum Co.	Felts
Kearney	Western Electric Co.	Insulation paper
Linden	Celatex Corp.	Asbestos products
Manville	Johns-Manville Products	Asbestos felts
Mount Holly	McGraw Edison Co.	Fiber pipe
Newark	Newark Boxboard Co.	News, specialty paper
Paterson	Morris Paper Board Co.	Folding boxboard
Perth Amboy	Celatex Corp.	Felt
Ridgefield	Lowe Paper Co.	Folding boxboard
Ridgefield Park	Lincoln Paper Co.	Cylinder board
Warren Glen	Riegel Products Corp.	Kraft products
Whippany	Whippany Paper Board Co. Eden Mill	Corrugating medium liner boxboard
	Hanover Mill	Boxboard, specialty boards
	Stony Brook Mill	Boxboard, specialty boards
New York		
Amsterdam	Sonoco Products Co.	Kraft paper
Beaver Falls	Latex Fiber Industries	Specialty automotive products
	Latex Fiber Industries	Combination board various papers
Brownville	Latex Fiber Industries	Various kraft products
Carthage	Climax Mfg. Co.	Boxboard
Castleton-on-Hudson	Brown Co.	Folding boxboard

CONUS PAPER RECYCLING PLANTS CONTINUED

LOCATION	COMPANY	*PRODUCTS
New York cont'd		
Chatham	Columbia Corp.	Various printing products
Corinth	International Paper Co.	Groundwood printing paper
Fayetteville	McIntyre Bros. Paper Co.	Kraft paper
Fulton	Armstrong Cork Co.	Felt
	North End Paper Co.	Wrapping paper
	Sealright Co. Inc.	Food container board
Green Island	Manning Paper Co.	Fiber paper, specialty papers
Greenwich	Stevens & Thompson Paper Co.	Tissue
Hoosick Falls	Wood Flong Corp.	Stereotype matrix
Lockport	Beaverboard Co. Inc.	Linerboard
Marcellus Falls	Martisco Paper Co.	Grey bogus
Napanoch	Roundout Corp.	Tissue
N. Tonawanda	Boundary Paper Mills Inc.	Linerboard
Oakfield	U.S. Gypsum Co.	Gypsum board
Penn Yan	Pen Yan Paper Products	Felt
Piermont	Clevepak Corp.	Linerboard
Red Hook	Atlantic Asbestos Corp.	Asbestos
Rock City Falls	Cottrell Paper Co. Inc.	Insulation board
Utica	Foster Paper Co. Inc.	Combination board
Walloomsac	Columbia Corp.	Chipboard, various papers
North Carolina		
Alma	Paramount Paper Products	Cellulose webbing
Charlotte	Carolina Paper Board	Boxboard
Morehead City	Lloyd A. Fry Roofing Co.	Felt
Patterson	Cellu Products Co.	Tissue
Roanoke Rapids	Federal Paper Board Co.	Chipboard
Rockingham	Goodwin Paper Mills Inc.	Tissue
Ohio		
Avery	Certain-Teed Products	Felt
Baltimore	Crown-Zellerback Corp.	Corrugating
medium		
Chagrin Falls	Chase Bag Co.	Specialty industrial paper
Cincinnati	Celotex Corp.	Felt
	Container Corp. of America	Liner and boxboard
Franklin	Logan-Long Co.	Felt asphalt roofing and siding
	Stone Container Corp.	Folding boxboard

CONUS PAPER RECYCLING PLANTS CONTINUED

LOCATION	COMPANY	*PRODUCTS
Ohio cont'd		
Gypsum	U.S. Gypsum Co.	Plaster board products
Hamilton	Nicolet Industries Inc.	Gasket papers
Lancaster	Loroco Industries Inc.	Linerboard
Lockland	Diamond International	Folding boxboard
	Fox Paper Co.	Specialty kraft papers
Massillon	Stark County Paper Co.	Chipboard
Miamisburg	Interstate Folding Box Co.	Boxboard
Middletown	Diamond International Paperboard Division	Folding boxboard
	Middleton Paperboard Co.	Chip--kraft board
Munroe Falls	Sonoco Products Co.	Tube board
Rittman	Packaging Corp. of America	Box-linerboard kraft
Steubenville	Federal Paperboard Co.	Corrugating medium boxboard
Toronto	Toronto Paperboard	Tube board
Oklahoma		
Ardmore	Big Chief Roofing Co.	Felts
Pryor	Georgia-Pacific Corp.	Gypsum board liner Felt
	National Gypsum Co.	Gypsum board liner
Stroud	Allied Materials Corp.	Felt
Corvalis	McGraw-Edison Co.	Fiber pipe
Oregon		
Portland	Bird & Son, Inc. of Mass.	Felt
	Lloyd A. Fry Roofing Co.	Felt
Pennsylvania		
Ambler	Nicolet Industries Inc.	Asbestos millboard
Chambersburg	U.S. Paper Mills	Tissue
Delaware Water Gap	Packaging Corp. of America	Chipboard
Downington	Brandywine Paper Corp.	Tube, specialty papers
	Sonoco Products Co.	Combination newsboard
Emmaus	LLoyd A. Fry Roofing Co.	Felt
Erie	GAF Corp.	Asbestos
Lancaster	American Paper Products	Newsboard
Milton	National Gypsum Co.	Gypsum board liner
Norristown	Nicolet Indus. Inc.	Asbestos felt
Paxinos	Cellu-Products Co.	Tissue

CONUS PAPER RECYCLING PLANTS CONTINUED

LOCATIONS	COMPANY	*PRODUCTS
Pennsylvania cont'd		
Philadelphia	Container Corp. of America	Boxboard
	Crown Paper Board Co.	Combination chipboard
	Newman & Co., Inc.	Boxboard
Reading	Federal Paper Board Co.	Folding boxboard
	Interstate Intercorr Corp.	Corrugating medium
York	Certain-Teed Products	Felt
	St. Regis Paper Co.	Corrugating
	Yorktown Paper Mills	Boxboard
Pureto Rico		
Arecibo	Pan American Paper Mill Inc.	Corrugating medium
Rhode Island		
Phillipsdale	Bird & Son, Inc.	Felt
South Carolina		
Hartsville	Sonoco Products Co.	Corrugating medium Packaging board
Taylors	Carotell Paper Board	Chipboard newsboard
Tennessee		
Chattanooga	Container Corp. of America	Tube and liner board
	Tennessee Paper Mills	Boxboard
Memphis	Celotex Corp.	Felt
	Lloyd A. Fry Roofing Co.	Felt
Newport	Sonoco Products Co.	Cone and tube board
Texas		
Dallas	GAF Corp.	Felt
	TXI Paper Products Inc.	Boxboard
Evadale	Eastex Inc.	Boxboard
Fort Worth	Southern Johns-Manville	Felt
Galena Park	U.S. Gypsum Co.	Gypsum linerboard
Houston	Celotex Corp.	Felts
	Lloyd A. Fry Roofing Co.	Felts
Irving	Lloyd A. Fry Roofing Co.	Felts
San Antonio	Celotex Corp.	Felt
Sherman	McGraw Edison Co.	Fiber pipe
Vermont		
Brattleboro	Boise Cascade Corp.	Specialty paperboard

CONUS PAPER RECYCLING PLANTS CONTINUED

LOCATIONS	COMPANY	*PRODUCTS
Vermont cont'd		
N. Bennington	Vermont Tissue Paper	Tissue
Putney	Putney Paper Co., Inc.	Tissue
Sheldon Springs	Standard Packaging Corp.	Paperboard
St. Johnsbury	EHV-Weidmann Industries	Fiberboard
Virginia		
Hopewell	Continental Can Co.	Linerboard, corrugating medium boxboard
Jarratt	Southern Johns-Manville Products Corp.	Insulation board
Lynchburg	Mead Corp.	Corrugating medium
Richmond	Federal Paper Board Co.	
	Seaboard Mill	Boxboard
	Southern Mill	Boxboard
Washington		
Bellingham	Georgia-Pacific Corp.	Tissue coated boards
Port Angeles	Fibreboard Corp	Coated boxboard
Port Townsend	Crown Zellerback Corp.	Container board
Sumner	Fibreboard Corp.	Coated boxboard
Tacoma	Container Corp. of America	Linerboard
West Virginia		
Halltown	Halltown Paperboard Co.	Chipboards
Wellsburg	Banner Fibreboard Co.	Linerboard
	S. George Co.	Kraft shipping paper
Wisconsin		
Beloit	Beloit Box Board Co.	Packaging materials
Cornell	The Flintkote Co.	Felt
Milwaukee	St. Regis Paper Co.	Boxboard
West Bend	McGraw Edison Co.	Fiber pipe
Wisconsin Rapids	Consolidated Papers Inc.	Enamel book
	Wisconsin Rapids Div.	Boxliner board
	Biron Div.	Enamel book

*General benchmarks for scrap paper use are as follows:

Product	Primary Wastepaper Type Used
Printing paper, tissue	High grade, e.g. discarded printing paper
Newsprint	Old newspapers
Linerboard, corrugating medium	Corrugated containers
Boxboard, chipboard	Corrugated containers, old newspaper, mixed paper, high grades
Construction paper and board	Mixed paper, old newspaper, corrugated containers, high grades

APPENDIX D

DLA Partial Full-Service Contract
For McChord AFB

DEPARTMENT OF DEFENSE

DEFENSE LOGISTICS AGENCY

Term Sale 41-9237

BID OPENING:

10 April 1979

SEALED BID

High Grade Waste Paper

SALE SITE:

For Sale Site & Mailing Address See Page 7

FOR FURTHER INFORMATION SEE INSIDE

DEFENSE PROPERTY DISPOSAL REGION
POST OFFICE BOX 53
DEFENSE DEPOT OGDEN STATION
OGDEN, UTAH 84407

OFFICE HOURS: 7:00 A.M. to 3:30 P.M.
CURRENT AND FUTURE SALES INFORMATION-PHONE: A/C 801, 399-7773

HIGH BID INFORMATION WILL NOT BE FURNISHED BIDDER UNTIL AFTER AWARDS HAVE BEEN MADE. (See Paragraph 8, Page 1 of Sale by Reference).
HIGH BID INFORMATION, PAYMENTS, REFUNDS, CONTRACTING OFFICER(S). PHONE: A/C 801, 399-7942

PROPERTY LOCATION AND CONTACT :

ITEM 1
Defense Property Holding Activity
McChord Air Force Base,
Tacoma, WA. 98438
Viola Rouse
Phone: A/C 206, 984-5656

SCOPE OF SALE

This Invitation for Bids is being issued to bidders who may wish to submit bids for the purchase of accumulations of high-grade waste paper (defined elsewhere herein, see Paragraph 30, Page 3) which will be generated in the operation of Government administrative facilities. The high-grade waste paper being offered for sale by this Invitation will be generated by certain administrative offices located on McChord Air Force Base, Tacoma, Washington. The contract awarded pursuant to the Invitation for Bids will be for a period of three years from date of award. Award under this Invitation will not grant the successful bidder exclusive rights to all waste paper products generated in the stated locations but such will be limited to "high-grade waste paper". Estimated tonnage of the high-grade waste paper to be generated is based on the best available information to the Government at the time of preparation of this Invitation. The Government does not guarantee the accuracy of these estimates. Payment will be made on the basis of actual tonnage delivered.

The Government will provide a "Desk Top Container" to each employee who is identified as a generator of high-grade waste paper for use in segregating high-grade waste paper from other paper products. The Government will collect and transport the paper so segregated from the "Desk Top Containers" to reusable "Secondary Containers" which are to be provided by the contractor. The Government will also transport the "Secondary Containers" to a single collection point where they will be emptied into the contractor provided "Shipping Containers" which will be used by the contractor to effect removal of the waste paper from the base.

DPDS Form 82
Mar 78

ADDITIONAL GENERAL INFORMATION AND INSTRUCTIONS
SEALED BID

(See DPDS pamphlet, "Sale by Reference, January 1978", for General Information and Instructions 1 thru 22.)

23. SUBMISSION OF BIDS. Bids must be in the possession of the Sales Contracting Officer by the hour (exact time) specified for the bid opening. Bids must be submitted on the bid forms provided in this Invitation, prepared in ink, indelible pencil or typewritten, and signed by the person submitting the bid. Envelopes containing the bids must be sealed and identified by the name and address of the bidder, the number of the sale, and the date and hour of the bid opening — see following format:

NAME (Use same NAME and ADDRESS as on BID form)	Postage Required
ADDRESS	
CITY STATE ZIP CODE	
	Sales Contracting Officer Defense Property Disposal Region P. O. Box 53 Defense Depot Ogden Station Ogden, Utah 84407
BID – SALE NO. 41-9237	
OPENING DATE 10 Apr. 79 TIME 9:00 A.M.	
BIDDER IDENTIFICATION NO. (If assigned)	

ENVELOPE PREPARED AS ABOVE ASSURES PROMPT IDENTIFICATION AND PROCESSING OF BID

CAUTION! *Do NOT mail bids to DoD Surplus Sales, P. O. Box 1370, Battle Creek, Michigan*

24. MAILING ADDRESS FOR BIDS. The mailing address shown in the above sample is the International mailing address of the sales office. Users of the U.S. Postal System may address and mail their bid to the Sales Contracting Officer, Defense Property Disposal Region, P. O. Box 53, Defense Depot Ogden Station, Ogden, Utah 84407.

25. HAND-CARRIED BIDS. Deliver to the Sales Contracting Officer at Defense Property Disposal Region Ogden, Defense Depot Ogden, Bldg. 2A, Ogden, Utah.

26. TELEGRAPHIC MODIFICATIONS OF BIDS. Telegraphic modifications (or withdrawals) of bids are to be sent to the Sales Contracting Officer, Defense Property Disposal Region, Telex No. 388-351, answer back Code DPDR OGED Defense Depot Ogden, Utah and must be received prior to time set for bid opening.

27. INSPECTION DATE AND TIME. 23 March 1979 ———————————————— (EXCLUDING SATURDAYS, SUNDAYS, AND FEDERAL/NATIONAL HOLIDAYS). INSPECTION HOURS: 8:00 A.M. to 3:00 P.M.

28. ACCOUNTS DUE. There shall be such accounting as may be necessary to comply with General Condition No. 6, entitled payment. Normally, accounting for property will be accomplished on or before the tenth day following the end of each month, provided however, that more frequent accounting may be necessary for property removed or to be removed. Immediately upon receipt of a Statement of Account any amount due shall be remitted to the Treasurer of the United States and mailed to the Sales Contracting Officer, Defense Property Disposal Region, P. O. Box 53, Defense Depot Ogden Station, Ogden, Utah 84407.

29. There will be one (1) pickup point for all accumulated paper. This will be inside storage in south end of Bldg. No. 501, McChord Air Force Base, WA.

30. SPECIAL DEFINITION - HIGH-GRADE WASTE PAPER.
White ledger, as used herein, consists of all white sheets and shavings of untreated ledger bond, writing papers, and other hard papers which have similar fiber content, and must be free of solid color printing. This grade may contain sulphite paper containing a trace of groundwood. For purposes of this bid, it also may include manila tabulating cards and computer printout which are not separated at data processing and similar facilities. Contamination will not exceed 2% of the delivered weight.

(Edition of Jan 78 can be used.)

DPDS Form 83-1
Jan 78

TERM IFB 41-9237

CONDITIONS OF SALE - SEALED BID-TERM

The General Information and Instructions and General and Special Conditions of Sale are hereby incorporated by reference and become a part of this Invitation for Bids and any contract resulting from acceptance of bid submitted pursuant to this Invitation for Bids as fully as though such Instructions, Terms and Conditions had been specifically set forth herein. The Instructions, Terms and Conditions are contained in Defense Property Disposal Service pamphlet entitled "Sale by Reference – Instructions, Terms and Conditions Applicable to Department of Defense Personal Property Offered By Defense Property Disposal Service, dated January 1978," and may be obtained upon request from DoD Surplus Sales, P. O. Box 1370, Battle Creek, Michigan 49016. Copies are also available for review at any activity of the Defense Property Disposal Service. The specific Instructions, Terms and Conditions applicable to this sale are as follows:

DPDS pamphlet, "Sale by Reference, January 1978":

Part 1: General Information and Instructions (DPDS Form 81, Jan 78), Complete.

Part 2: General Sale Terms and Conditions (Standard Form 114C, Mar 74 ed., and DPDS Form 84, Jan 78), All Conditions.

Part 4: Special Sealed Bid–Term Conditions (Standard Form 114C-2, Jan 70 ed.), All Conditions. Bidder's particular attention is drawn to Condition A which reads as follows:

"A. BID DEPOSITS. All bids must be accompanied by a bid deposit which must be in the possession of the Contracting Officer by the time set for bid opening. Bid deposits shall be in the form prescribed in Condition No. 4, General Sale Terms and Conditions (Standard Form 114C). Unless otherwise provided in the Invitation, a bid deposit of 20% of the estimated total contract price is required on sales not exceeding one year; sales exceeding one year's duration will require a bid deposit computed at 20% of the estimated total price estimated for one year's removal of property. Deposit Bond–Individual Invitation, Sale of Government Personal Property (Standard Form 150), or Deposit Bond–Annual, Sale of Government Personal Property (Standard Form 151) are NOT acceptable as bid deposits. In accordance with Condition No. 6 of the General Sale Terms and Conditions entitled "Payment" (Standard Form 114C), the 20% bid deposit submitted by the Purchaser will be retained by the Government and applied against the last delivery effected under the contract. At the option of the successful bidder, a Performance Bond (Standard Form 25) may be substituted by the successful bidder for his bid deposit at any time after notification of award of the contract. Any bid which is not timely supported by a proper bid deposit may be rejected as nonresponsive. Any bid deposit received after bid opening will be considered in the same manner as late bids."

Part 7 : Special Circumstance Conditions (DPDS Form 86). As specified in item description.

IN ADDITION TO THE ABOVE, THE FOLLOWING IS ALSO INCORPORATED AS PART OF THIS SALE:

ARTICLE BA: <u>BID PRICE EVALUATION AND BID DEPOSIT COMPUTATION</u>: The following market prices indicated for the listed items will be used as a basis for evaluation of bid prices and for computation of the required 20% deposit:

A. Market prices taken from Mill Trade Journal (Los Angeles/San Francisco Market). Published Monday 12 March 1979.

Item 1 ———— $ 95.00 White Ledger

B. Sample Bid Deposit Computation for Item 1

Market Price Per Net Ton ————	$ 95.00
Percent of Market Price Bid ————	80%
Bid Price Per Net Ton ————	$ 76.00 Per Net Ton
Multiplied by Estimated Generation For One Year ————	70 Net Ton
	$5320.00 Total Contract Price 1 Year
Multiplied by 20% ————	20%
Required Bid Deposit ————	$1064.00

ARTICLE BB: PRICE DETERMINATION:

A. The following publication will be used as a basis for determining the bid price of each item to be included in Statement of Account. Bid prices will be based on the highest quotation published for each item as indicated in the Los Angeles/San Francisco Market quoted in the Mill Trade Journal for the Third Monday of each month in which deliveries are made.

B. In the event no market prices are published as specified above, market prices quoted in the first subsequent publication will be used.

CONTINUED

Replaces DPDS Form 83-1, Apr 76, and DPDS Form 117, Oct 74, which are obsolete.

CONDITIONS OF SALE - CONTINUED

ARTICLE BC: SECONDARY CONTAINERS. The contractor shall provide 100 each secondary containers for use by the Government in effecting removal of the waste paper to the shipping point designated in Paragraph 29, Page 3 of this Invitation for Bid. The secondary containers required by this provision shall be fiberboard/cardboard, of a quality suitable for the intended use. The containers shall be of a top-loading box design and solid in color. Top flaps are not required; however, if the containers provided have top flaps, they will be folded inward to provide an open top. Maximum outer dimensions shall be 16" X 12" X 12" (length, width, height). The containers shall have no projections which might cause injury and shall be clearly labeled for use only in the recycling program for the accumulation of high-grade waste paper. Such containers will remain the property of the contractor, will be replaced as necessary during the performance of the contract and will be removed by the contractor upon completion of the contract.

ARTICLE BD: SHIPPING CONTAINERS. The contractor will be required to furnish shipping containers for use in the designated storage area for storage of accumulation of waste paper prior to removal by the contractor.

ARTICLE BE: TRAINING SESSIONS. The contractor will be required to participate with Government Personnel in effecting an educational program for those individuals identified by the Government as generators of high-grade waste paper. At the contractor's option, the Government will provide training aids for such educational programs (training sessions). (Six) 6 training sessions shall be scheduled for presentation to participating Government personnel as soon as possible after date of award but in no event later than thirty (30) days thereafter. Such training sessions will be held at McChord Air Force Base Theater and will consist of visual aids, written materials, or other educational devices deemed necessary to assure satisfactory separation of high-grade waste paper. The training sessions shall be held on a periodic basis thereafter, but no less frequently than every six months.

DPDS Form 85
Jan 78

TERM IFB 41-9237

LOADING TABLE

(See DPDS pamphlet, "Sale by Reference, January 1978", Part 2, Condition No. 8, Standard Form 114C.)

LOADING LEGEND

I – Government will load

(a) Rail
(b) Truck or Trailer

II – Government will load - open top conveyance only

(a) Rail
(b) Truck or Trailer

III – Purchaser must load (no government assistance)

(a) Rail facilities available adjacent to property
(b) Rail facilities available on the installation but remote from property
(c) No rail facilities available

IV -- Other

LOADING HOURS: 8:00 A.M. to 3:00 P.M.

ITEM	LOCATION	LOADING LEGEND
1	McChord AFB	III (c) See Note below

NOTE:

REMOVAL - Material will be removed within three days after notification that property is available for removal. The contractor has an option to make pickup any time prior to notification, provided a 24-hour notice is given. Contractor must furnish replacement container at time of removal.

WEIGHING - Shall be under the supervision of the Government, McChord Air Force Base, Washington.

Replaces DPDS Form 85, Jun 76, and DPDS Form 119, Oct 74, which are obsolete

TERM IFB 41-9237

22-R-173 RETURN WITH BID to DPDR OGDEN

SALE OF GOVERNMENT PROPERTY—BID AND AWARD

INVITATION FOR BIDS NO.

PAGE NO.

ISSUED BY
DEFENSE PROPERTY DISPOSAL REGION OGDEN
P.O. BOX 53
DEFENSE DEPOT OGDEN STATION
OGDEN, UTAH 84407

ADDRESS YOUR BID TO SALES CONTRACTING OFFICER
DEFENSE PROPERTY DISPOSAL REGION OGDEN
P.O. BOX 53
DEFENSE DEPOT OGDEN STATION
OGDEN, UTAH 84407

FOR INFORMATION CONTACT *(Name & tel. no.)*
SEE INSIDE FRONT COVER

BIDS WILL BE OPENED AT *(Place, date and time)*
DEFENSE PROPERTY DISPOSAL REGION OGDEN
DEFENSE DEPOT OGDEN, BLDG. 2A, OGDEN, UTAH
10 APRIL 1979 - 9:00 A.M.

Sealed bids in one copy(ies) for purchasing any or all items listed on the accompanying schedule, will be received at the place designated above until the date and time specified above and at that time publicly opened, subject to: (1) The General Sale Terms and Conditions, SF 114C, Jan 1970 ed.; and Special Sealed Bid Conditions, SF 114C-1, Jan 1970 ed. ☐; Special Sealed Bid-Term Conditions SF 114C-2, Mar. 74 ed. ☒; all incorporated herein by reference; and such other special terms and conditions ☒ attached or ☒ incorporated herein by reference and identified as (See pages 4 and 5 of this IFB) (Copies of these forms, unless attached hereto, are on file at the issuing office and will be made available upon request.) (2) BID DEPOSIT ☐ IS NOT REQUIRED; ☒ IS REQUIRED IN AN AMOUNT NOT LESS THAN 20 % OF THE TOTAL BID, MADE PAYABLE TO:
TREASURER OF THE UNITED STATES.
(3) Bidder is required to pay for any or all of the items listed on the Item Bid page(s) as part of this Bid, at the price set opposite each item, and to remove the property within * calendar days after date of award by the Government.
*FOR DURATION SEE ITEM BID PAGE, FOR REMOVAL SEE LOADING TABLE

BID *(This section to be completed by the Bidder)*

In compliance with the above, the undersigned offers and agrees, if this Bid is accepted within ________ calendar days (60 calendar days if no period is specified by the Government or the Bidder, but not less than 10 calendar days in any case) after date of Bid opening, to pay for and remove the property. The total amount of the Bid(s) is $________ and attached is the bid deposit, when required by the Invitation, in the form(s) of ________________, in the amount of $________.

BIDDER REPRESENTS THAT: *(Check appropriate boxes)*

(1) He ☐ has, ☐ has not, inspected the property on which he is bidding.

(2) He ☐ is, ☐ is not, an individual or a small business concern. (See CFR, Title 13, Chapter 1, Part 121, Sec. 121.3-9, for the definition of small business.) *(Complete the following only if the total amount of the bid(s) exceeds $25,000.)*

(3) (a) He ☐ has, ☐ has not, employed or retained any company or person (other than a full-time, bona fide employee working solely for the Bidder) to solicit or secure this contract, and (b) he ☐ has, ☐ has not, paid or agreed to pay any company or person (other than a full-time, bona fide employee working solely for the Bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer. (For interpretation of the representation, including the term "bona fide employee", see CFR, Title 41, Subpart 101-45.3.)

NAME AND ADDRESS OF BIDDER *(Street, city, state & ZIP Code)* *(Type or print)* (Use same address on envelope)

TELEPHONE NUMBER:

BIDDER IDENTIFICATION NO. *(If applicable)*:

SIGNATURE OF PERSON AUTHORIZED TO SIGN THIS BID

SIGNER'S NAME & TITLE *(Type or print)*

DATE OF BID

ACCEPTANCE BY THE GOVERNMENT *(This section for Government use only)*

ACCEPTED AS TO ITEM(S) NUMBERED
(FOR ACCEPTANCE INFORMATION SEE DPDS FORM 1427 ATTACHED)

UNITED STATES OF AMERICA
BY
(Contracting Officer)

DATE OF ACCEPTANCE

TOTAL AMOUNT

CONTRACT NUMBER(S)

NAME AND TITLE OF CONTRACTING OFFICER

BUDGET BUREAU NO. 29-R0022

(FORM CONTENT COMPLETELY REVISED)

(DPDR-OMM Mar 76)

GPO 1970 OF—390-461 (32-81)

STANDARD FORM 114
JAN 1970 EDITION
General Services Administration
FPMR (41 CFR) 101-45.3
114-108

BIDS SUBJECT TO TERMS OF TERM IFB 41-9237

RETURN TO DPDR OGDEN

SALE OF GOVERNMENT PROPERTY—ITEM BID PAGE—SEALED BID

IFB NUMBER | PAGE

ITEM NO.	ARTICLES FOR SALE	QUANTITY (No. of Units)	UNIT OF MEASURE	PRICE BID PER UNIT	TOTAL PRICE BID DOLLARS	CTS	ITEM NO.
	IT HAS BEEN DETERMINED THAT THIS PROPERTY IS NO LONGER NEEDED BY THE FEDERAL GOVERNMENT						
	DURATION: FOR ITEM 1 THE CONTRACT PERIOD IS 10 APRIL 1979 THRU 9 APRIL 1982, BOTH DATES INCLUSIVE, UNLESS SOONER COMPLETED UPON DELIVERY OF THE MAXIMUM QUANTITY DELIVERABLE UNDER THE CONTRACT PURSUANT TO CONDITION D, ADJUSTMENT FOR VARIATION IN QUANTITY OR WEIGHT, OR TERMINATED BY EITHER PARTY PURSUANT TO CONIDTION E, TERMINATION.						
	ITEM 1 IS LOCATED AT McCHORD AIR FORCE BASE, TACOMA, WASHINGTON 98438						
1.	HIGH GRADE WASTE PAPER: Including white sheets of untreated bond, writing paper, shavings and cuttings of sulphite, all other paper with a similar fiber and filler content, blueline paper. This may also include manila tabulating cards and computer printout which are not separated at data processing and similar facilities. Contamination will not exceed 2% of the delivered weight. Inside - Bldg 501, McChord AFB, WA. A02A*A Article AB: Liability and Insurance applies	210	NET TON	The price which the bidder agrees to pay per net ton is ______percent of the Los Angeles and San Francisco Market for White Ledger. DO NOT SHOW DOLLAR AMOUNT			1.

IMPORTANT NOTICE: PROVIDE YOUR BIDDER ID NO., SALE NO. AND BID OPENING DATE ON THE FACE OF THE ENVELOPE AS SHOWN IN THE EXAMPLE IN THIS IFB. IT IS IMPORTANT TO YOU AS WELL AS TO THE GOVERNMENT.

BID NO.—TO BE FILLED IN BY SALES OFFICE	NAME OF BIDDER AND IDENTIFICATION NO., IF APPLICABLE *(Type or print)*
-	

BUDGET BUREAU NO. 29-R0022

(FORM CONTENT COMPLETELY REVISED)

PAGE NO. 8

STANDARD FORM 114B
JAN. 1970 EDITION
General Services Administration
FPMR (41 CFR)101-45.3
114-305

APPENDIX E

GSA Term Contract For High
Quality White Paper

GSA GUARANTEES DESCRIPTIONS

GENERAL SERVICES ADMINISTRATION

SALE GOVERNMENT PERSONAL PROPERTY

GENERAL SERVICES ADMINISTRATION

Sealed Bid TERM CONTRACT FOR HIGH QUALITY WHITE PAPER SOURCE SEPARATION PROGRAM

Sale No. 8FWS-78-22

Bid Opening December 6, 1977

DENVER REGION

GSA FORM 2554 (REV. 11-73)

RETURN WITH BID

SALE OF GOVERNMENT PROPERTY—BID AND AWARD

INVITATION FOR BIDS NO. 8FWS-78-22

PAGE NO. 3

ISSUED BY General Services Administration
Region 8-Sales Branch-8FWS
P.O. Box 25006, DFC
Denver, CO 80225

ADDRESS YOUR BID TO
GSA-Business Service Center
P.O. Box 25006, DFC
Denver, CO 80225

FOR INFORMATION CONTACT *(Name & tel. no.)*
Frank Stapleton
GSA-Sales Branch
(303) 234-3962

BIDS WILL BE OPENED AT *(Place, date and time)*
GSA-Business Service Center
Building 41, Denver Federal Center
December 6, 1977, 3:00 P.M., Local Time

Sealed bids in ________ copy(ies) for purchasing any or all items listed on the accompanying schedule, will be received at the place designated above until the date and time specified above and at that time publicly opened, subject to: (1) The General Sale Terms and Conditions, SF 114C, Mar 1974 ed.; and Special Sealed Bid Conditions, SF 114C-1, Jan 1970 ed. ☐; Special Sealed Bid-Term Conditions SF 114C-2, Jan 1970 ed. ☐; all incorporated herein by reference; and such other special terms and conditions ☒ attached or ☐ incorporated herein by reference and identified as * See Clause ________ (Copies of these forms, unless attached hereto, are on file at the issuing office and will be made available upon request.) (2) BID DEPOSIT ☐ IS NOT REQUIRED; ☒ IS REQUIRED IN AN AMOUNT OF $500.00 MADE PAYABLE TO: GENERAL SERVICES ADMINISTRATION.

(3) Bidder is required to pay for any or all of the items listed on the Item Bid page(s) as part of this Bid, at the price set opposite each item, within ________ calendar days after date of award, and to remove the property within ________ calendar days after date of award by the Government.

BID *(This section to be completed by the Bidder)*

In compliance with the above, the undersigned offers and agrees, if this Bid is accepted within ________ calendar days (60 calendar days if no period is specified by the Government or the Bidder, but not less than 10 calendar days in any case) after date of Bid opening, to pay for and remove the property. The total amount of the Bid(s) is $ N/A and attached is the bid deposit, when required by the Invitation, in the form(s) of ________ ________, in the amount of $ ________.

BIDDER REPRESENTS THAT: *(Check appropriate boxes)*

(1) He ☐ has, ☐ has not, inspected the property on which he is bidding.

(2) He ☐ is, ☐ is not, an individual or a small business concern. (See CFR, Title 13, Chapter 1, Part 121, Sec. 121.3-9, for the definition of small business.) *(Complete the following only if the total amount of the bid(s) exceeds $25,000.)*

(3) (a) He ☐ has, ☐ has not, employed or retained any company or person (other than a full-time, bona fide employee working solely for the Bidder) to solicit or secure this contract, and (b) he ☐ has, ☐ has not, paid or agreed to pay any company or person (other than a full-time, bona fide employee working solely for the Bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer. (For interpretation of the representation, including the term "bona fide employee", see CFR, Title 41, Subpart 101-45.3.)

NAME AND ADDRESS OF BIDDER *(Street, city, state & ZIP Code)* *(Type or print)*	SIGNATURE OF PERSON AUTHORIZED TO SIGN THIS BID	
TELEPHONE NUMBER:	SIGNER'S NAME & TITLE *(Type or print)*	DATE OF BID
BIDDER IDENTIFICATION NO. *(If applicable)*:		

ACCEPTANCE BY THE GOVERNMENT *(This section for Government use only)*

ACCEPTED AS TO ITEM(S) NUMBERED		UNITED STATES OF AMERICA BY *(Contracting Officer)*	DATE OF ACCEPTANCE
TOTAL AMOUNT	CONTRACT NUMBER(S) GS-08-DP-(S)-8-	NAME AND TITLE OF CONTRACTING OFFICER Property Marketing Specialist	

BUDGET BUREAU NO. 29-R0022

(FORM CONTENT COMPLETELY REVISED)

STANDARD FORM 114
JAN 1970 EDITION
General Services Administration
FPMR (41 CFR) 101-45.3
114-108

GPO 1970 OF—390-461 (32-K)

BID PAGE

BEFORE BIDDING, SEE "METHOD OF AWARD" CLAUSE.

The tonnage of wastepaper stated in Clause 36, Federal Agencies Currently Participating in a Source Separation Program, represents the Government's best estimate of the per month amount to be generated. Other agencies may be included during the term of the contract that may materially increase the total generation. No facilities will be added without agreement of the contractor and the approval of the contracting officer. The Government does not guarantee the estimates and payment must be made on the actual tonnage delivered.

SERVICE AREA: Greater Metropolitan Denver (An area with its geographical center in downtown Denver and having a radius of 20 miles).

LOCATION OF PROPERTY: See Clause 36, Federal Agencies Currently Participating in a Source Separation Program. More agencies may be included during the term of the contract at the option of the government and the ability of the contractor to sell his program.

BID QUOTATION

High-Grade White Wastepaper as follows: White Ledger, as defined under the clause entitled "Special Definitions," source separated using desk-top collection receptacles, and stored in accordance with the terms and conditions of this contract.	Bid Quotation (+ or - dollar figure per ton, or "net" or "0")	
	______ (indicate + or -)	$ ______ (indicate dollar figure per ton, or "net" or "0")

A single bid must be made for all High-Grade White Wastepaper in the form of a dollar figure (plus, minus, or "net" or "0") in accordance with the clause entitled "Method of Award." This dollar figure will be applied to the full average market price for each item in accordance with the clause entitled "Method of Establishing Monthly Billing Prices."

If the bidder has any questions or need for clarification regarding any part of this invitation, the bidder must contact General Services Administration, Region 8, Federal Supply Service, Personal Property Division, Sales Branch-8FWS, Telephone No. (303) 234-3962, prior to the time set for bid opening.

SCOPE OF CONTRACT

This invitation is for bidders who wish to submit bids for the purchase of accumulations of surplus personal property, consisting of high-grade white wastepaper which is generated in the daily operation of Government facilties and source separated through a recycling program provided by the bidder as specified herein, from GOVERNMENT OWNED, OPERATED, OR LEASED BUILDINGS IN THE GREATER DENVER METROPOLITAN AREA during the period January 1, 1978 thru September 30, 1980. Award under this invitation does not grant the successful bidder exclusive rights to all wastepaper products generated in any award location. Nothing herein shall be construed as requiring the disposal hereunder of new and additional grades of wastepaper developed during the period of this contract. Estimated tonnage of the offered wastepaper is based on the best available information to the Government at the time of this invitation. The Government does not guarantee these estimates and payment must be made on the actual tonnage delivered. Additional agencies may be added during the term of contract; however, the contractor must agree to provide the service to the additional agency(s), and, must have approval from the contracting officer. These additional facilities will have a minimum of 100 office workers.

SPECIAL SALE TERMS AND CONDITIONS

1. RECYCLING PROGRAM

Bidders are responsible for developing and implementing a complete program for the recovery of source separated high-grade white wastepaper generated in the daily operation of Government facilities included in this invitation.

CONTRACTOR RESPONSIBILITIES

Under this program, the contractor agrees to provide:

a. A written plan to include a description of the procedures for and the technical assistance to be provided in establishing and maintaining desk-top source separation programs, and in improving and maintaining current desk-top source separation programs, in accordance with the requirements of this invitation. Such procedures and assistance shall include an employee publicity and educational program consisting of follow-up progress reports, promotional memos, or other forms of continuing program promotion; and shall include training and/or re-training sessions utilizing visual aids, written materials, and other educational devices. Training and re-training sessions shall be scheduled for presentation to participating Government personnel, as requested by individual agency facilities, subject to the approval and coordination of the Government. The contractor shall be required to provide training or re-training programs within sixty (60) days of an agency's request. However, each agency facility will be limited to one request for a training or re-training program during the term of this contract, and no training or re-training programs will be scheduled within the last 12 months of the contract period unless agreed upon by both the contractor and the Government. Wastepaper will not be collected prior to the delivery and distribution of the desk-top collection receptacles and the collection and storage containers described below.

IN VIEW OF THE FACT THAT A SOURCE SEPARATION PROGRAM IS CURRENTLY IN EFFECT, IN THE BUILDINGS SPECIFIED HEREIN, IT IS ESSENTIAL THAT THE SUCCESSFUL BIDDER FOR THIS CONTRACT ENSURE THAT THERE IS NO INTERRUPTION OR DELAY IN IMPLEMENTING SERVICE ON JANUARY 1, 1978. UPON NOTIFICATION OF AWARD ARRANGEMENTS MUST BE MADE WITH CURRENTLY PARTICIPATING AGENCIES FOR THE DELIVERY OF DESK-TOP UNITS AND OTHER CONTAINERS PRIOR TO JANUARY 1, 1978, AND FOR SCHEDULING OF TRAINING OR RE-TRAINING PROGRAMS AS REQUESTED BY INDIVIDUAL AGENCY FACILITIES.

b. Desk-top collection receptacles for each employee. The receptacles shall be fabricated from plastic of a quality suitable for the intended use. The receptacles shall be designed with a base and two upright sides. The two ends and the top shall be open to permit paper to be placed between the uprights. The receptacles may be one piece formed as above or may be formed by using two interlocking sections. The paper receptacles shall be sufficiently stable to permit one unwrapped ream of bond paper to be placed in the receptacle without tipping over. Minimum inner dimensions shall be 6" x 2-1/4" x 6" (length measured at the base, width, height). The interior capacity of the receptacle shall be not less than 2-1/4 inches. The receptacles shall have no sharp edges or projections which might cause injury or might scratch or mar desk top surfaces. A brief description of acceptable white paper and unacceptable items shall be clearly indicated on each receptacle. (See note under (d))

c. Central collection containers for every twenty (20) employees. The containers shall be fabricated from corrugated fiberboard, single wall variety, of a quality suitable for the intended use. The containers shall be of a top-loading box design and solid in color. Top flaps are required; and they will be folded outward to provide an open top. Maximum outer dimensions shall be 18" x 12" x 12" (length, width, height). Minimum outer dimensions shall be 16" x 10" x 10". The containers shall have no projections which might cause injury and shall be clearly labeled for use only in the recycling program for the accumulation of high-grade white wastepaper. (See note under (d))

d. Storage containers for use in the designated storage area for storage prior to removal by the contractor. Containers may consist of pallet size boxes, 4' x 4' x 5' (and pallets), fiberboard cartons, canvas hampers, or any other container which meets the approval of the Contracting Officer or participating agency.

Note: Additional desk-top collection receptacles, central collection containers, storage containers, and any necessary equipment (e.g., pallets) shall be provided at the contractor's expense within five (5) working days of notification by the Government in the event of the theft, breakage, loss, or the addition of new employees. The contractor will be responsible, subject to the approval of and coordination with the Government, for delivery and distribution of the receptacles, containers, and any necessary equipment at the start of the program and as required during the term of the contract, and for removal of same at the termination of this contract. All receptacles, collection containers, storage containers, and other necessary equipment remain the property of the contractor.

e. Necessary labor and equipment, which may include banding and/or palletizing, to prepare wastepaper for removal from the designated storage area to the contractor's truck.

f. Necessary labor and equipment to remove wastepaper from the designated storage area and to load wastepaper into the contractor's truck at the loading dock.

GOVERNMENT RESPONSIBILITIES

Under this program, the Government agencies occupying and/or operating the facilities covered by this contract agree to provide:

a. A program coordinator for each facility, and time and location for the training of all participating employees subject to the approval of the program coordinator.

b. A designated storage area(s) in each facility, in the vicinity of the loading dock(s), for the storage of the accumulated source separated wastepaper prior to pickups by the contractor.

c. Labor and equipment associated with moving wastepaper within the building and delivery of the wastepaper to the designated storage area.

2. PRE-AWARD INSPECTION

To be considered for award, bidder must be regularly engaged in the wastepaper removal or paper recycling busiess, or if newly entering the field, he must furnish evidence that all necessary prior arrangements (written commitments) for supplies, equipment, and personnel have been made. The bidder's facilities, equipment, recycling program, receptacles and containers, and financial responsibility, including those of contemplated subcontractors, will be subject to pre-award inspection. If requested by the Contracting Officer, bidders will submit, within two (2) weeks after the date of such request, a copy of the bidder's written plan and publicity and educational materials described in paragraph (a) of the clause entitled "Recycling Program," two samples of the receptacles and containers described in paragraphs (b) and (c) of that clause, and a description of the container(s), any necessary equipment, and the method of removal from the storage areas referred to in paragraphs (d), (e), (f), and (g) of that clause, in order to assist the Contracting Officer in determining the bidder's responsibility. A bidder may be rejected as nonresponsible if it is determined that the bidder fails to meet the minimum standards for responsible prospective contractors contained in 41 CFR 1-1.1203.

3. INSTRUCTIONS TO BIDDERS

Article 1 of SF 114C is deleted and the following is substituted therefore: Bids shall be prepared on the forms provided by the Government and strict compliance is necessary with the requirements of the invitation. Bidders are expected to examine all the terms and instructions prescribed herein, evaluate the facilities and all local conditions and contingencies, and investigate removal requirements. Failure to do so will be at the bidder's risk. Each bidder shall furnish the information required by the invitation. Each bid must include the full business address of the bidder and be signed by the bidder with his usual signature. Bids by partnership must be signed with the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed with the name of the corporation followed by the signature and designation of the president, secretary, or other person authorized to bind it in the matter. The names of all persons signing shall also be typed or printed below the signature. When requested by the Government, satisfactory evidence of the authority of the officer signing in behalf of a corporation shall be furnished.

4. METHOD OF AWARD

The contract will be awarded to that responsible bidder whose bid conforming to the invitation will be most advantagious to the Government, price and other factors considered. (See Clause 1, Recycling Program; Clause 2, Pre-Award Inspection; and Clause 3, Instructions to Bidders: All aspects of these clauses must be met and fulfilled to be considered for award). Award will be made by service area, (Metropolitan Denver) at the highest return to the Government, on the basis of the best single dollar figure bid per ton, either as a reduction from, or addition to, the full average market price, as determined under the clause entitled "Method of Establishing Monthly Billing Prices". In order to be considered for an award, the bidder must insert a plus (+) or minus (-) dollar figure, or the word "net" or "0", in the appropriate space on the Bid Page (Page 4) for all high-grade white wastepaper offered for the service area. Bidders desiring to bid full average market price will enter "net" or "0". bidders desiring to bid above full average market price will enter a plus (+) dollar figure (e.g. +$5.00), and those desiring to bid below full average market price will enter a minus(-) dollar figure (e.g. -$10.50). If the word "net" is entered as the bid, it will be interpreted as "0". In the absence of either a numerical figure, or the word "net", or"0", the bid will be deemed a "No Bid". A written award mailed (or otherwise furnished) to the successful bidder within the time for acceptance provided in the invitation shall be deemed to result in a binding contract without any further action by either party.

5. METHOD OF ESTABLISING MONTHLY BILLING PRICES

Monthly billing prices shall be established by using the average of the highest prices quoted for White Ledger for the Chicago Market in those issues of the "Official Board Markets,"* (published by Magazines for Industry, Inc., 20 North Waker Drive, Chicago, Illinois) dated within the month in which the paper was removed. The price which the successful bidder will pay the Government per ton for the grade of wastepaper removed during a calendar month shall be determined by adding or substracting the (plus, minus, or "0") dollar figure bid per ton, entered in the appropriate space on the Bid Page (Page 4) to or from (as appropriate) the average price stated above for White Ledger as illustrated in the example below. IN NO EVENT SHALL THE MINIMUM PRICE TO BE PAID TO THE GOVERNMENT FOR WASTEPAPER DISPOSED OF UNDER THIS CONTRACT BE LESS THAN 25% OF THE MONTHLY AVERAGE PRICE FOR WHITE LEDGER PAPER, AS COMPUTED IN THIS CLAUSE.

*If for any reason the publication, "Official Board Markets," becomes unavailable, a source of information acceptable to the Contracting Officer and the contractor shall be used as a basis for determining the prices to be paid for wastepaper purchased and removed under this contract.

EXAMPLE OF METHOD USED TO COMPUTE MONTHLY BILLING PRICE

If the dollar figure quoted was minus (-) $10.50 from the full average market price, the price paid to the Government for White Ledger paper removed during a hypothetical month of October would be computed as follows:

Issue published October 7	$ 95.00 per ton
Issue published October 14	$ 95.00 per ton
Issue published October 21	$ 95.00 per ton
Issue published October 28	$100.00 per ton
Average Monthly Price	$385.00 ÷ 4 (number of issues of the publication during the month) = $96.25 Average price.

$96.25 minus $10.50 equals $85.75 (Price to be paid to the Government).

Note: Dollar figures are rounded to nearest cent.

6. BID DEPOSIT

Each bid must be accompanied by a bid deposit in the amount of $500.00, which must be in the possession of the Contracting Officer by the time set for bid opening. Bid deposits shall be in the form prescribed in Article 4 of SF 114C. The successful bidder shall furnish a performance bond, as required, within ten (10) days after notice of award (see clause entitled "Performance Bond"). Deposits of unsuccessful bidders will be returned when award is made; that of the successful bidder will be returned when his performance bond is received by the Government. Any bid which is not timely supported by a proper bid deposit may be rejected as nonresponsive. Any bid deposit received after bid opening will be considered in the same manner as late bids.

7. PERFORMANCE BOND

Within ten (10) days after notice of award the successful bidder shall furnish a bond on U. S. Standard Form No. 25, for the faithful performance of the contract, in the amount of $2000.00. Such bond shall remain in full force and effect during the term of the contract. The successful bidder shall not be permitted to begin performance until such time as the bond has been received.

8. MODIFICATION OR WITHDRAWAL OF BIDS

Bids may be modified or withdrawn by written or telegraphic notice and a bid also may be withdrawn in person by a bidder or his authorized representative, provided his identity is made known and he signs a receipt for the bid.

9. CONSIDERATION OF LATE BIDS, MODIFICATIONS, OR WITHDRAWALS

Bids and modifications or withdrawals thereof, must be in the possession of the Contracting Officer by the time set for bid opening. Any bid, modification, or withdrawal received after the time set for bid opening will not be considered unless received by the Contracting Officer prior to award, was mailed (or telegraphed where authorized) and in fact delivered to the address specified herein in sufficient time to have been received by the Contracting Officer by the time and date set forth herein for the bid opening, and, except for delay attributable to personnel of the sales office or their designees, would have been received on time. In no event will hand-carried bids or withdrawals be considered if deliverd to the Contracting Officer after the exact time and date set for bid opening. However, a modification which makes the terms of the otherwise successful bid more favorable to the Government will be considered at any time it is received prior to award and may be accepted.

10. CONDITION OF PROPERTY

Article 2 of SF 114C is deleted and the following is substituted therefore: All property listed herein is offered for sale "Where Is" and without recourse to the Government except that the contractor shall not be obligated to accept any wastepaper which does not qualify for the grade nominated, as determined by the Contracting Officer.

11. TITLE

Article 7 of SF 114C is deleted and the following is substituted therefore: Title to the wastepaper sold hereunder shall vest in the contractor as and when removal is effected.

12. RESTRICTION ON USE

Wastepaper purchased under this contract shall only be used or sold as wastepaper. The contractor shall not use, allow access to, or offer for resale or use any papers, documents, file record material, or any other form of records as files, records, or for the information contained therein.

13. REMOVAL OF PROPERTY

Article 8 of SF 114C is deleted and the following is substituted therefore: It is recognized that benefits for the contractor depend on the quantities of wastepaper to be picked up, and that the storage capacity in a Government facility limits the quantity of wastepaper that may be stored. Therefore, an approximation of the minimum pickup quantity for each facility is specified in Clause 36. The respresentatives of Government facilities participating in this sale is required to have available for pickup at least the minimum pickup quantity (specified for that facility) based on his best estimate, before calling the contractor for removal. The contractor is not required to remove the wastepaper upon call as specified herein if the amount of wastepaper does not equal at least 80 percent of the minimum pickup quantity. However, the contractor has the option of picking up smaller quantities of wastepaper with the consent of the Government. The minimum pickup quantity is 2000 pounds unless otherwise specified in Clause 36.

The contractor shall have two (2) working days to remove wastepaper after the date of notice from the holding agency. Removal shall be between the hours of 8:00 a.m. and 3:30 p.m. daily, except legal Federal holidays and weekends.

The contractor must use wastepaper delivery orders as prescribed in the clause entitled "Weighing". The contractor shall accomplish removal within the prescribed time period and furnish all necessary labor, materials, and transportation for removal. The wastepaper shall be secured in such a manner to prevent it from dropping off the conveyance while being transported over Government property or public streets and highways. The contractor shall leave the area in a clean and orderly condition and shall reimburse the Government for any damage to Government property caused by removal operations of the contractor or his agents.

The holding agency must submit a copy of the wastepaper delivery order to GSA-Sales Branch-8FWS, within five (5) working days of the removal of wastepaper by the contractor.

14. REJECTION OF PROPERTY

In the event that the contractor refuses to accept and pickup an accumulation of wastepaper, or claims an adjustment is necessary after pickup regarding such an accumulation, on the basis that the accumulation does not properly qualify for the grade nominated, the Contracting Officer shall be notified immediately by telephone, followed by a letter of confirmation within two (2) working days of the rejection or claimed adjustment. The Contracting Officer shall provide for inspection by the Government and, in the absence of agreement between the Government and the contractor, shall make the decision as to quality and grade. In the event that the Contracting Officer agrees that the accumulation does not properly qualify for the grade nominated, the reasonable cost of removing outthrows above the specified levels as determined by a mutual written agreement between the Government and the contractor, and in the absence of agreement, as decided by the Contracting Officer, will be deducted from the amount due to the Government by the contractor. Decisions of the Contracting Officer made pursuant to this clause shall be subject to Article 19 (Disputes) of SF 114C.

15. WEIGHING

Article 13 of SF 114C is deleted and the following is substituted therefore: Certified Public Scales, or other scales which meet the approval of the Contracting Officer, shall be used. The contractor shall arrange for and pay all expenses of weighing the wastepaper. Weighing shall be done as soon as practicable after pick-up, between the hours of 7:30 a.m. and 4:00 p.m. on any day of the week except weekends and legal Federal holidays.

A wastepaper delivery order (copy attached) to be reproduced as required by participating agencies, shall be completed in quadruplicate for each truckload of wastepaper picked up. The contractor or the contractor's representative shall indicate on the wastepaper delivery order the contractor's name, contract number, truck number, date, and wastepaper pick-up location(s). All trucks will be weighed empty enroute to buildings where pick-ups are to be made, with the exception that those trucks used by the contractor to make regular pick-ups need only be weighed empty on the first day of each month. When the trucks are weighed, the tare weight will be filled in on the wastepaper delivery order by the weighmaster. The Government representative at the wastepaper pick-up location will enter on the wastepaper delivery order the grade of wastepaper removed, and the number and type of containers and pallets loaded on the truck with the wastepaper. Upon receiving the wastepaper, the contractor, or the contractor's representative will sign all copies of the wastepaper delivery order and leave two copies with the Government's representative. The original and remaining copy of the wastepaper delivery order will be signed by the Government representative and taken by the contractor, or the contractor's representative, with the loaded truck to the scales where the weighmaster will note or stamp thereon the weight of the loaded truck, the date, and hour of weighing, and sign them. The contractor or his representative will send within five (5) days from the date of each pick-up the original of the wastepaper delivery order to GSA-Sales Branch-8FWS, and will retain the remaining copy of same. THE INFORMATION ON EACH WASTEPAPER DELIVER ORDER MUST BE COMPLETE TO INSURE PROPER BILLING.

16. PAYMENT

Article 6 of SF 114C is deleted and the following is substituted therefore: A monthly billing will be made by the GSA Region 8 Sales Branch, for the net weight of white wastepaper removed on or before the last day of each month during the term of this contract. The net weight of the white wastepaper removed with each pickup will be determined by deducting from the gross weight of the loaded truck, the tare weight of the truck and the estimated weight, as determined by the Government, of any containers and pallets loaded on the truck with the wastepaper. Full payment must be made by the contractor to GSA within ten (10) calendar days from the date of billing.

17. DEFAULT

Article 9 of SF 114C is deleted and the following is substituted therefore:

(a) The Government may, subject to the provisions of paragraph (c) below, by written notice of default to the contractor, terminate the whole or any part of the contact in any one of the following circumstances:

(i) If the contractor fails to remove white wastepaper within the time required by the clause entitled "Removal of Property", or any extension thereof, or fails to make payment within the time required by the clause entitled "Payment"; or

(ii) If the contractor fails to perform any of the other provisions of this contract, or so fails to make progress as to endanger performance of this contract in accordance with its terms, and in either of these two circumstances does not cure such failure within a period of ten (10) working days (or such longer period as the Contracting Officer may authorize in writing) after receipt of notice from the Contracting Officer specifying such failure.

(b) In the event the Government terminates this contract in whole or in part as provided in paragraph (a) of this clause, the Government may sell the wastepaper covered by this contract to another purchaser and have the terminated portion of the contract performed by contract or otherwise, under such terms and in such manner as the Contracting Officer may deem appropriate. The contractor and surety shall be liable to the Government for any loss occasioned the Government by such termination.

(c) Except with respect to defaults of subcontractors, the contractor shall not be liable for any loss if the failure to perform the contract arises out of causes beyond the control and without the fault or negligence of the contractor. Such causes may include, but are not restricted to, acts of God or of the public enemy, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; but in every case the failure to perform must be beyond the control and without the fault or negligence of the contractor. If the failure to perform is caused by the default of a subcontractor, and if such default arises out of causes beyond the control of both the contractor and subcontractor, and without the fault or negligence of either of them, the contractor shall not be liable for any such loss, unless the supplies or services to be furnished by the subcontractor were obtainable from other sources in sufficient time to permit the contractor to meet the required removal or performance schedule.

(d) If, after notice of termination of this contract under the provisions of this clause, it is determined for any reason that the contractor was not in default under the provisions of this clause, or that the default was excusable under the provisions of this clause, the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to the clause entitled "Terminaton for the Convenience of the Government."

(e) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

(f) As used in paragraph (c) of this clause, the terms "subcontractor" and "subcontractors" mean subcontractor(s) at any tier.

18. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT

The Contracting Officer, by written notice, may terminate this contract, in whole or in part, when it is in the best interest of the Government. If this contract is so terminated, the contractor shall be compensated in accordance with Part 1-8 of the Federal Procurement Regulations (41 CFR 1-8), in effect on this contract's date.

19. CHANGES

The Contracting Officer may at any time, by a written order, and without notice to the sureties, if any, make changes within the general scope of this contract. If any such change causes an increase or decrease in the cost of, or time required for performance of, this contract, or otherwise affects any other provisions of this contract, whether changed or not changed by any such order, an equitable adjustment shall be made (i) in the contract price or time of performance, or both, and (ii) in such other provisions of the contract as may be so affected, and the contract shall be modified in writing accordingly. Any claim by the contractor for adjustment under this clause must be asserted within thirty (30) days from the date of receipt by the contractor of the notification of change; provided, however, that the Contracting Officer, if he decides the facts justify such action, may receive and act upon any such claim asserted at any time prior to final payment under this contract. Failure to agree to any adjustment shall be a dispute concerning a question of fact within the meaning of Article 19 (Disputes) of SF 114C. However, nothing in this clause shall excuse the contractor from proceeding with the contract as changed.

20. SPECIAL DEFINITIONS

(1) White Ledger, as used herein, cosists of all white sheets and shavings of untreated ledger bond, writing papers, and other hard papers which have similar fiber content, and must be free of solid color printing. This grade may contain sulphite paper containing a trace of groundwood. For purposes of this bid, it may include computer printout forms which are not separated at data processing and similar facilities. Outthrows are not to exceed 2.0% of the boxed weight less skid weight. Prohibitive materials are not permitted.

(2) Outthrows, as used herein, consist of all papers that are so manufactured or treated or are in such a form as to be unsuitable for consumption as the grade specified (White Ledger).

(3) Prohibitive Materials, as used herein, consist of any materials which by their presence in an accumulation of wastepaper, in excess of the amount allowed, will make the accumulation unusable as the grade specified; and any materials that may be damaging to equipment.

(4) Ton(s) and tonnage, as used herein, refer to net short tons of wastepaper.

21. LOST ARTICLES

It is understood and agreed that any department or establishment of the Government shall have the right to require the contractor to make search of the paper collected by him for any article or thing lost or supposed to have been lost. The reasonable cost, as determined by the Contracting Officer, for such search will be deducted from the amount due from the contractor or paid directly by the Governemnt upon submission by the contractor of a properly itemized and duly certified bill in substantially the following form:

> This is to certify that actual expense incurred in search of wastepaper from ______________(Agency) on______________, 19__, requested by __________ was $__________.
>
> ______________________________
> (Firm Name)

22. APPLICABILITY OF SF 114C

The following conditions of SF 114C, General Sale Terms and Conditions, are applicable to this contract: Articles, 3, 4, 10, 11, 16-22, 24, and 25. The remaining conditions of SF 114C are inapplicable to this contract.

23. DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA

The "Disabled Veterans and Veterans of the Vietnam Era" clause, which is set forth in FPR Temporary Regulation No. 39, (41 Fed. Reg. 33265 of August 9, 1976) is hereby incorporated by reference. (This clause is applicable to contracts of $10,000 or more.) A copy of the full text of the clause will be furnished by the Contracting Officer upon request.

24. EQUAL OPPORTUNITY

(The following clause is applicable unless this contract is exempt under the rules, regulations, and relevant orders of the Secretary of Labor (41 CFR, CH. 60).)

During the performance of this contract, the contractor agrees as follows:

(a) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recuritment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Equal Opportunity clause.

(b) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(c) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the contractor's commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) The contractor will comply with all provisions of Executive Order No. 11246 fo September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and of the rules, regulations, and relevent orders of the Secretary of Labor.

(e) The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(f) In the event of the contractor's noncompliance with the Equal Opportunity clause of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of Octoer 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 1, 1967, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(g) The contractor will include the provisions of paragraph (a) through (g) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor, issued pursuant to section 204 of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

25. EMPLOYMENT OF HANDICAPPED

(a) The contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination base upon their physical or mental handicap in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

(b) The contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Rehabilitation Act of 1973, as amended.

(c) In the event of the contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(d) The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor, provided by or through the Contracting Officer. Such notices shall state the contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.

(e) The contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the contractor is bound by the terms of section 503 of the Act and is committed to take affirmative action to employ and advance in employment physically and mentally handicapped individuals.

(f) The contractor will include the provisions of this clause in every subcontract or purchase order of $2,500 or more unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 503 of the Act, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Director, Office of Federal Contract Compliance Programs, may direct to enforce such provisions, including action for noncompliance.

26. UTILIZATION OF SMALL BUSINESS CONCERNS

(a) It is the policy of the Government as declared by the Congress that a fair proportion of the purchases and contracts for supplies and services for the Government be placed with small business concerns.

(b) The contractor agrees to accomplish the maximum amount of subcontracting to small business concerns that the Contractor finds to be consistent with the efficient performance of this contract.

27. UTILIZATION OF LABOR SURPLUS AREA CONCERNS

(The following clause is applicable if this contract exceeds $5,000.)

(a) It is the policy of the Government to award contracts to labor surplus area concerns that (1) have been certified by the Secretary of Labor (hereafter referred to as certified-eligible concerns with first or second preferences) regarding the employment of a proportionate number of disadvantaged individuals and have agreed to perform substantially (i) in or near sections of concentrated underemployment or in persistent or substantial labor surplus areas or (ii) in other areas of the United States, respectively, or (2) are noncertified concerns which have agreed to perform substantially in persistent or substantial labor surplus areas, where this can be done consistent with the efficient performance of the contract and at prices no higher than are obtainable elsewhere. The contractor agrees to use his best efforts to place his subcontracts in accordance with this policy.

(b) In complying with paragraph (a) of this clause and with paragraph (b) of the clause of this contract entitled "Utilization of Small Business Concerns" the contractor in placing his subcontracts shall observe the following order of preference: (1) Certified-eligible concerns with a first preference which are also small business concerns; (2) other certified-eligible concerns with a first preference; (3) certified-eligible concerns with a second preference which are also small business concerns; (4) other certified-eligible concerns with a second preference; (5) persistent or substantial labor surplus area concerns which are also small business concerns; (6) other persistent or substantial labor surplus area concerns; and (7) small business concerns which are not labor surplus area concerns.

28. UTILIZATION OF MINORITY BUSINESS ENTERPRISES

(a) It is the policy of the Government that minority business enterprises shall have the maximum practicable opportuinty to participate in the performance of Government contracts.

(b) The contractor agrees to use his best efforts to carry out this policy in the award of his subcontracts to the fullest extent consistent with the efficient performance of this contract. As used in this contract, the term "minority business enterprise" means a business, at least 50 percent of which is owned by minority group members or, in case of publicly-owned businesses, at least 51 percent of the stock of which is owned by minority group members. For the purposes of this definition, minority group members are Negroes, Spanish-speaking American persons, American-Orientals, American-Indians, American-Eskimos, and American Aleuts. Contractors may rely on written representations by subcontractors regarding their status as minority business enterprises in lieu of an independent investigation.

29. PAYMENT OF INTEREST ON CONTRACTORS' CLAIMS

(a) If an appeal is filed by the contractor from a final decision of the Contracting Officer under Article 19 (Disputes) of SF 114C, denying a claim arising under the contract, simple interest on the amount of the claim finally determined owed by the Government shall be payable to the contractor. Such interest shall be at the rate determined by the Secretary of the Treasury pursuant to Public Law 92-41, 85 Stat. 97, from the date the contractor furnishes to the Contracting Officer his written appeal under Article 19 (Disputes) of SF 114C, to the date of (1) a final judgement by a court of competent jurisdiction, or (2) mailing to the contractor of a supplemental agreement for execution either confirming complete negotiations between the parties or carrying out a decision of a board of contract appeals.

(b) Notwithstanding (a), above, (1) interest shall be applied only from the date payment was due, if such date is later than the filing of appeal, and (2) interest shall not be paid for any period of time that the Contracting Officer determines the contractor has unduly delayed in pursuing his remedies before a board of contract appeals or a court of competent jurisdiction.

30. NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT

The provisions of this clause shall be applicable only if the amount of this contract exceeds $10,000.

(a) The contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the contractor has knowledge.

(b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed hereunder, the contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the contractor as agreed to indemnify the Government.

31. CONVICT LABOR

In connection with the performance of work under this contract, the contractor agrees not to employ any person undergoing sentence of imprisionment at hard labor except as provided by Public Law 89-176, September 10, 1965 (18 U.S.C. 4082(c)(2)) and Executive Order 11755, December 29, 1973.

32. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION

This contract, to the extent that it is of a character specified in the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333), is subject to the following provisions and to all other applicable provisions and exceptions of such Act and the regulations of the Secretary of Labor thereunder.

(a) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, apprentices, trainees, watchmen, and guards shall require or permit any laborer, mechanic, apprentice, trainee, watchman, or guard in any workweek in which he is employed on such work to work in excess of eight hours in any calendar day or in excess of forty hours in such workweek on work subject to the provosions of the Contract Work Hours and Safety Standards Act unless such laborer, mechanic, apprentics, trainee, watchman, or guard receives compensation at a rate not less than one and one-half times his basic rate of pay for all such hours worked in excess of eight hours in any calendar day or in excess of forty hours in such workweek, whichever is the greater number of overtime hours.

(b) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions of paragraph (a), the contractor and any subcontractor responsible therefore shall be liable to any affected employee for his unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, apprentics, trainee, watchman, or guard employed in violation of the provisions of paragraph (a) in the sum of $10 for each calendar day on which such employee was required or permitted to be employed on such work in excess of eight hours or in excess of his standard workweek of forty hours without payment of the overtime wages required by paragraph (a).

(c) Withholding for unpaid wages and liquidated damages. The Contracting Officer may withhold from the Government prime contractor, from any moneys payable on account of work performed by the contractor or subcontractor, such sums as may administratively be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidaged damages as provided in the provisions of paragraph (b).

(d) Subcontracts. The contractor shall insert paragraphs (a) through (d) of this clause in all subcontracts, and shall require their inclusion in all subcontracts of any tier.

(e) Records. The contractor shall maintain payroll records containing the information specified in 29 CFR 516.2(a). Such records shall be preserved for three years from the completion of the contract.

33. <u>CLEAN AIR AND WATER CERTIFICATION</u>

(Applicable if the bid or offer exceeds $100,000, or the Contracting Officer has determined that orders under an indefinite quantity contract in any year will exceed $100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c-8(c) (1)) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c)) and is listed by EPA, or is not otherwise exempt.)

The bidder certifies as follows:

(a) Any facility to be utilized in the performance of this proposed contract has___, has not___, been listed on the Environmental Protection Agency List of Violating Facilities.

(b) He wil promptly notify the Contracting Officer, prior to award, of the receipt of any communication from the Director, Office of Federal Activities, Environmental Protection Agency, indicating that any facility which he proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities.

(c) He will include substantially this certification, including this paragraph (c), in every nonexempt subcontract.

34. <u>CLEAN AIR AND WATER</u>

(Applicable only if the contract exceeds $100,000, or the Contracting Officer has determined that orders under an indefinite quantity contract in any one year will exceed $100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c-8(c) (1)) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c)) and is listed by EPA, or the contract is not otherwise exempt.)

(a) The contractor agrees as follows:

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1958, et. seq., as amended by Pub. L. 91-604) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251 et. seq., as amended by Pub. L. 92-500), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract.

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing.

(3) To use his best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed.

(4) To insert the substance of the provisions of this clause into any nonexempt subcontract, including this paragraph (a) (4).

(b) The terms used in this clause have the following meanings:

(1) The term "Air Act" means the Clean Air Act, as amended (42 U.S.C. 1857 et. seq., as amended by Pub. L. 91-604).

(2) The term "Water Act" means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et. seq., as amended by Pub. L. 92-500).

(3) The term "clean air standards" means any enforceable rules, regualtions, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as descried in section 110(d) of the Clean Air Act (42 U.S.C. 1857c-5(d)), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

(4) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a dsicharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local Government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

(5) The term "compliance" means compliance with clean air or water standards. Compliance shall also mean compliance wth a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency or an air or water pollution control agency in accordance with the requirements of the Air Act or Water Act and regulations issued pursuant thereto.

(6) The term "facility" means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be utilized in the performance of a contract or subcontract. Where a location or site of operatins contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

35. INTEREST

Article 11 of SF 114C is modified by substituting the word "eleven" instead of "six" (percent) in the first sentence.

36. FEDERAL AGENCIES CURRENTLY PARTICIPATING IN A SOURCE SEPARATION PROGRAM

LOCATION AND CONTACT	EMPLOYEES	AVERAGE MONTHLY GENERATION
Denver Federal Building & Courthouse 19th and Stout Streets (Mixed Agencies) Denver, CO Contact: Casey Jones, Buildings Manager (303) 837-4083	1200	4700 lbs. 2000 lbs. minimum pickup
Custom House Building (Mixed Agencies) 19th and Stout Streets Denver, CO Contact: Howard Manwiller, Small Business Administration (303) 837-3568	600	1600 lbs. 1000 lbs. minimum pickup
Environmental Protection Agency Lincoln Tower Building 1860 Lincoln Street Denver, CO Contact: Gary Morgan (303) 837-2221	150	4100 lbs. 2000 lbs. minimum pickup
Government Accounting Office Diamond Hill Complex 2460 West 26th Avenue Denver, CO Contact: Debbie Moore (303) 837-3000	60	300 lbs. 1000 lbs. minimum pickup
General Services Administration Building 41, Denver Federal Center Denver, CO Contact: Ron Watkins (303) 234-2231	500	4000 lbs. 2000 lbs. minimum pickup
Bureau of Land Management Building 50, Denver Federal Center Denver, CO Contact: Ed Coggs (303) 234-4560	500	6500 lbs. 2000 lbs. minimum pickup

U. S. Geological Survey Building 25, Denver Federal Center Denver, CO Contact: John Akers (303) 234-3840	1400	4700 lbs. 2000 lbs. minimum pickup
Bureau of Mines (Mixed Agencies) Building 20, Denver Federal Center Denver, CO Contact: Ed Looney (303) 234-3730	400	6500 lbs. 2000 lbs. minimum pickup
Bureau of Reclamation Building 67, Denver Federal Center Denver, CO Contact: M. S. Greenlee (303) 234-3079	1300	11500 lbs. 2000 lbs. minimum pickup
Civil Service Commission Building 20/53, Denver Federal Center Denver, CO Contact: Juel Jorgensen (303) 234-2023	160	2000 lbs. 2000 lbs. minimum pickup
U. S. Fish and Wildlife Service 10597 West 6th Avenue Denver, CO Contact: Barbara Williams (303) 234-2209	150	500 lbs. 1000 lbs. minimum pickup

APPENDIX F

Excepts From Vandenberg AFB Partial
Full-Service Contract With Civilian Community
Sponsored Recycling Authority

Contract No. F04684 77 90045

COMMUNITY ENVIRONMENTAL COUNCIL, INC.

Supplies/Services	Quantity	Unit	Unit Price	Amount
PART II - SECTION E				
SUPPLIES/SERVICES, AND PRICES				
Furnish all plant, labor, material and other resources, unless otherwise indicated, for the implementation and operation of a resource recovery program for Vandenberg Air Force Base, California in strict accordance with the Statement of Work and the terms and conditions of the contract.	12	MO	$_______	$______
	1	MO	6000	6000
	1	MO	1000	1000
	10	MO	500	500

(See Part II - Section K - Contract Administration Data)

PART II - SECTION K - CONTRACT ADMINISTRATION DATA

1. INVOICING AND PAYMENT

Payment is authorized as follows:

First Month - $6,000.00
Second Month - $1,000.00
Ten Consecutive payments - $500.00 each

Note 1: This excerpt is from the original 16 March 1977 VAFB contract showing authorization of installations to provide "up-front" money to alleviate start-up cash flow problems.

Note 2: Follow-on contract is reflected in following pages of this Appendix.

STANDARD FORM 26, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED PROC REG (41CFR) 1-16.101

AWARD/CONTRACT J

1. CONTRACT (Proc. Inst. Ident.) NO. F04684 79 C0005
2. EFFECTIVE DATE 78NOV01
3. REQUISITION/PURCHASE REQUEST/PROJECT NO. F7DEEC82690002
4. CERTIFIED FOR NATIONAL DEFENSE UNDER BDSA REG. 2 AND/OR DMS REG. 1. RATING: N/A

5. ISSUED BY CODE
Base Contracting Division
P.O. Box 1827
Vandenberg AFB, CA 93437
Buyer/Symbol: Jan Berry/LGCV
Phone: (805) 866-8007

6. ADMINISTERED BY (If other than block 5) CODE
PAS: None

7. DELIVERY
[X] FOB DESTINATION
[ ] OTHER (See below)

8. CONTRACTOR NAME AND ADDRESS CODE 22C3M FACILITY CODE
(Street, city, county, State, and ZIP code)
Community Environmental Council
924 Anacapa, Suite B4A
Santa Barbara, CA 93108

9. DISCOUNT FOR PROMPT PAYMENT
Net

10. SUBMIT INVOICES (4 copies unless otherwise specified) TO ADDRESS SHOWN IN BLOCK 12

11. SHIP TO/MARK FOR CODE
4392 AEROSG/DEEC
Vandenberg AFB, CA 93437
M/F: F04684 79 C0005

12. PAYMENT WILL BE MADE BY CODE
Accounting and Finance Division
4392 AEROSG/ACFMS
Vandenberg AFB, CA 93437

13. THIS PROCUREMENT WAS [ ] ADVERTISED, [X] NEGOTIATED, PURSUANT TO: [X] 10 U.S.C. 2304 (a)(10) [ ] 41 U.S.C. 252 (c)( )

14. ACCOUNTING AND APPROPRIATION DATA
5793400 309 6717 234494 01 53330 S594100

15. ITEM NO.	16. SUPPLIES/SERVICES	17. QUANTITY	18. UNIT	19. UNIT PRICE	20. AMOUNT
1	NONPERSONAL SERVICES The contractor shall furnish all plant, labor, material and other resources, unless otherwise indicated, for the implementation and operation of a resource recovery program for Vandenberg Air Force Base, California, in strict accordance with the Statement of Work and the terms and conditions of the contract. CONTRACTUAL CONTENTS 1. Standard Form 26, Page 1 2. Schedule, Pages 2 and 3 3. General Provisions by Reference for Service Contracts, Pages 4 and 6, Additional General Provisions, Pages 7-14 4. Statement of Work with Addendum No 1 Thereto (Atch 1), 5 Pages	11	MO	$2,100.00	$23,100.00

21. TOTAL AMOUNT OF CONTRACT $23,100.00

CONTRACTING OFFICER WILL COMPLETE BLOCK 22 OR 26 AS APPLICABLE

22. [X] CONTRACTOR'S NEGOTIATED AGREEMENT *(Contractor is required to sign this document and return* 2 *copies to issuing office.)* Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. *(Attachments are listed herein.)*

26. [ ] AWARD *(Contractor is not required to sign this document.)* Your offer on Solicitation Number ________, including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

23. NAME OF CONTRACTOR Community Environmental Council
BY Philip C. Marking, President
(Signature of person authorized to sign)

27. UNITED STATES OF AMERICA
BY Joseph A. Zielinski
(Signature of Contracting Officer)

24. NAME AND TITLE OF SIGNER (Type or print) Philip C. Marking
25. DATE SIGNED

28. NAME OF CONTRACTING OFFICER (Type or print) JOSEPH A. ZIELINSKI
29. DATE SIGNED 1978 NOV 1

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DELIVERIES OR PERFORMANCE

The contract period shall extend from 78NOV01 through 79SEP30, unless sooner terminated under the provisions of this contract.

INSPECTION AND ACCEPTANCE

The Base Civil Engineer, Vandenberg Air Force Base, California or his authorized representative is designated as the Technical Representative of the Contracting Officer for the purpose of inspection and acceptance of all services rendered under this contract. This designation in no way authorizes anyone other than the Contracting Officer to commit the Government to changes in the terms of the contract.

SPECIAL PROVISIONS

1. REVENUE SHARING

a. In addition to the implementation of a resource recovery program, this contract provides for Government-Contractor shared revenue based on sales of all recyclable material collected on Vandenberg Air Force Base.

b. The term "revenue" as used herein refers to net proceeds received by the contractor from the sale of recyclable material collected on base.

c. The Government shall receive one-half (1/2) of the revenue received in excess of $ 46,000.00 of net sales (gross sales minus brokerage expenses; e.g., Boy Scouts, Commissary, etc) for recyclables sold by the contractor.

Payment to the Government shall be semi-annually and all revenue sharing checks made payable to the Accounting and Finance Officer, Vandenberg Air Force Base, CA 93437.

2. PHASE-OUT OF OPERATION

a. If the program is terminated at the conclusion of this contract, the Contractor will commence phase-out of operations no sooner than 31 August 1979. Phase-out will be conducted in an orderly manner, to include notification of all program participants prior to termination of service. All desk top holders will be turned in to the Government. All recyclables remaining at the Recycling Center will be processed and sold within 75 calendar days of program termination. Proceeds of the sale shall be shared as previously defined. Any recyclables remaining beyond the 75 day period shall become the property of the Government.

2. PHASE-OUT OF OPERATION (CONTD)

b. Should the program be continued, but operated by other than the incumbent, the Contractor will perform all operations to the final day of this contract. Approximately 30 calendar days prior to the contract completion date, full cooperation will be extended to the operators of the follow-on effort in order to maximize efficiency during the transition period. All recyclables attributed to this contract will be segregated on the final day, and sold through normal channels or to the follow-on Contractor. Proceeds of this sale will be the Contractor's to the point of revenue sharing as defined below.

3. GOVERNMENT FURNISHED TRUCKS. Should the Contractor receive vehicles from the State of California for program operation at Vandenberg, the Government furnished trucks shall be returned immediately to the Government in the condition as received, fair wear and tear excepted. Price adjustment, if any, shall be subject to negotiation at that time.

4. COLLECTIVE BARGAINING AGREEMENT

The Contractor agrees to provide the Contracting Officer upon request, a copy of any collective bargaining agreement applicable to employees performing on this contract.

5. FAIR LABOR STANDARDS

Notwithstanding any other provision of this contract, the minimum wage payment shall be as specified by Public Law 93-259 or the SCA Wage Determination, if any, whichever is greater.

CONTRACT ADMINISTRATION DATA

1. INVOICING AND PAYMENT

a. Payment will be made once each month for services rendered the previous month, upon submission of invoices in quadruplicate to the office indicated in Block 12, Standard Form 26.

b. Payments will be made to the Contractor in accordance with Block 8 of Standard Form 26 unless otherwise specified below:

NAME ______________________

STREET ______________________

CITY STATE ZIP

ADDENDUM NO. 1

STATEMENT OF WORK

VANDENBERG RESOURCE RECOVERY PROGRAM

1. Para 2: In line 11 add the word "metals" following the word cardboard.

2. Para 3b(1): Change line two from "...base personnel (semi-annually)." to "...base personnel at least semi-annually."

3. Para 3b(2): Change line three from "media (quarterly)." to "media at least semi-annually."

4. Add para 3f: Dumpster scavenging and monitoring for disposal section of all major buildings generating recyclables.

5. Add para 5b: Subject to approval by the contracting officer, expansion of the resource recovery program may include establishing a metals recovery program at the base land fill.

6. Add para 4e: Two Government one and a half (1 1/2) ton trucks, one of which has a lift gate, in good operating condition, as part of the contract price. These two trucks and the fork lift listed in paragraph 4b(1) above shall be operated and maintained as follows:

(1) Maintenance will be provided by the contractor. Maintenance and/or repair may be done off base, IAW T.O. 00-20B-5.

(2) Maintenance and operation records must be maintained and reported monthly by the fourth working day of the next month.

(a) Operations records will consist of the applicable AFTO forms for assigned vehicles and cost for fuel and oil. The AFTO forms will be maintained IAW AFM 77-310 Vol II. These will be turned in to the Vehicle Control Officer (VCO) of Civil Engineering.

(b) Maintenance records must contain, but are not limited to, the cost of parts and nouns, the cost of labor and manhours, and the mileage reading as of the end of the month.

(c) Maintenance and operations records may be maintained together.

(3) Vehicles must be turned in to the Base Vehicle Maintenance for a safety inspection. Civil Engineering's VCO will notify the contractor as to when it is time for this inspection.

(4) Vehicles will be used on-base only.

(5) Vehicles will only be operated by personnel with valid military licenses. Operators will be familiar with AFM 77-2.

(6) Vehicles will be kept clean and presentable at all times.

(7) The contractor will have on hand, or have access to, the following regulations, T.O.'s, and forms:

(a) AFM 77-310, Vols I and II.

(b) AFM 77-2.

(c) T.O. 00-20B-5

(d) AFTO Forms 374 and 421.

Contract F04684 79 C0005

STATEMENT OF WORK

Vandenberg Resource Recovery Program

1. Scope: The Contractor shall provide all plant, labor, material, and other resources, unless otherwise indicated, for the implementation and operation of a resource recovery program for Vandenberg Air Force Base, CA., in accordance with local, regional, and State solid waste resource recovery plans and the following specifications. Only recycleable materials generated on VAFB will be processed within the scope of this contract.

2. Background: The Department of Defense (DoD) is mandated by the Environmental Protection Agency guidelines to establish solid waste resource recovery. Guidelines for resource recovery, and in particular, source segregation on military installations are lacking and must be developed to meet the requirements of the EPA guidelines. A recent Executive Order requires all Federal installations with more than 100 people in the administrative function to participate in a desk-top segregation program, if economically feasible. This contract will support an existing regional resource recovery program. This program will involve the maximum cost effective amount of discarded office hi-grade bond paper, computer paper, computer cards, newspapers, cardboard and aluminum cans from generating centers on base. In office areas, a desk top container system may be utilized to voluntarily collect recoverable office materials. In Base residential areas, household members will be requested to voluntarily separate their wastes and set them on the curbside for recycling collection.

3. Contractor's Responsiblity: The Contractor's responsiblity generally includes, but is not limited to:

a. Review (quarterly) the existing pickup points base-wide, and recommend changes if appropriate. Pickup points will be fully coordinated with 4392ASG/DE before being implemented.

b. Organize and implement a publicity program to attract and maintain maximum participation. The following specific items will be included:

(1) Preparation and distribution of flyers which explain in simple terms the actions required of base personnel (semi-annually).

(2) Preparation of news articles explaining the program which are suitable for publication in base papers, and release in other local news media (quarterly).

All publicity items will be coordinated through and approved by 4392ASG/DE prior to use.

Attachment 1

c. Provide collection containers (except dumpsters) and transportation of recoverable items to the staging areas and beyond, except where dumpsters are used.

d. Insure that neatness is maintained at all working locations including pickup sites and on-base staging area(s).

e. Provide 4392ASG/DE with reports as defined below:

(1) Logistical map of initial commodity retrieval operation and updates.

(2) Monthly shipping volume and revenue reports including a narrative description of purity problems (by the 15th of the following month). In conjunction with this report, the contractor shall furnish to the Contracting Officer a copy of all receipts for sale of material collected under this contract. Each report shall be accompanied by a certification substantially as follows, signed by an officer of the corporation: "I certify that the attached sales receipts represent all revenue received during the period ____________________. (Signature)."

4. Government Furnished Services and Equipment:

a. Staging area, a processing building and storage building (of at least 3,000 square feet each) on base. Contractor will be provided reasonable amounts of utilities as part of the contract price. Contractor will be responsible for maintaining interior and exterior of buildings and grounds within 50 feet of the buildings.

b. The following listed equipment will be furnished rent free in "as is" condition. The Government will not provide any parts or maintenance. The equipment shall be returned to the Government in a condition comparable to present condition, fair wear and tear excepted. Condition will be based on an inventory and condition report at time of turnover. Condition will be acknowledged by both parties in writing.

(1) Forklift: Capacity 4,000 lbs.

(2) Baler

(3) Platform Scale

c. Assistance to the Contractor with public relations work through Base newspaper and bulletins.

d. "Dumpsters" required by the Contractor.

5. Program Expansion:

a. Expansion to other locations will be made by the Contractor as his on-base experience grows and participatory performance by the base improves. All program expansion will be coordinated and approved by 4392 AEROSG/DE.

6. Base Access and Security Passes: The Contractor shall be responsible for obtaining all necessary cards, passes, badges, buttons, decals or other items required for access to the area or areas in which the work will be performed. Contractor will be required to apply for vehicle and individual identification media at the 4392d Security Police Squadron, Pass and ID Section. These identification media shall be surrendered to the Pass and ID Section upon completion or termination of the contract, or upon termination of an individual's employment.

APPENDIX G

Example of the Type of Information that Should be Provided with Balers

(See also Section VIII 2.2.4)

EXAMPLE

I. INSTALLATION INSTRUCTIONS FOR MODEL #60 AND #72

The Accurate Industries Baler Model 60 and 72 is usually shipped intact lying on its side. It comes completely assembled and ready to operate. On special order, the platen and cylinder may be lowered; a separate set of instructions will be attached for this situation.

Installation:

A. Unload baler using a crane or fork lift with adequate load capacity.

   Safe Load 6,000 lbs, for both Model 60 and 72.

B. Stand baler upright on hard level surface at installation site. Note: Baler plus full bale weight may exceed 6,000 lbs. Floor must be able to carry this weight.

C. Level baler using adequate shims, use chamber floor as leveling surface.

D. Secure baler to floor using 1/2" diameter cinches, two in front and two at the rear. Note: Proper securing of baler is very important.

E. Fill oil reservoir with hydraulic oil, approximately 20 gallons will fill the tank. See separate page for hydraulic oil recommendations.

F. Wire in electrical service line to control panel. See separate page for detailed instructions.

G. Go through initial maintenance check before starting up the baler. Maintenance check list on separate page.

(Reference VIII, 41) EXAMPLE

H. Start up baler and run through a number of cycles. See operating instructions on separate page. Do not place material in chamber until baler has run through several cycles and all maintenance items are checked out.

II. HYDRAULICS

A. The hydraulic system is a completely self-contained system; all pumps, valves and switches are tested, assembled and preset at the factory.

B. When the unit is installed, the oil level in the reservoir should be checked by means of the level gauge on the side of the reservoir. The level is correct if it is at the "FULL" mark with the platen in the up position. In most cases, the baler is shipped without hydraulic oil. Approximately 20 gallons is required to fill the reservoir. Check the oil level when adding oil. DO NOT OVERFILL! If the oil level is too high, the excess oil will overflow from the top during operation. Remove vent port plug and install vent filter cap attached on a chain.

C. A visual check of the hydraulic connections should be made to assure that there are no leaks and everything is tight. Go through this procedure after the first operation and after several cycles have been run.

<u>Manufacturers Hydraulic Oil Recommendation</u>
<u>Standard Inside Installation</u> :

10W30 Hydraulic Oil, never thinner than 100 S.S.U. at highest operating temperature. Oil should be operating at no higher than 130° - check oil temperature periodically.

High grade motor oil or paraffin base can be substituted for the above. Automatic transmission fluid is highly recommended.

Atlantic Richfield Co. DURO S150

<u>Winter-Summer Oil Recommendations for Accurate Industries Balers</u> (If installation is subject to the weather.)

<u>Winter:</u> 5W20 Hydraulic Oil, never thicker than 10,000 S.S.U. calculated at lowest temperature for area in which equipment is used.

<u>Summer:</u> 10W30 same as in "Standard Inside Installation." If temperature of oil constantly runs above 130°F, reservoir must be shielded from direct rays of sun and an auxiliary oil cooler installed.

<u>Manufacturer's Hydraulic Oil Recommendation</u>:

1. Mobil Oil Corporation - D.T.C. 24 (low temperature, outside use).
2. Atlantic Richfield Company - DURO S150 (low temperature, outside use.)
3. Atlantic Richfield Company - DURO S150 (standard usage, inside.)

NOTES:
1. Hydraulic oil should be changed once a year.
2. Oil running out of full tank indicates oil level is too high - check level and remove some oil.
3. Foamy oil or air bubbles in oil indicate air leaks in suction side of pump. Check out and repair.

4. Milky appearance of soil may indicate presence of water in oil. Oil should be changed immediately. At the same time, automotive demoisturant should be added to remove any residual water.

Note: System schematics/diagrams will accompany this and other narratives. (Reference VIII, 41)

EXAMPLE

EXAMPLE

III. ELECTRICAL CONNECTION'S, SERVICE LINE TO BALER

When your baler system was manufactured, the factory wired it for a specific line service. Unless otherwise noted or requested the panel will be wired for 230 Volt, 3 phase, 3 wire service. Inside the baler control panel is a tag that shows the line service needed at your installation.

CAUTION: If your line service is not the same, the transformer wiring, motor terminal box wiring, and motor starter overload switches, (heaters) will have to be changed. The electrical schematic shows the line and overload switches. Transformer connections are shown on the transformer name plate.

Hi and Low Voltage Motor Wiring - By changing the internal wiring of the motor windings the internal resistance of each phase is changed which allows the use of 230 volt or 460 volt, 3 phase. This information is always given on the motor serial number plate.

CAUTION: Take time to check the motor for correct wiring, heater and fuse protection before trying to run the motor.

Motor Amperage: 230 Volt, 3 phase - 30 AMP; 460 Volt, 3 phase - 15 AMP

National Electrical Code Requirements for Disconnect and Feed Lines:

230V - Min. Copper Wire, Size 8 AWG
Circuit Breaker 40 AMP
Time Delay Fuse 30 AMP

460V - Min. Copper Wire, Size 12 AWG
Circuit Breaker 20 AMP
Time Delay Fuse 15 AMP

NOTE: All electrical connections should be done in accordance with the National Electrical Code, State and Local Codes.

IV. INITIAL MAINTENANCE BEFORE START UP

During shipping or installation hydraulic or electrical connections may become loose. Therefore, it is strongly recommended that the entire system be given a very thorough inspection <u>before start up</u> and <u>after a few days of operation</u>.

DESCRIPTION

1. Electric service must be checked to ensure that it is 230V. If it is 460V, internal changes must be made in motor and control box.

2. Correct rotation of electric motor as indicated by arrow on motor.

3. All electrical connections in control panel, hydraulic power unit and limit switches should be checked for loose connections and/or equipment.

4. <u>Actuation of all limit switches and securing bolts tight</u>.

5. <u>Stop Limit Switch</u>, mounted on left side inside top frame.

6. <u>Safety Door Switch</u> mounted on bracket behind aluminum door.

7. <u>Main Door Safety Switch</u> mounted on hinge side of main door.

8. <u>Safety Door Continuance Switch</u>, mounted on left guide channel for aluminum safety door.

9. Hydraulic Cylinder Mounting Bolts, tighten firmly.

10. Cylinder Rod Mounting Pin, make sure cotter pins are in and secure.

11. Hydraulic Oil Tank Full, must be full before operating unit.

12. Remove vent port plug and install vent filter cap attached on a chain.

13. Hose connections and fittings tight.

14. Bale ejector arms, position properly, lying flat in base, pivot pins in and secure with cotter pins.

15. Ejector arm chains and hooks straight and on hook retainers.

16. Aluminum Safety Door Limit Switch bracket tight and secure.

17. Lubrication.

18. Grease door lock hinges periodically.

19. Grease main door hinges periodically, a little grease on top of each hinge pad.

20. Grease safety door guide channels periodically.

(Reference VIII, 41)

EXAMPLE

V. TROUBLE SHOOTING HINTS

NOTE: Review "Initial Maintenance Check List" before trouble shooting baler.

PUMP NOISY

2. Air leaks in suction or shaft seal. Air drawn in through inlet due to low oil level.
3. Entrained air
4. Fluid viscosity too high
5. Pump running too fast
6. Suction filter too small
7. Loose parts in pump
8. Worn or damaged parts
9. Foreign matter drawn into pump
10. Coupling spider defective
11. Oil too light weight for temperature conditions

NO PRESSURE OR LACK OF PRESSURE

1. Relief valve not working properly (disassemble and clean)
2. Broken lines
3. Coupling loose
4. Cylinder piston seals leaking allowing fluid to pass

PUMP DOES NOT DELIVER FLUID

1. Low fluid level in reservoir due to reservoir gasket leak or other leak.
2. Suction line blocked

EXAMPLE continued

3. Pump not priming (extremely cold weather)
4. Pump not being driven properly or coupling loose
5. Pump rotation reversed due to reversal of 3-phase line (May be caused by electrical work elsewhere in building)
6. Oil too heavy for temperature conditions
7. Moisture in oil frozen

<u>FLUCTUATING FLUID PRESSURE</u>

1. Air entrainment
2. Dirt passing through relief valve
3. Cold oil (extreme cold weather morning start up)

<u>EXCESSIVE HEATING OF FLUID</u>

1. Relief valve set too high or stuck
2. Unloading valve improperly set
3. System may require heat exchanger
4. Restricted lines
5. Twist or kink in line

V. TROUBLE SHOOTING HINTS continued

<u>DOES NOT RUN AT ALL</u>

1. Fuses or circuit breaker turned off or blown
2. Small fuse in control panel blown
3. Motor starter overload tripped (especially during hot weather, brown out or other low voltage condition)

PLATEN REVERSES PREMATURELY

1. Obstruction preventing closing of aluminum door
2. Material in door track
3. Door twisted or bent
4. Main door open
5. Cardboard or other foreign material obstructing aluminum door safety switch
6. Switch in door track bent or obstructed

PLATEN DOES NOT REVERSE

1. Pressure switch out of adjustment or defective
2. Directional control valve stuck (dirt or foreign material)
3. Directional control valve coil burned out
4. Time delay relay defective

BALER DOES NOT SHUT OFF

1. Switch actuator tab on platen bent
2. Actuator tab on platen not actuating stop limit switch
3. Stop limit switch arm loose or bent
4. Stop limit switch defective

VI. MAINTENANCE

The following maintenance should be performed on your International Baling Machine at the intervals indicated. Should any further maintenance or adjustments be required, contact your factory authorized representative.

TWICE WEEKLY	Inspect top of press head and remove any accumulation of paper or other debris.
WEEKLY	Clean and lightly grease door opening/closing gears.
MONTHLY	Clean the lift gate guides and lubricate with a light coating of grease.
ANNUALLY	Drain hydraulic reservoir and replenish with fluid specified on Page __.
ANNUALLY	At same time hydraulic fluid is changed, also change hydraulic system filter. The filter is located inside the reservoir tank. It can be reached through the inspection opening on the top of the tank. Unscrew filter and replace with a new one (49-10 filter). Tighten hand-tight only.

VII. RECOMMENDED REPLACEMENT PARTS STOCK LIST

National/American recommends that the following parts be stocked with all vertical balers:

Part Number	Quantity	Description
20-0052	1	Limit Switch w/Arm

36-0001	2	Solenoid Coil w/cover
21-0069	1	Replacement Contact Set for NEMA 2 CH Model Starter
21-0005	3	Fuses, 6A
102-0001	1	Ring Gear/Worm Set
54-0204	4	Lift-Gate Spring
40-0001	1	10 GPM Oil Filter
	1	Seal Kit (* for cyl)

The above components will reduce downtime of all vertical balers to a matter of minutes if kept in stock.

*Many cylinder models have been used. All will interchange but seal kits must be ordered to fit model.

(Reference VIII, 42)

EXAMPLE

APPENDIX H

to Section VII

MEMORANDUM OF AGREEMENT

MEMORANDUM OF AGREEMENT

This agreement is hereby made and entered into this 26th day of August 1976, by and between the UNITED STATES AIR FORCE, DAVIS-MONTHAN AIR FORCE BASE, hereinafter called DMAFB and THE ARIZONA DEPARTMENT OF ECONOMIC SECURITY, ARIZONA TRAINING PROGRAM AT TUCSON, hereinafter called ATP.

WITNESSETH, that for and in consideration of the agreements hereinafter set forth, it is mutually agreed between the parties hereto:

ARTICLE I

That DMAFB shall:

A. Grant ATP permission to collect and remove waste paper from the premises of Davis-Monthan Air Force Base at no cost to the Government.

B. Grant all reasonable access to Davis-Monthan Air Force Base to ATP personnel while performing their collection and removal duties. ATP will have their collection vehicles marked so as to identify them as belonging to the Arizona Training Program. Individual Identification Cards will be issued to individuals performing services under this Agreement, upon application with the Solid Waste Manager, Civil Engineering Squadron, DMAFB, AZ.

C. Provide reasonable and sufficient space on which ATP may locate their refuse containers.

ARTICLE II

That the ARIZONA TRAINING PROGRAM shall:

A. Collect and remove waste paper from the premises of Davis-Monthan Air Force Base at no cost to DMAFB.

All such collecting and removal of paper shall be on a regularly scheduled basis approved by the Solid Waste Manager, Civil Engineering Squadron, DMAFB, AZ. The ATP shall submit to the Solid Waste Manager, for approval, a listing of the location, number and type of waste paper containers, along with a schedule for pick-ups. ATP shall furnish collection containers marked to indicate that they are for collection of recyclable waste paper. All containers will be provided with covers of sufficient strength to prevent spillage of waste paper. Containers shall be so located as to not present an unsightly appearance nor a hazard to traffic. All spillage shall be picked up immediately by ATP personnel.

B. Submit to the Solid Waste Manager by the fifth working day of each month, an AF Form 1452 in five copies covering refuse pick up for the preceding month. The above referenced forms will be supplied to ATP by the Solid Waste Manager. ATP shall record on AF Form 1452 the pounds (tons) of paper collected each month to comply with Air Force Solid Waste Management Policies.

C. Conform to all Department of Defense, U.S. Air Force, Davis-Monthan AFB and OSHA safety rules and regulations. The ATP agrees to take all reasonable steps and precautions to prevent accidents and preserve the life and health of ATP and DMAFB personnel performing or in any way coming in contact with the performance of this agreement. Any Violation of the above referenced rules and regulations shall be grounds for termination of this agreement.

D. Furnish DMAFB with a certificate of insurance evidencing comprehensive automobile liability insurance coverage on motor vehicles operated by ATP personnel in the minimum amounts of $100,000 per person and $300,000 per accident for bodily injury and $25,000 per accident for property damage. Such Certificate of Insurance should also indicate that in the event of modification, cancellation or nonrenewal of insurance coverage, DMAFB will be given ten (10) days prior to notice.

E. The ATP shall indemnify, save harmless, and defend the United States from and against any and all claims, demands, actions, debts, liabilities and attorney's fees arising out of, claimed on account of, or in any manner predicated upon loss of or damage to property of and injuries to or death of any and all persons whatsoever, in any manner caused or contributed to by the ATP, its agents, servants, employees or other personnel (including students and trainees), while in, upon, or about the military installation wherein work or visits are to be performed, or while going to or departing from the same and to indemnify and save the United States from and on account of damage of any kind which the United States may suffer as the result of the acts of the ATP's agents, servants, employees, or other personnel (including students and trainees).

ARTICLE III

A. The period of this agreement shall be from 76 SEPTEMBER Ø1 or date of agreement, whichever is later, and continue through 30 JUNE 1977, unless sooner terminated under the provisions of this agreement.

B. This agreement may be terminated by notice of either party by a written 30 day notice indicating a desire to discontinue the service. Such notice shall be sent by registered or certified mail and notice time shall begin upon receipt of notice. If the ATP fails substantially, without good cause, to perform his agreements under this memorandum, the DMAFB may terminate this contract immediately.

C. This agreement in no way obligates DMAFB to provide wastepaper for ATP to collect.

ARTHUR E. HUHN, Colonel, USAF
Commander
803d COMBAT SUPPORT GROUP
Davis-MONTHAN AIR FORCE BASE

BRUCE MARKEE
ARIZONA DEPARTMENT OF ECONOMIC
SECURITY, ARIZONA TRAINING PROGRAM

APPENDIX I

DETERMINATION OF HIGH GRADE WASTEPAPER

PLANNING FACTORS

1.0 BACKGROUND

1.1 Accurate estimating of recoverable wastepaper quantities is critical to the validity of recovery program feasibility studies and ultimately to the economic potential inherent in a specific recovery program. HIstorically, the task of estimating has suffered from significant problems in:

1.1.1 Identifying the characteristics affecting the type and quantity of wastepaper products originating in the diverse mission support functions located on a military installation.

1.1.2 Identifying the most accurate and cost-effective estimation techniques to be used.

1.1.3 Identifying appropriate and accurate waste generation, composition and recovery factors to use with the estimation techniques.

1.1.4 Obtaining accurate installation data to which the generation, composition and recovery rates can be applied.

1.2 In perspective these problems can be described as follows:

1.2.1 The types and quantities of solid waste generated on a military installation will vary from one activity to another and studies conducted to characterize these wastes usually develop emission factors accordingly. A review of the literature shows numerous breakouts of these activities, as indicated in Table 1, ranging from Dormitories to Maintenance Shops to Offices, Sewage Plants, et. cetera (Reference 1-5).

1.2.2 In establishing emission factors analysts attempt to survey representative buildings within each activity group and then extrapolate their findings to estimate total solid waste emissions for each group, and hence the installation as a whole. The number of representative buildings chosen and the period of time allocated for this analysis is ideally based on fundamental statistical sampling criteria but frequently is subjected to less ideal criteria because of time and budgetary constraints. For example, a one-month survey may be chosen to represent a "typical month" when in reality a proper assessment of all interacting factors bearing on waste emissions would require sampling over a much longer period of time of six months to a year (Reference 6).

1.2.3 The problem of time available for sampling is aggravated by difficulties in choosing buildings that adequately represent a grouped activity such as "Office/Administration;" although associated together under this common group label, the buildings often house functional activities that differ significantly in their solid waste generation characteristics (Reference Table 2). Failure to recognize these differences or to be consistent from one analyst to another has resulted in emission and compositional factors that can only be used as general guidance rather than as a substitute for a solid waste study (Reference 7).

1.2.3.1 The choice of representative buildings will significantly impact on the important determination of waste density factors used to develop total waste generation estimates and emission factors. This impact is illustrated in Table 3 which lists results of installation surveys and guidebook determinations.

1.2.3.1.1 In the four installation surveys many buildings were studied although the number of buildings and functions within them varied from one installation to another. The resulting density determination varied widely from a low of 30.0 pounds/cubic yard to a high of 158.0 pounds/cubic yard, averaging 79.0.

1.2.3.1.2 The four base survey differs importantly with the study done at Offutt AFB which considered three buildings on the installation as being representative of the total office group. Both of these surveys differ with other results/findings listed in the Table and cumulatively fail to create confidence in their usefulness as specific guidance on any installation.

TABLE 1. COMMON MILITARY INSTALLATION ACTIVITY GROUPINGS USED FOR TRADITIONAL SOLID WASTE CHARACTERIZATION

Activity	
Barracks (Dorms)	Restaurants
Retail (Base Exchange)	Ground Maintenance Shops
Retail (Commissary)	Aircraft Maintenance
Printing Plants	Warehouses
Offices	Sewage Plants
Family Housing	Classrooms
Hospital	Recreation
Shops	Clubs

TABLE 2. EXAMPLES OF OFFICE ACTIVITY FUNCTIONS

Listed below are examples of diversified functions that fit within the Activity Grouping of "Office," but possess differing solid waste generation characteristics that make it difficult to establish an emission rate and composition factor to describe the entire grouping with confidence.

Airfield Operations Staff	Data Automation
Base Headquarters Staff	Base Supply Headquarters
Accounting & Finance	Contractor Aerospace Support
Procurement	Base Transportation Staff
Civilian Personnel	Base Civil Engineering Staff
Military Personnel	Maintenance Headquarters
Non-Appropriated Fund Staffing	R&D Office Acitivities
	etc.

TABLE 3. EXAMPLES OF SOLID WASTE SURVEY DIFFERENCES

I. Office Solid Waste Density (pound/cubic yard)

	Avg	Max	Min
Four AFB Installation Survey(1)	79.0	158.0	30.0
Offutt AFB Survey(2)	115.0	218.5	94.5
USN(3)	94.0	144.0	43.0
Tri-Service Guidance(4)	87.5	95.0	80.0

II. Office Solid Waste Paper Composition - Percent by Weight

		Avg	Max	Min
Four AFB Installation Survey(5)				
	Corrugated	17.6	33.6	5.9
	Other Paper	51.5	90.3	23.2
Fort Sam Houston Study(6)				
	Corrugated	16.0	-	-
	Other Paper	42.0	-	-
EPA(7) (Civilian Office Buildings)				
	Corrugated	9.0		
	Other Paper	76.0		
USA(8)		(95% Confidence Interval)		
	All Paper	71.1	78.9	63.3

(1) Reference 8
(2) Reference 9
(3) Reference 10
(4) Reference 11
(5) Reference 12
(6) Reference 13
(7) Reference 14
(8) Reference 15

1.2.3.1.3 The only data which shows a small range of variance is the Tri-Service guidance which is based on civilian sector solid waste analysis, and appears to be markedly different from, and therefore non-applicable to, military environments. (The question arises as to why the range of civilian sector waste densities is so much tighter than findings from the military. The answer would appear to be that civilian waste sources are not as individually identified as military buildings are, the sampling data base is much larger, wastes from many buildings are merged with one another before sampling and, therefore, reflect a collective density rather than the limited, individualistic building densities determined on the military installations.)

1.2.3.2 The methodologies which affect the density characteristic similarly impact on the resulting solid waste emission rate and composition factors that personnel like to use for waste planning and resource recovery purposes.

1.2.3.2.1 The attraction of these factors is the hope that they can substitute for more site specific, resource-intensive surveys. The problem with using them is deciding which factor(s) (if any) are appropriate to use and are acceptably accurate.

1.2.3.2.2 As illustrated in Tables 4 and 5 these emission rate and compositional factors vary considerably from building to building and installation to installation. Derivation of factors that can be used with confidence is difficult. and perhaps impossible with the data available.

1.2.3.2.3 The usefulness of the information is further limited because compositional data rarely breaks out beyond the "corrugated" and "Other (remaining) Paper" categories. Consequently, an engineer evaluating the feasibility of a high grade wastepaper program would find little use of "Other Paper" compositional factor data because the factor includes less desirable material such as colored ledger, newspaper and other non-recyclables such as carbon paper and wax coated or impregnated paper products. He/she would be unable to discriminate how much the high grade components (computer cards, computer printout paper and white ledger paper) make up the office waste stream.

TABLE 4. EXAMPLE OF DIFFERING COMPOSITION AND EMISSION RATES AMONG BUILDINGS IN SAME ACTIVITY GROUP

I. Activity Group: Offices

II. Data Listing (from four-installation survey[1])

Installation	Buildings	Composition (Percent by Weight) Corrugated	Other Paper	Emission Rate (pound/employee/day)
Kelly AFB TX	43	13.7	61.6	
	73	11.4	75.3	
	70	32.9	52.6	
	100	28.7	44.4	
	171	22.2	70.9	
	886	10.3	68.5	
	1598	6.3	90.3	0.62
	1621	33.6	65.5	
Charleston AFB SC	-	19.8	41.6	
Vandenberg AFB CA	-	5.9	39.8	
	11219	-	-	1.62
	10577	-	-	0.68
Hanscom Field AFB NM	1101	15.5	42.3	
	1520/21	33.6	23.2	
	1605	9.3	67.3	
	1223	21.0	29.6	
	1308	-	-	1.80
	1600	-	-	2.40
	1618	-	-	0.60
	1810/12	-	-	2.60

(1) Reference 16

TABLE 5. ADMINISTRATIVE OFFICE SOLID WASTE EMISSION RATES[1]

Bldg No.	Location	Employees	Solid Wastes (lbs/day)	lbs/employee/day
332	HQ Wing Ops (Bldg C) Offutt AFB NE	628	711.2	1.13
53	HQ Command, Offutt AFB NE	118	163.3	1.38
29	Base Ops, Offutt AFB NE	118	447.2	3.79
K208	Admin Office, NAS, Miramar CA	99	234	2.36
494	Admin Office, NAS, Miramar CA	45	76	1.69
1	Admin Office NMC Pt Mugu	85	112	1.32
K175[2]	Admin Office, NAS, Mirimar, CA			1.70
1598	Admin Office Kelly AFB TX	75	32.9	0.44
11219	Base Supply Office Vandenberg AFB CA	67	75.7	1.13
10577	Security Police Office, Vandenberg AFB CA	336	148.5	0.44
1223	Admin Office, L.G. Hanscom AFB MA	343	142.9	0.36
1308	Admin Office, L.G. Hanscom AFB MA	22	60	2.73
1508	Admin Office, L.G. Hanscom AFB MA	20	72.9	3.64
1600	Admin Office, L.G. Hanscom AFB MA	366	497	1.36
1618	Admin Office, L.G. Hanscom AFB MA	244	242.9	1.00
1721	Admin Office, L.G. Hanscom AFB MA	68	157.2	2.31

(1) All data compiled from Reference 17 unless otherwise specified.
(2) Reference 18.

1.2.4 In light of the current national emphasis for resource recovery and the associated need to provide engineers and planners with credible planning tools, the Environmental Protection Agency (EPA) and other organizations have attempted to develop data which will overcome historical data limitations. This has not been an easy task and questions exist with respect to the data's suitability for military application, as discussed in the following paragraphs.

1.2.4.1 The EPA studied and characterized three Bank/ Insurance Co. buildings and three General Office buildings. The results of these analyses are listed in Table 6. No data was provided on the functions performed in the General Office buildings.

1.2.4.2 As indicated in the Table, EPA determined that non-corrugated wastepaper constitued, by weight, approximately 76 percent of the total solid waste generated within the General Office facilities. When compared (See Table 4) to historical military installation compositional determinations, variable as they were, it raises questions regarding the translatableness of the data to the military.

1.2.4.2.1 Of particular concern is what constitutes an appropriate emission rate for the high grade components? In addition, how much of this material can be reasonably recovered under a well organized program?

1.2.4.2.2 The answers to both of these questions cannot be adequately answered by available EPA documentation. For example, Table 7, Part I lists data compiled from two EPA source documents on the subject. The data on composition and waste generation represent the same General Office data listed in Table 6, modified in form to highlight the paper components.

1.2.4.2.3 As presented in these sources, the waste generation factor for high grade paper averaged 0.67 pounds/ employee/day. This rate represents the cumulative contribution of computer tab cards, computer printouts and white ledger wastepaper in the wastestream.

TABLE 6. COMPOSITION OF NON-MILITARY OFFICE SOLID WASTE BY BUILDING TYPE*(1)

	Generation/Building Type (lbs/employee/day)					
	Bank/Insurance Co.			General Office		
Material	Range	Average	%	Range	Average	%
Paper						
Computer Tab Cards	0.28-0.53	0.39	17	0.02-0.11	0.05	3
Computer Printout	0.60-0.74	0.70	30	T -0.17	0.11	7
White Ledger	0.67-0.74	0.70	30	0.31-0.62	0.51	33
Colored Ledger	0.05-0.16	0.12	5	0.05-0.19	0.09	6
Newspaper	T+-0.16	0.07	3	0.19-0.36	0.25	16
Corrugated	0.05-0.07	0.05	2	0.11-0.17	0.14	9
Other#	0.11-0.16	0.14	6	0.14-0.22	0.17	11
Garbage	T -0.07	0.02	1	0.05-0.12	0.09	6
Metal	0.02	0.02	1	0.02-0.05	0.03	2
Glass	T -0.02	0.02	1	T -0.06	0.03	2
Plastic	0.02-0.05	0.02	1	0.02-0.09	0.05	3
Textile	T -0.02	0.02	1	T	T	T
Wood	T -0.02	0.02	1	T	T	T
Miscellaneous	T -0.02	0.02	1	T -0.06	0.03	2
Total	---	2.31	100	---	1.55	100

* Based on Representative solid waste sampling by the EPA, conducted at six buildings during study; does not include cafeteria waste

\+ Trace

\# Generally non-recyclable paper: carbon paper, wax coated or impregnated paper products, etc.

(1) Reference 19

TABLE 7. LITERATURE IDENTIFIED OFFICE WASTEPAPER RECOVERY DATA - APPLICA

Part I. Sources 1 & 2 - EPA

Component	Composition (Percent by Wt)		Waste Generation Factor (lbs/employee/day)		Recovery Source 1
Corrugated		9%		0.14	
Other Paper					
. Computer Tab Cards	3%		0.05		0.90
. Computer Printout	7%		0.11		0.90
. White Ledger	33%		0.51		0.90
Subtotal (High Grade)		43%		0.67	0.9 (See Comment
. Colored Ledger	6%		0.09		
. Newspaper	16%		0.25		
. Non-recyclable	11%		0.17		
Subtotal (Non-High Grade)		33%		0.51	
Non-Paper		15%		0.23	
All Waste		100%		1.55	

Comments on recovery factors and associated generation

(1) Source 1 implies that 0.67 lbs/employee/day is average quantity of high grade generaged and t available for recovery.

(a) Source 1 also indicates that the recoverable protion of this generation is 90 percent us source separation approach (Note: the 90 percent is described as a "participation rate"

(2) Source 2 differs in interpretation of the same data and indicates that the desk-top programs the facilities studied recovered 60-70 percent of the high grade paper (cards, printouts and

(a) It rounded off the recovery factor to 75 percent or an average of 2.5 lbs per employee p (Reference 21).

(3) Which factors should be used? Are recovery rates equal for each high grade component?

TABLE 7. LITERATURE IDENTIFIED OFFICE WASTEPAPER RECOVERY DATA - APPLICABLE? (Concluded)

Part II. Source 3

Component	Composition (Percent by Wt)	Waste Generation Factor	High-Grade Paper Composition Factor*	High-Grade Paper Recovery Rate Factor**
Corrugated	16%			
Other Paper	42%			
Non-Paper	42%			
All Waste	100%	1.68 lb/day/employee	0.42	0.7

* Fraction of total waste generated
** Portion of waste stream that is normally recoverable.

Comment:

(1) "Other Paper" includes computer tab cards and printout paper; white ledger; colored ledger; newspaper; other non-recyclable paper.

Source 3 recommended waste component calculation methods:

(1) Tab Cards: Monthly consumption (__ boxes) x (# /box) x (local recovery factor estimate) = #/mo.
(2) Printout Paper: Monthly consumption(___ boxes) x (#/box) x (local recovery factor estimate) = #/mo.
(3) High Grade: (1.68 #/day/employee) x (No. employees) x (0.42) x (0.7) = #/day.

Comments
(a) "High grade" consists of white ledger, however,
(b) 0.42 composition factor listed for high grade-white ledger also appears to be applicable for all "other" non-conrrugated paper components, not white ledger paper only; therefore,
(c) Use of 0.42 factor to determine white ledger appears to be much higher than the data presented would allow, and therefore erroneous for use in the calculations.

Source 3 - Reference 32.

1.2.4.2.4 The 0.67 factor is inadequate by itself for planning purposes since it does not take into consideration actual recovery rates. In recognition of the latter, the first EPA source equated "participation" to recovery effectiveness and indicated that a 90 percent recovery factor should be applied to the total high grade generation and to each of its components when utilizing the desktop separation method (the most effective method studied by EPA).

1.2.4.2.5 While it is important to distinguish between paper components for economic reasons (tab cards are considerably higher in value than plain white ledger paper), the following questions arise:

-Can participation rates be a reliable indicator of recovery effectiveness? (The 90 percent rate was based on estimates, not measurements, by project coordinators in the buildings studied, and essentially means that nine out of ten employees were "estimated to participate continuosly in the average (desk top) paper recovery program" (Reference 22).

-Does such a participation or effectiveness rate apply equally to each of the component categories? (For example, experience has shown that the concentrated form and usage of computer tab cards makes them easy to recover whereas the diversity and wide usage of white ledger make recovery more difficult.)

1.2.4.2.6 The answers to both of these questions would appear to be "no" but source 1 offered no alternatives. Source 2, however, indicated that general purpose office facilities desk top recovery programs surveyed by EPA recovered 60-70 percent of the high grade paper in the waste stream. Apparently, to facilitate the planning process, this recovery rate was rounded off to 75 percent and applied to the 0.67 pounds/employee/day high grade factor, resulting in an average 0.50 pounds/employee/day.

1.2.4.2.7 Although this half-pound per employee per day factor takes into account reasonably overall recovery expectations, it does not address recovery rates applicable to each of the high grade components and therefore leaves open that important question.

1.2.4.2.8 Complicating the use of the EPA data were questions regarding the applicability of the generation factors to military office facilities. Experienced military personnel believed that the net high grade factor of 0.50 was too high, particularly because they believed (1) that the 0.51 pounds/employee/day generation factor for white ledger was too high, and (2) that technological changes in the use of computer cards created doubt about the reliability of using any generalized emission factor (Reference 23-27). (The changes involve use of cathodic ray tube (CRT) input/output; storage on tapes, magnetic disks, and conversion to microfiche; one installation's DPDO office estimated that use of the latter for files dropped traditional computer tab card usage and recovery 10-20 percent within a short period of time after implementation (Reference 28)).

1.2.4.2.9 Despite these doubts, in face of pressure to pursue recycling and in the absence of good data to the contrary, DOD utilized the 0.50 pounds/employee/day factor to conduct initial feasibility studies required by the EPA upon promulgation of its source separation guidelines (Reference 29-34).

1.2.5 In an effort to provide engineers with a more confident means of estimating recyclables, the U.S. Army published interim source separation guidance in May 1977. Recognizing the difficulties inherent in attempting to use EPA's emission rates for the various high grade wastepaper categories, the guide presented a reasoned approach to estimating quantities of computer card and computer printout paper through use of local inventory turnover records and assumed recovery rates. However, in estimating white ledger generation the guide resorted to a generalized emission rate and compositional factor that appears to be used in a contradictory manner.

1.2.5.1 Reference Part II, Table 7 The data in question is a 42 percent waste composition factor (by weight) determined for non-corrugated paper material during a special study of Fort Sam Houston, Texas. (Reference also Table 3, Part II, for a comparison of this data with various other study findings.) As presented, this 42 percent includes all the high grade paper, colored ledger, newspapers and other generally non-recyclable paper.

1.2.5.2 Since this factor includes all non-corrugated wastepapers its usefulness for estimating white ledger as a separate category is doubtful. However, for unknown reasons, the guide directs users to utilize the 42 percent factor against a 1.68 pound/day/employee emission rate in order to estimate high grade (i.e., white ledger) wastepaper generation.

1.2.5.2.1 This procedure appears to be in error, and further confuses decisions regarding the appropriate method and factors to use in wastepaper recovery feasibility analysis.

1.2.6 The problems associated with the emission rates continue into the methods/schemes used to apply them.

1.2.6.1 The EPA generation rate of 0.5 pound/employee/ day requires knowing how many administrative employees are in the facilities under study. This information isn't readily available to the installation individual conducting the study; his/her options are to conduct a survey or use other data that can serve as an indicator. Since surveys take time and manpower resources that are rarely available, the engineer/ planner has often resorted to the use of square footage data as a means of obtaining the theoretical number of employees or for applying a waste generation rate based on square footage to obtain estimated quantities.

1.2.6.2 There are uncertainties associated with a square footage method that can be best described by first presenting historical examples of its usage (however, these examples and the data used in them should not be used as guidance in feasibility studies, the data are of questionable reliability.)

1.2.6.2.1 Example of using square footage to obtain the number of employees and then applying an employee emission rate:

. Assume: Admin. Space = 10,000 ft^2

. Gov't Space factor of $150 ft^2$/employee (Reference 33)

. EPA High Grade
Emission Rate = 0.5 pound/employee/day
(includes .75 recovery factor)

$$\text{Quantity (high grade)} = \left[\frac{\text{Admin. Space}}{\text{Space/Employee}}\right] \times \text{(Emission Rate)}$$

$$= \frac{10{,}000}{150} \times 0.5 = 33.3 \text{ pound/day}$$

1.2.6.2.2 Example of using pound/square foot emission rate.

Assume: Admin. Space = 10,000 ft^2
Floor emission factor = 0.0086 pound/day/ft^2

High Grade Composition = 0.42
Recovery Rate = 0.7 (reference 34, 35)

$$\text{Quantity (high grade)} = \text{(Admin Space)} \times \text{(Emission Factor)} \times \text{(Composition)} \times \text{(Recovery Rate)}$$

$$= (10000\ ft^2) \times (0.0086 \text{ pound/day/}ft^2) \times (0.42) \times (0.7) = 25.3 \text{ pound/day}$$

1.2.6.3 The differences between the two methods are significant (8 pound/day) and center around the emission, composition and recovery rates used. However, the square footage per employee factor is highly variable, depending upon its source, and can easily introduce wide variances in the final results.

1.2.6.3.1 For example, is 150 square feet per employee a valid factor? Some sources use this figure, but does it truly represent a military "office" building? Air Force guidance for real property planning lists a range of net floor area per occupant, from a minimum of 115 to a maximum of 130 square feet. (Reference 36). Which of these two parameters should be used, if at all? Are they more valid than the 150 square foot factor? These space designators are really allowances and do not consider mission growth activities and organizational changes that frequently occur on an installation, accompanied by changes in facilities usage and office layouts; it is not uncommon for more (or less) personnel to occupy an office area than it was originally designed for.

1.2.6.3.2 As a further indication of how the real world differs from planning guidance, real property surveys at one installation revealed that the average net space for facilities (after accounting for mechanical and other permanently installed fixtures) amounted to approximately 75-80 percent of the gross square footage indicated on real property records (Reference 37). Hence, an individual using a pounds/day/square foot would have to know whether that rate was based on gross or net facility footage. Some references/sources do not specify the square footage basis used. Hence, the individual's choice could mean a difference of 20-25 percent in the calculated results, in addition to any variances to the calculations introduced by the uncertainties associated with the emission rate itself.

1.2.6.3.3 The same arguments hold true when attempting to use square footage based on custodial service contract requirements; there is seldom agreement between this source and facility real property records.

1.2.6.3.4 Another argument against using the area emission factors is differences among functions performed within a facility. It is unreasonable to expect a Data Automation/computer processing facility to produce the same quantity of high grade wastepaper as a staff headquarters function, even though both functions may be listed under the same administrative category code. To get a reasonable estimate of the quantities may mean lumping many installation buildings together and using the emission factor, which is an average, to calculate the quantities; however, this method may include buildings in which it will not be worthwhile to include recycling (because of low employee numbers, distance, etc.) and it also gives no indication of the wastepaper components of value in each building.

1.6.2.4 In summary, use of data based on square footage is risky and should not be encouraged. A physical survey to determine the actual number of employees working in a facility (including those on leave and on temporary duty elsewhere) appears to be the most reliable means of obtaining the data needed.

1.2.7 Other methods have been used by installation planners and consultants to derive estimates of high grade wastepaper quantities. These included estimating inches of paper discarded per month, inventory record turnover investigations, and use of Air Force Tab A-1 Environmental Narratives to determine employee population (Reference 38-41). All the approaches make tentative assumptions about population, paper distribution and flow that may or may not be appropriate and bear closer examination.

1.3 Given the variety and uncertainties associated with historical wastepaper recovery estimating methods, schemes and data factors, tests were organized at Tyndall AFB, Florida and Vandenberg AFB, California for the purpose of identifying analysis approaches and data that can be confidently used by military installation engineers/planners for evaluating the feasibility and scope of high grade wastepaper recovery. These tests were also organized in a broader context to include examination, testing and validation of various methods for establishing the gathering, storing, processing and transportation requirements of source separated items, and effective marketing of those items. The latter-described studies have been incorporated into the main sections of this report. The determination of high grade wastepaper generation estimates is described in the following paragraphs.

2.0 OBJECTIVE OF, AND EXPERIMENTAL CONDITIONS FOR, WASTEPAPER GENERATION ANALYSIS

2.1 Objective:

2.1.1 As described previously there were many waste materials recovery objectives germane to the tests conducted at Tyndall AFB, Florida and Vandenberg AFB, California; however, the objective specifically relevant to this discussion was to develop reliable models for predicting component high grade wastepaper generated in facilities common to most military installations.

2.1.2 This would be accomplished by first gathering data characterizing mission support functions with associated parameters such as number of people, desks, square footage, phones, et. cetera. Next, "hard-data" on the actual amounts of high grade paper used and thrown into the waste stream would be gathered. Finally, both the building/functional charaterization and wastepaper data would be statistically analyzed to develop a model(s) describing component wastepaper output as a function of one or more of the building/mission support function characteristics.

2.2 Hypotheses of Testing

2.1.1 The growing data base and guidance for solid waste source separation for recycling in the civilian sector are insufficient for reliably estimating effective high grade wastepaper generation on military installations. (Rationale is contained in paragraph 1.0 of this Appendix.)

2.2.2 Existing data characterizing solid waste generation on military installations is inadequate for reliably estimating installation high grade wastepaper recovery potential. (Rationale is contained in paragraph 1.0 of this Appendix.)

2.2.3 A linear relationship exists between white ledger wastepaper generation and building/mission support function characteristics and this relationship(s) provides a common basis for estimating white ledger wastepaper quantities on military installations.

2.2.3.1 Although sampling of the office waste stream is the most recommended means for obtaining data to make the most site-specific reliable generation estimates, the engineer assigned to conduct a feasibility study usually has insufficient time, people and material resources availabe to conduct such a detailed study and his/her only recourse is to use best available factors. A linearly related factor(s) is desirable since it provides a straightforward, easy to use mathematical tool for this purpose.

2.2.3.2 One factor linear relationships such as pounds/employee or pounds/square foot, are commonly used in solid waste characterization studies. In addition, numerous researchers and analysts have suggested that multiple factors, related together through multiple regression analysis, may be more accurate estimating tools than only factor analysis (Reference 42-45); hence, multiple linear regression analysis will be used to develop an easily applied linearly related white ledger wastepaper estimator.

2.2.4 Generation of high grade wastepaper components of computer tabulating cards and computer printout paper can most accurately be estimated using inventory turnover data and recovery rates based on experience and survey. (Rationale is reflected in paragraph 1.0 of this Appendix.)

2.3 Experimental Conditions

2.3.1 Tyndall AFB, Florida

2.3.1.1 A significant part of this study was carried out on Tyndall Air Force Base, located near Panama City on the northwest panhandle of the state of Florida. Tyndall was assigned to the Aerospace Defense Command (ADC) and is primarily responsible for air defense mission support related to aircraft and ground support combat crew training and geographical sector air defense (Reference 46). In addition, it hosts a number of tenant organizations, including the Air Force Civil Engineering Center (now incorporated into the Air Force Engineering and Services Center at Tyndall) responsible for worldwide facilities' engineering team readiness training, civil and environmental engineering research, development, test and evaluation and assistance. Personnel from these research and development offices conducted the test, with full support from installation personnel.

2.3.1.2 Altogether the installation has a working population of approximately 5,200 employees. Approximately 3,000 of these are military personnel and the remainder are civil service (981) or non-appropriated fund employees (Reference 47). Total solid waste generation falls in the range of 10-14.9 tons per day, including approximately 10 tons a day from the non-residential areas (Reference 48).

2.3.1.3 Forty buildings are categorized under the 610XXX administrative codes. As is common with most installations their size varies considerably, ranging from 64 square feet to 24,080 square feet (Reference 49).

2.3.1.4 As represented by these administrative codes Tyndall includes office-type functions which are common to most non-radar site installations and are primary generators of the high grade wastepaper to which a recycling/recovery program would be directed. These activity functions are essentially listed in Table 2.

2.3.1.5 Tyndall also represents a majority of Air Force (and other military services) installations in that the office-type functions are spread out in many buildings, some of which are multistory, and building populations which are small ranging from 10 or less to 139 people.

2.3.1.6 For these reasons, Tyndall was chosen as a site for the test wastepaper recovery program. In addition, it was convenient to test management personnel and resources and, since Tyndall was also required by HQ USAF to determine the feasibility of source separation for recycling, it provided a convenient conjunction of location and need for assistance.

2.3.1.7 The test was conducted during the period 1 July 1977 - 31 January 1978, with actual wastepaper recapture and measurement occurring from 3 October 1977 - 13 January 1978.

2.3.2 Vandenberg AFB, California

2.3.2.1 Vandenberg Air Force Base is located on the coast of California near Santa Maria and Lompoc. It is assigned to the Strategic Air Command (SAC). The primary mission is to support the Free World's only site from which operational intercontinental ballistic missiles and polar-orbiting space satellites are launched. Over 40 DOD and non-DOD government organizations, plus numerous civilian contractors operate on and from Vandenberg. All organizations contribute directly or indirectly to launch operations, operational training, weapons system research, development and testing, and missile combat crew training. The airfield and air operations facilities are designed for a support mission rather than an operational mission (Reference 50).

2.3.2.2 Vandenberg had a working population of approximately 10,500 people. It is unique in comparison to most installations in that there is a large contractor force, supporting the launch mission, of nearly 3,620 employees. Military personnel numbered about 5,100 people, civil service almost 1,600 and non-appropriated fund 200 (Reference 51). Total solid waste averages 26 tons a day, of which non-residential areas generate approximately 16 tons a day (Reference 52).

2.3.2.3 Thirty-six office-type buildings were included in original pretest survey of Vandenberg. These builidings were identified under the customary administrative category code 610XXX and under a special category code 310-476, Missile Space Rsch/Engr, a situation which indicates installation wastepaper recovery program planning engineers must investigate for unique administrative functions that are not included under the normal DOD facility categorization.

2.3.2.4 Administrative buildings studied under the test program varied in size, ranging from 1,210 to 112,333 square feet, and 11-360 people. This characteristics variation is common to military installations; however, a majority of these buildings were primarily occupied by launch support contractor personnel and later wastepaper analysis indicated that wastepaper generation for these facilities varied significantly from DOD occupied facilities.

2.3.2.5 Vandenberg was chosen as a test site because of opportunity. In 1976, Santa Barbara County proposed to base officials that the county set-up a refuse recycling operation on Vandenberg as part of the county's Solid Waste Management Program (Reference 53). The Air Force accepted the proposal in order to test the feasibility of (1) operating an economical recycling program and doing so by (2) participating with a Regional Resource Recovery Program operated by the civilian community; both are Air Force/DOD directed requirements.

2.3.2.6 The basis of the test program involved supplemental funding by the Air Force to share start-up costs and insure adequate cash flow during the initial stages of the program. The Air Force and the county would split revenue profits if and when a "maintenance level" of income versus costs was achieved. Cost avoidance from reduced base waste operations was also to be a factor in break-even or better economic analysis.

2.3.2.7 In order to obtain data that would be translatable to other military installations, the Civil Engineering Center at Tyndall AFB, Florida, recommended and obtained Headquarters USAF approval to conduct an independent analysis of the total waste management and recycling programs. The Center, assisted by the Navy's Civil Engineering Laboratory at Port Hueneme,

California and the recycler, then analyzed both pretest and test operations. The period of data collection and analysis, including pretest analysis, ran from approximately 1 Mar 1977 -
•30 September 1978.

3.0 TEST PROCEDURES - WASTEPAPER GENERATION ANALYSIS

3.1 Tyndall AFB, Florida

3.1.1 Base Civil Engineering real property records were screened to develop a list of potential administratively oriented buildings. A building characteristic survey questionnaire was developed (and later refined to the one illustrated in Section X) and sent to organizations for completion. This survey was also reaccomplished at the end of the test in order to identify changes that may have taken place during the test period. The purpose of the survey was manifold, but of primary importance in identifying how many people worked in the buildings and enumerating other building/functional characteristics that could (1) guide in the determination of wastepaper recovery equipment needs, and (2) be useful in determining if characteristics other than or in addition to the number of employees could be parameters for reliably estimating white ledger generation.

3.1.2 The returned questionnaires were used to further screen out buildings that appeared to offer little or no value to the program, primarily because of function and/or small work force (less than 10 employees, a number chosen from experience). The remaining buildings were then inspected in a walk-through survey by the researchers to determine if white ledger wastepaper generation appeared to be significant enough to warrant test recycling efforts. Concurrently, building coordinators assigned to support the researchers were queried during the walk-through surveys regarding use of computer tabulating cards and computer printouts; if usage of either one of those appeared to be above 12 pounds a week (the weight of one case of cards) the building was included in the test program regardless of white ledger wastepaper output. After these screenings, it turned out that no office-type building with less than 25 people was included in the program.

3.1.3 Altogether, 20 office related buildings were chosen for the test, including the administrative offices of the hospital. In addition to office-type buildings, the administrative offices of 3 buildings under base supply were chosen for recovering paper, primarily because of the computer cards and printout paper generated; these were the Shipping, Receiving and Local Purchase Store functions in one building and the staff offices in 2 warehouse buildings. Culminating the choice of test buildings were 4 aircraft maintenance hangars and offices, for a total of 27 buildings to be studied in various degrees.

3.1.4 Concomitantly, data on computer card and computer printout paper usage was gathered from base supply inventory records and the base publications distribution office (PDO); historical data on computer card recovery were obtained from the local Defense Property Disposal Office (no other high grades were or had been recovered for sale). Base military and civilian personnel offices were visited to determine if the number of installation administrative personnel could be determined from their records, and building square footage data was obtained from base Civil Engineering real property and custodial/janitorial contract records.

3.1.5 Desk top holders, trays and cardboard boxes were delivered to all test areas and distributed to personnel during the last few days of the week preceding the test start date. Both research personnel and building coordinators acted to ensure that all the containers were empty at the start of the test and not subject to pretest wastepaper buildup that would bias data analysis.

3.1.6 The important objective of the test program was to determine generation rates based on total wastepaper recapture. Consequently, arrangements were made with both the civilian janitorial contractor and military janitorial personnel to put all gathered trash into heavy duty plastic bags provided through the research program, and then place the bags inside building entrances for subsequent collection by test personnel. Oversize items, such as cardboard boxes were placed next to the trash bags.

3.1.7 Each morning after janitorial gathering of the trash, test personnel collected the material, tagged it with appropriate building identification, and brought it to a processing area. Dumpsters were also checked to determine if any waste had been inadvertently thrown there instead of packed into the bags.

3.1.8 At the processing area, all the trash was weighed on an adjustable scale with readout accurate to an eighth of a pound, and the data recorded. Then the bags were opened and hand screened for computer cards, computer printout paper and white ledger paper. When found, the weight of each category was also recorded. (Any paper that was obviously soaked with moisture was not weighed; this was not a frequent occurrence and the quantity was so small that it could not be registered on the scale; most moisture laden trash originated from the lavatories and was usually separately bagged by janitorial personnel as a routine procedure. This type of trash rarely, if ever, contained high grade recyclable paper.)

3.1.9 To complement the trash processing, test personnel collected the source separated wastepaper from the buildings. The paper was quickly checked for contaminants and proper segregation of the high grade components. It was then weighed, by component, on the collection vehicle and the data recorded, taking into account the weight of each container used to collect the paper. The same scale used at the processing area was used for this purpose, with careful attention constantly given to proper calibration. (Contamination by non-high grade items) was never a problem, sampling was accomplished to quantify the degree of contamination.)

3.1.10 Whenever the per building quantity of high grade wastepapers appearing in the trash seemed high compared to the weight of the total trash collected for the building, test personnel would return to the building to diplomatically determine the cause for the occurrence and how it could be avoided in the future. (The "high" quantity was set at 5-10 percent of the paper expected from the building during a weekly period, or whenever slugs of paper appeared in the daily trash pickup; the 5-10 percent essentially represented a desired level of 90-95 percent recovery effectiveness.* Initial

*Recovery effectiveness is defined as the percentage of each wastepaper component actually recovered through source separation from the total possible recoverable quantity of that component.

estimates of high quantities were subjectively made until better generation data became available during the course of the test program.)

3.1.11 After the first two weeks of the test, and monthly thereafter, the trash separated and source separated wastepaper data were combined to make determinations of recovery effectiveness, per high grade component, per building, and all buildings overall. This performance data was then fed back to all organizations involved.

3.1.12 Data on all aspects of the program were recorded for future possible reference. These included times, manpower, mileage and other resources needed for trash bag collection, processing, and source separated wastepaper collection operations. In addition, sampling of the non-office, aircraft maintenance buildings was accomplished to estimate their recovery effectiveness; sampling was carried out to determine the quantity of white ledger paper tied up in carbon paper manifold forms that were constantly thrown in the trash by supply personnel; and sampling was accomplished to determine if files being thrown out/destroyed by the Records Staging Storage Office could be economically screened for the high grade paper contained within them.

3.1.13 Data was compiled and analyzed by the techniques described in paragraph 4.0.

3.2 Vandenberg AFB, California

3.2.1 The Navy's Civil Engineering Laboratory (CEL) was tasked by the Air Force Civil Engineering Center (AFCEC) to evaluate the technical and economic effectiveness of the Vandenberg source separation program. The responsibilities of CEL as a "third party test analysis contractor," and other participating agencies were outlined by the author in a source separation test plan, attached as Addendum 1 to this Appendix. Detailed requirements were included in a Statement of Work to CEL.

3.2.2 Approach and Scope of CEL's Participation

3.2.2.1 Overall Program

3.2.2.1.1 The Civil Engineering Laboratory conducted a study in various phases, complementing the contracted source separation test conducted at Vendenberg Air Force Base.

3.2.2.1.2 Phase I of the Civil Engineering Laboratory Study consisted of surveying and characterizing the pre-test solid waste management system to establish a data baseline. Phase II, concurrent with the VAFB test, was comprised of two primary tasks: (1) periodic survey and evaluation of the technical effectiveness of the source separation, and (2) assessment of the impact of source separation on the costs of waste collection and disposal.

3.2.2.2 Phase I

3.2.2.2.1 The Phase I study, the work plan for which is included as Addendum 2, consisted of surveying and characterizing the pre-test solid waste management system at Vandenberg Air Force Base, both functionally and quantitatively. The purpose was to establish a meaningful data baseline with which the source separation test results can be compared. This effort included a detailed survey and analysis of solid waste management costs. The study also included determination of the quantities (tonnages) of solid waste materials potentially recoverable from waste-generating source types, as well as the total quantities of the waste streams for each source type from which a portion of the recyclable materials was later recovered.

3.2.2.3 Phase II

3.2.2.3.1 Surveys to evaluate the technical effectiveness of the source separation of refuse and its impact on the costs of refuse collection were made midway through the Vandenberg Air Force Base test (in May, June, and August 1977) and near the end of the test (in February and March 1978). These surveys consisted of operational time studies of janitorial collection of office refuse, vehicle collection of refuse from office buildings, and landfill disposal of all refuse. These surveys were supplemented by photographic surveys of the composition of residential and office refuse and by determinations of quantities (weights) and densities of office and residential refuse, both recycled and residue.

3.2.3 CEL Solid Waste Weight Surveys

3.2.3.1 Phase I

3.2.3.1.1 A significant part of the pre-test survey was the measurement of waste quantities generated at Vandenberg Air Force Base by each source (e.g., offices) type. During two typical one-week periods, solid waste collected by the base vehicles and by those of the residential collection contractor was weighed. To determine the weights of waste generated by each source type, the collection vehicles were routed selectively to only one source type per weight-in. The drivers were asked to collect the waste from only one source type at a time, weigh it, and dispose of it at the base landfill before proceeding to collect from another source type.

3.2.3.1.2 In addition to the source-type-oriented weight survey, the separated recyclable materials collected from the entire base in a typical one-week period were weighed. These data were added to the weight survey data that excluded the recyclables, in order to obtain the total quantity of waste in tons per week.

3.2.3.2 Phase II

3.2.3.2.1 Similar weight surveys were conducted in August 1977 and in February-March 1978, for source types A and E (offices and residences) only, as these were of particular concern in the Vandenberg Air Force Base test.

3.2.4 CEL Solid Waste Composition Survey

3.2.4.1 To provide a basis for the evaluation of the effectiveness of source separation of solid waste during the in-test phase (Phase II) of the program, pre-test survey and analysis of the solid waste composition was performed.

3.2.4.2 Phase I and II solid waste composition surveys were conducted by photographing random samples of waste from both the residential cans and the outdoor containers (LoDal): These photographs made possible the application of a photo-sort technique (Reference 54) in which the color slides are projected onto a rectangular grid, and the composition (e.g., glass, paper, aluminum, etc.) of the object at each grid intersection is identified and recorded. The percentages by volume of the various waste constituents of interest, as determined by the photogrid technique, were used along with the appropriate bulk densities to calculate the weight distribution of the various constituents (waste categories). The calculation procedure used is presented in Addendum 3.

3.2.4.3 The two figures for each refuse category, i.e., the weight (tons per week) of recyclables recovered from the waste stream and the weight (tons per week) of recyclables left in the waste stream (from the photo-sort analysis), provided a basis for calculating the separation effectiveness (percent) for each refuse category.

3.2.5 Recycling Contractor Data Gathering

3.2.5.1 In order to obtain "hard" data that could be used to develop high grade emission factors through multiple linear regression analysis, the county established recycling organization, the Community Environmental Council (CEC), was tasked to obtain the following data (in addition to management and operation of the installation's materials recovery program) on at least 23 office buildings considered to be the largest generators of high grade wastepaper.

- Building characteristics (No. of people, phones, desks, et cetera) that might be correlated with mission support function and wastepaper generation.

- Total high grade wastepaper generation from each of the buildings (requiring CEC to totally recapture the high grades, both that which was source separated and the remainder slipping into the trash stream).

3.2.5.2 The period of data collection was to be three consecutive months.

3.2.5.3 To prepare for the data gathering CEC did the following.

3.2.5.2.1 A preliminary survey of building characteristics was developed to assist study program start-up and was used as a guide in deploying a paper capture system tailored specifically to the characteristics of each building and the requirements of building tenants.

3.2.5.3.2 The building pick-up procedures employed by the ongoing program were re-configured to provide for regular daily and weekly service to the study buildings. (Previously, all buildings were serviced on an as-needed basis.) Weekly tray pickup service was initiated at 11 buildings.

3.2.5.4 The following steps were to have been taken to facilitate total capture of recyclable paper in study buildings:

3.2.5.4.1 Source separation guidelines for study buildings have been modified to eliminate separation into grades (white ledger, colored ledger, etc.) by office personnel. Office workers were instructed that paper of any description was to be placed in recycling trays and that no paper should be discarded. Sorting of paper into grades would be done by Recycling Center workers at time of pickup.

3.2.5.4.2 In 27 buildings, Base Command and janitorial management agreed to implement a "janitor control" system to prevent paper slippage. Under this system, wastebaskets which contain recoverable paper would not be emptied by the janitor. Instead, the janitor would leave a reminder notice requesting that recyclables be placed in a desktop tray.

3.2.5.4.3 In two contractor buildings which permit entry by recycling workers, daily "wastebasket scavenging" service would be implemented. Under this system, study workers will glean paper from waste baskets, measure the quantity obtained, and place it in the recycling container.

3.2.5.4.4 In three contractor buildings which did not participate in the regular recycling program, a "pre-dumpster capture" service would be implemented. Under this system, several fiber drums would be placed in proximity to the waste dumpsters. The janitors would collect wastebaskets from office areas as usual, but would empty the office waste into the pre-dumpster drums rather than the dumpster. The pre-dumpster drums would be collected daily for sorting and weighing.

3.2.5.4.5 Recovery effectiveness would be monitored daily at each study building by the method of "dumpster surveillance." Under this system, study workers would retrieve recyclables from dumpsters where possible and would fill out a "building status sheet" to provide information on the contents of waste containers and recycling bins. The Building Status Sheets would also provide rate-of-fill data and an approximation of dumpster waste composition.

3.2.5.4 Building characteristics information was obtained for all study buildings. Several buildings were in flux or were unable to supply complete information at the time of initial survey. These buildings were re-surveyed and data on all buildings was to be verified by a follow-up survey as the program progressed (Reference 55).

3.2.6 Air Force Civil Engineering Center (AFCEC) Data Gathering

3.2.6.1 After the CEC data was provided, questions arose with respect to its "hardness;" consequently the author researched the recycler's data logs to obtain additonal data on the quantities of high grade wastepapers recovered over the course of the test program, particularly from those buildings included in the Civil Engineering Laboratory's Office - category surveys but not covered by the recycler's efforts; building characteristics for those facilities were also gathered for subsequent statistical analysis.

4.0 PROCESSING OF THE DATA

4.1 Correlation Analysis

4.1.1 Ten building characteristics were originally chosen as candidate variables for white ledger wastepaper generation correlation analysis. As indicated in Table 8, these included historically used variables of people (employees) and floor space (square feet), and other parameters that the author believed wothwhile testing, particularly in the analysis directed at identifying function-specific relationships, if any, within the office/administrative activity category.

4.1.2 Simple correlations were calculated among building characteristic parameters, computer printout and white ledger wastepaper in order to meet the following objectives:

4.1.2.1 To discriminate which building characteristics would provide the best factors in predicting white ledger output by first eliminating those variables, if any which showed a simple correlation of 0.96 or higher with each other.

4.1.2.1.1 This procedure was accomplished because high correlations between variables can upset calculations and statisticians recommend eliminating one of the two variables if their correlation coefficient is above 0.95 (Reference 56).

4.1.2.1.2 All correlations of 0.80 or higher were initially identified for consideration. This represented a starting point for analysis and was chosen on the basis that it might provide better estimates than was achieved when Graf and Whittenberger used literature-based data to develop a model for office solid waste prediction, for which the coefficient of correlation was 0.74 (R^2 = 0.5512) (Reference 57).

4.1.2.2 To identify unique relationships, if any, between various administrative functions, their respective high grade wastepaper output and building characteristics.

4.1.2.3 To identify any sensitivity of high grade wastepaper output to time. For example: are there periodic or consistent levels of high grade output from certain functions that would aid waste stream sampling planning and analysis?

- Is Fiscal Year files cleanout significant?

TABLE 8. CANDIDATE BUILDING CHARACTERISTICS

Computer Acronym	Definition
PEOPLE	Number of office-type employees within a building
DESKS	Number of desks used within a building
DESKSWB	(1) Number of desks with wastebaskets within a building at Tyndall AFB (2) Number of wastebaskets-Vandenberg AFB
DESKIO	Number of desks with in-out baskets within a building
PHONES	Number of telephones within a building
SECTYP	Number of secretary/typists within a building
SQFTPE	Administrative floor space, in square feet, listed in base Civil Engineering real property records (maintained by Real Estate Section)
SQFTJC	Floor space, in square feet, described in janitorial contract statement of specifications
PRIOFF	Number of private, one person offices, within a building
SHAOFF	Number of shared offices, more than one person, within a building

- Does Christmas or other holidays significantly impact output levels?

4.1.3 A computer subroutine called BECORO, available on the Air Force's Civil Engineering Center CDC 6600 computer system, was used to develop the parameter corrrelations (Reference 58).

4.1.3.1 Given an N by M matrix of N observations on each of the M variables, BECORO computes the means, standard deviations and simple correlation coefficients of the M variables. These statistics were computed as follows:

4.1.3.1.1 Means ($\bar{x}_j$):

$$\bar{x}_j = \sum_{i=1}^{N} \frac{x_{ij}}{N}, \quad j = 1, 2 \ldots M$$

where, x_{ij} is an observation i on variable j, i = 1, 2, ... N; j = 1, 2 ... M

4.1.3.1.2 Standard Deviation (s_j):

$$s_j = \frac{\sum_{i=1}^{N} t_{ij}^2 - N(\bar{x}_j - \bar{T}_j)^2}{N-1}$$

where $\bar{T}_j$ = temporary mean for variable j (the first row of the matrix is used for the temporary mean if not user-specified); $t_{ij} = x_{ij} - \bar{T}_j$, j = 1, 2, ...M

4.1.3.1.3 Correlation Coefficients (r_{ij}):

$$r_{ij} = \begin{cases} \dfrac{\sum_{K=1}^{N} (t_{ki})(t_{kj}) - N(\bar{x}_i - \bar{T}_i)(\bar{x}_j - \bar{T}_j)}{(N-1)s_i s_j}, & i \neq j \\ 1 & i = j \end{cases}$$

where, $r_{ij} = r_{ji}$ and i, j = 1, 2, ... M.

4.1.3.2 Initially, 22 variables (M=22) were used for the Tyndall analysis. These included all the building characteristics listed in Table 8 plus 12 weeks of computer printout wastepaper (CPO) and 12 weeks of white ledger wastepaper (WLP); both the CPO and WLP were divided into 2 week generation segments each. Hence, as listed in Addendum 4, CPO12 reflects the total CPO wastepaper output, per building, for the first two weeks of the test; CPO34 is output for weeks 3 and 4, et. cetera.

4.1.3.3 The 22 variables were matrixed against 15 buildings (N=15) studied on Tyndall AFB. Altogether, wastepaper was collected from more buildings than these 15, however, one building came "on-board" two weeks later than the 15 originally used and could not be included in BECORO because the algorithm could not handle unequal observations (there would be no ovserations CPO12, WLP12 for the 16th building). The remaining buildings were essentially aircraft maintenance or supply warehouse administrative activities and were not studied as comprehensively as the more "pure" office functions.

4.1.3.4 In order to identify interparameter relationships through correlation analysis, the following scheme was devised:

4.1.3.4.1 First, WLP generation rates, pounds/employee/day, were calculated for all 16 buildings on Tyndall on which comprehensive hard data had been collected.

4.1.3.4.2 Next, the mean and standard deviation of the WLP generation rates were calculated. Each building's generation rate was then plotted to show where it lay within the distribution (assumed to be normal) of these statistics; all fell with $\pm 2\sigma$ of the mean.

4.1.3.4.3 The next step was to run the correlation analysis on all 15 buildings (the 16th could not be used in BECORO, as described in paragraph 4.1.3.3 above).

4.1.3.4.4 Thereafter, buildings (representing, essentially, different administrative functions) were arbitrarily grouped together according to where they lay within the generation rate distribution. These groupings were respectively submitted to correlation analysis to determine if there were any building characteristics unique to each or any of the groupings.

4.1.3.4.4.1 The groupings were identified by buildings falling within the following standard deviation (σ) intervals:

mean + 1σ	mean + 2σ
mean - 1σ	mean - 2σ
-1σ to $+1\sigma$	+ 1σ to + 2σ
- 1σ to - 2σ	

4.1.2.4.4.2 When a building happened to fall on the limits for two groups, e.g., the mean, it was tested in both groups and both groups were also tested without it. This occurred with only one building.

4.1.4 Building characteristics selected from this analysis procedure were then used for the multiple linear regression analysis.

4.2 Multiple Linear Regression Analysis

4.2.1 Multiple linear regression analysis extends simple linear regression analysis to take account of the effect of more than one independent variable, x_j, on the dependent variable, Y. In this study, the dependent variable, Y, is the quantity of white ledger wastepaper and the independent variables, x_j, are the building characteristics. In effect, the main reason for using multiple regression analysis instead of simple regression analysis is that multiple regression reduces the bias that might result if an uncontrolled variable that affects Y were ignored (Reference 59). By identifying such variables, if any, more accurate estimating factors/models should become available.

4.2.2 The linear relationships desired from this analysis were expected to have the following general form:

Y_i = White ledger quantity (pounds) generated in a selected military building, or group of buildings.

x_j = Building characteristic parameters.

$$Y_i = B_1x_1 + B_2x_2 + \ldots + B_Mx_M$$

$$= \sum_{j=1}^{M} B_jx_j$$

Note: In order to make the relationship translatable to other military installations, no regression intercept (Bo) is included in the model. Hopefully, the effect of this modeling constratint will be to remove the population sampling bias of the Tyndall and Vandenberg data and make the model applicable to a building of any size population.

4.2.3 Several regression models were evaluated and the best among them chosen using the "F" test at the 95 percent confidence level, and the "R^2" statistic.

4.2.3.1 The "F" test and related tests of individual coefficients or regression:

4.2.3.1.1 The "F" test is based on the following null hypothesis:

$H_o: B_1 = B_2 = \ldots B_j$ (i.e., the slope of the line estimating the output quantity is zero)

$H_1: B_1 \neq B_2 \neq \ldots B_j \neq 0$ - alternative hypothesis

$$F_{\text{Regression Model}} = \frac{\text{Variance explained by regression}}{\text{Unexplained variances}}$$

4.2.3.1.2 A calculation of the F value for the 95 percent confidence level was made. If the $F_{\text{Regression Model}} > F0.95$ confidence level, then the null hypothesis was rejected. If the null hypothesis was rejected, then there was a 95 percent chance that the regression model explains Y_i, the extimated white ledger wastepaper output. It was believed that the F-test would be powerful since the sample size was large and, just as important, there was a wide spread of the independent variable values which would increase the accuracy of the sample regression coefficients (Reference 60).

4.2.3.1.3 Following the test for the overall regression mode, test were conducted on the individual coefficients of regression, B_1, B_2 ... B_j, to determine if each independent variable added anything to the explanation of Y_i with all other independent variables being held constant. If the selected independent variable added nothing to the explanation of Y_i, that independent variable was removed from the regression equation the regression reaccomplished. The new coefficients of regression were then tested.

4.2.3.1.4 The test on the regression coefficients was a "t" test at the 95 percent confidence level. The null hypothesis was as follows:

$$H_o: \; B_j = 0$$

$$H_1: \; B_j \neq 0$$

$$t_{b_j} = \frac{b_j}{s_{b_j}} = \frac{b_j}{\text{Standard error of } b_j}$$

- If $t_{bj} > t_{0.95}$ confidence level, then the independent variable was considered to add to the explanation of Y_i.

4.2.3.2 The "R^2" statistic

4.2.3.2.1 In choosing the most promising building characteristic variables from simple correlation analysis for use in multiple linear correlation analysis, it was hope that the latter would provide a better predictor model than what was then available to military engineers/planners. However, development of this model through the "F"-test and "t"-tests did not ensure that it was the best model to use because, by itself the model did not reflect how important the linear relationship was between white ledger wastepaper output and the variable(s) in the equation. Therefore, another statistic was needed to indicate the importance of this relationship, thereby indicating whether the linear equation or perhaps a non-linear equation was appropriate to describe and predict wastepaper output as accurately as possible.

4.2.3.2.1.1 For the simple correlation analysis the statistic "R" was used. This "R", called the coefficient of correlation, indicates how closely the observed points fit the estimated line of regression. However, this does not indicate the importance of the dependent variable (white ledger wastepaper generation) to the independent variable (i.e., what proportion of the original variation in wastepaper output has been accounted for by the independent variable (people, square footage, phones, et. cetera)).

4.2.3.2.1.2 The importance can be determined by calculating the multiple correlation coefficient, R^2, (also called the coefficient of determination) which will indicate how much error in the estimate of wastepaper output is removed if the independent variable is accounted for by using the best fitting straight line (Reference 61, 62).

4.2.3.2.1.3 A high R^2 was desired for the model and 0.80 was chosen as a minimum because anything below this makes it difficult to speculate about cause and effect (Reference 63). Hence, 0.80 meant that 80 percent of the variation in the wastepaper output could be explained by the independent variables included in the straight line equation.

4.2.3.2.2 The R^2 has the following mathematical representation (Reference 64):

$$R^2 = \frac{(\hat{Y}_i - \bar{Y})^2}{(Y_i - \bar{Y})^2} = \frac{\underline{\text{Explained Variation}}}{\text{Total Variations}}$$

where, $\bar{Y}$ = mean quantity of white ledger wastepaper generated in military administrative/office buildings.

$\hat{Y}_i$ = quantity of white ledger wastepaper generated for a military office building(s) as estimated by the regression equation.

Y_i = actual quantity of white ledger wastepaper for a particular building(s) as measured during the research study.

4.2.4 Regression models were calculated using a regression procedure in the Biomedical Computer Programs (BDM) developed at the University of California. The procedure, identified as the BMD02R-Stepwise Regression, computes a sequence of multiple linear regression equations in a stepwise manner. At each step one variable is added to the regression equation. The variable added is the one which makes the greatest reduction in the error sum of squares; equivalently, it is the variable which, if it were added, would have the highest F value. Regression equations without the regression intercept were selected (Reference 65). Output from this program included:

(1) At each step:

(a) Multiple R
(b) Standard error of estimate
(c) Analysis-of-variance table
(d) For variables in the equation:
  1. Regression coefficient
  2. Standard error
  3. F to remove
(e) For variables not in the equation:
  1. Tolerance
  2. Partial correlation coefficient
  3. F to enter

(2) Prior to performing regression

(f) Means and standard deviations
(g) Covariance matrix
(h) Correlation matrix

Note: Since a zero regression intercept was chosen, all variances, covariance, standard deviations and correlations were computed about the origin rather than about the mean.

(3) After performing regression

(i) List of residuals
(j) Plots of residuals versus input variables
(k) Summary table, including F^2

4.2.5 It was expected that a statistically significant linear regression with R^2 greater or equal to 0.8, would be developed from the analysis which would provide a reliable, white ledger wastepaper prediction model for administratively oriented military installation functions. If the regression equation/model proved to be statistically insignificant or had a low R^2, an attempt would be made to identify a nonlinear model of acceptable significance and importance.

4.3 Determination of Effectiveness

4.3.1 Effectiveness was defined as the percentage of each high grade wastepaper component recovered through source separation from the total possible recoverable quantity of the respective component. The combined wastepaper quantities recovered through both source separation and trash screening served as the basis for the total quantities; effectiveness for each building and overall was computed simply by dividing the source separated component quantities by their respective totally available quantities and then multiplying by 100.

4.3.2 Total recapture of high grade wastepaper produced by the administrative sections of Tyndall AFB aircraft maintenance buildings was beyond the resources available; however, data on recyclable paper generated in these facilities and the effectiveness of recovery were of study interest. Consequently, source separation procedures were established in four of these buildings and sampling accomplished to estimate quantities and effectiveness.

4.3.2.1 The sampling scheme was based on guidance from Snedecor and Parl for populations of finite size, N (Reference 66, 67). Determination of the sample size is as follows:

4.3.2.1.1 Decide how large an error can be tolerated in the estimate of the mean.

Let L = allowable error in the sample mean

4.3.2.1.2 Express the allowable error in terms of confidence limits (assuming a normally distributed population).

- The author assumed a willingness to take a 5 percent chance that the error will exceed L, thereby establishing 95 percent confidence limits for the sample mean, $\bar{y}$, to wit:

- Since $\sigma_{\bar{y}} = \frac{\sigma}{n}$ (population std. deviation)

Confidence limits are at $\bar{y} \pm \frac{1.96\sigma}{n}$

and, $\frac{1.96\sigma}{n} \leq \frac{1}{L}$

Note: The population standard deviation must be estimated from previous data or best available literature data.

- since 1.96 represents a significance ratio Z (the number of standard errors from the mean, expressed as $Z = \frac{y_i - \bar{y}}{\sigma_{\bar{y}}}$),

then,

$$\frac{Z\sigma}{n} \leq L$$

4.3.2.1.3 Since the population is finite, a Finite Population Correction Factor must be applied to L, to wit:

Given Correction Factor $\stackrel{d}{=} \frac{N-n}{N-1}$

then,

$$L = \left(\frac{Z\sigma}{n}\right) \left(\frac{N-n}{N-1}\right)$$

4.3.2.1.4 The final form of the sample size equation is then derived by squaring all terms and transposing to arrive at the following:

$$\text{Sample size, n,} = \frac{(Z^2)(\sigma^2)(N)}{(L^2)(N-1) + (Z^2)(\sigma)^2}$$

4.3.2.2 Research resources limited the aircraft maintenance area analysis to twelve days. Hence, the total number of trash pickups from all four facilities studied during the twelve day period was considered the finite population N. The estimate of the population standard deviation σ, was 18.84, the standard deviation of source segregation effectiveness for combustibles, in maintenance shops, during a source separation experiment conducted at the Naval Construction Battalion Center, Port Hueneme, California (Reference 68); this standard deviation was the most applicable and best available statistic found in the literature.

5.0 RESULTS

5.1 Tyndall AFB

5.1.1 Table 9 lists the white ledger wastepaper generation rates for 16 buildings comprehensively studied at Tyndall. The weighted mean generation rate was 0.24 pounds/employee/day.

5.1.2 Ten groupings of buildings were organized according to the criteria described in paragraphs 4.1.3.4.3 and 4.1.3.4.4, and simple correlations were run on the respective data. Data and correlations on the entire grouping of 15 buildings studied throughout the full study period is listed in Addendum 4. Wastepaper data was incremented into totals for every two weeks in order to smooth out daily variations and establish patterns of generation, if any.

5.1.3 Conclusions reached from this correlation analysis included the following:

5.1.3.1 It is difficult to identify unique building characteristics of the building (and, therefore, functional) groupings tested.

5.1.3.1.1 Many of the variables exhibited a 0.96 or greater correlation with each other and had to be removed from future consideration. This was accomplished by comparing their respective correlations to biweekly white ledger wastepaper output (WLP) and then choosing those with the most consistently high correlations to the WLP.

5.1.3.1.2 As expected, PEOPLE was the one characteristics' variable that showed a consistently high correlation with WLP from group to group. Other variables changed from group to group with DESKWB (desks with wastebaskets) being the second most common correlative variable. Curiously, negative correlations occurred within the three buildings with the highest generation rates: as square footage decreased, wastepaper output increased and so did the number of employees. Whether this was a phenomenom of higher employee density vis-a-vis function was difficult to determine with only 3 buildings to study.

TABLE 9. WHITE LEDGER WASTEPAPER (WLP)
GENERATION RATES - TYNDALL AFB

Period of data collection: 3 Oct - 31 Dec 1977

Rate (pounds/employee/day)	Function	Bldg	Number of Employees
0.11	Data Automation	748	32
0.14	Civil Engineering Offices	421	103
0.14	R&D Staff Offices w/shops	530	53
0.17	Civilian Personnel	761	32
0.19	Transportaion Staff Offices	745	25
0.20	R&D Staff Offices	710	33
0.20	Military Personnel	757	68
0.23	Base Hqtrs & Comptroller	647	120
0.24	A/C Maintenance Staff Hqtrs	156	100
0.25	Hqtrs type staff offices	548	69
0.27	Flight Operations Hqtrs	219	73
0.29	Base T&E Staff Offices	747	44
0.29	Base Supply Staff Offices	160	139
0.31	Judge Advocate & Hqtrs-type offices	916	36
0.32	Hospital Administrative offices	1465	54
0.38	Procurement	751	38
			1019

Weighted Mean: 0.24 pounds/employee/day
Median: 0.24 pounds/employee/day

Std. Deviation (σ): 0.08 pounds/employee/day
Range (95% Confidence Interval = $\pm$ 1.96σ): 0.07-0.38

5.1.3.1.3 For all buildings the following variables were selected for follow-on regression analysis: PEOPLE, DESKWB, PHONES, SQFTRE, SHAOFF.

5.1.3.2 The two-weekly periods WLP12, WLP34, et. cetera, generally showed consistant correlation with each other over the course of the 12 week period, except for the first two weeks. (The week of 26-31 December 77 was not included.) This difference may be attributable to irregular Fiscal Year files cleanout during those first two weeks in October. This correlation "abbreviation" did not occur for those buildings with generation rates falling between 0.11-0.14 and 0.31-0.38 pounds/employee/day. Approaching Christmas holidays seemed to have had some effect on the correlations, but was not considered significant.

5.1.3.3 Correlation between white ledger output (WLP) and computer printout paper (CPO) was inconsistent from group to group thereby indicating that generation behavior is different for the two high grade components and generation estimates for the two components should be considered as two distinct operations.

5.1.3.4 Computer printout paper output was very consistent and highly correlative (greater than 0.80) from one two-week period to another. This implies that it can be sampled for, say a two-four week period, and be highly representative of CPO generation in the buildings which use it.

5.1.3.5 Data was also collected during the first nine days of January 1978. Overall, per employee generation rates went up 53 percent for all buildings studied, implying that calendar year cleanout of files significantly affects wastepaper output at that time of the year. However, this is believed to be unrepresentative of the normal output and, therefore, not included in analysis to develop a multiple regression estimate model.

5.1.4 Multiple linear regression analysis was conducted on data from all 16 buildings for which "hard" data was collected.

5.1.4.1 Using the 5 independent building characteristics' variables chosen from simple correlation analysis, and averaged daily white ledger output per building studied, stepwise regression produced the following:

5.1.4.1.1 The best equation obtained for the quantity of white ledger wastepaper output is:

$$Y = (0.24715)(\text{employees})$$
$$= (0.25)(\text{employees})$$

5.1.4.1.2 Statistical Tests:

<u>"F" Test</u>

H_o: $B_1 = 0$

H_1: $B_1 \neq 0$

$F_{model} = 268.319$

$F^1_{15,0.95} = 4.54$, therefore, reject H_o

<u>R^2</u>

$R^{1^2} = 0.9471$

5.1.4.1.3 Discussion:

5.1.4.1.3.1 The statistical test for the overall regression equation explained the white ledger wastepaper output with a 99.5 percent degree of confidence ($F^1_{15,0.995} = 10.798 < 268.319$).

5.1.4.1.3.2 The other variables were not included in the best equation since none were of importance in removing any error in the estimate of wastepaper output. In this regard, the multiple correlation coefficient, R^2, was 0.9471 using PEOPLE as the only variable; therefore, the equation explained 94.71 percent of the total variation in the quantity of white ledger output. The next variable added by the regression program was square footage (SQFTRE) and this only increased the R^2 by 0.0023. Consequently, for practical reasons only PEOPLE (employees) was chosen to be the prediction building characteristic variable.

5.1.4.2 The low generation rate, compared to EPA civilian-sector derived estimates, is not surprising since many recycling-experienced engineers on military installations have observed/ studied low generation of WLP in their facilities. (e.g., HQ ADC recovered an average of 0.28 lbs/ employee/day for WLP and computer printout combined from a command headquater's staff of 1385 employees.) (Reference 69.)

5.1.5 Analysis of inventory turnover and recovery of computer printout paper (CPO) revealed the following:

5.1.5.1 Base Supply and Data Automation were the largest users of CPO. CPO used on their computers is distributed to many of the base functions as well as within their own organizations.

5.1.5.2 The base Self Service Store (BSS), also know as the Local Purchase (LP) Store, provides the CPO to users, such as Base Supply and Data Automation.

5.1.5.3 Using inventory-based monthly quantities of CPO used by Base Supply and Data Automation, corrected for container box and carbon paper content (determined through sampling), and comparing this data with the average monthly CPO recaptured from buildings served by these organizations, showed that approximately 65 percent of the usage was available for recovery. The non-recoverable portion is apparently lost through permanent file storage, classified destruction and off-base distribution. Derivation of the recoverable quantity is described in Addendum 5.

5.1.6 Analysis of inventory turnover and recovery of computer tabulating cards (CC) revealed the following:

5.1.6.1 Data Automation, Base Supply and the Communications Squadron were the biggest users of the cards. Most cards are identified as official forms and are controlled through the local Publication Distribution Office (PDO).

5.1.6.2 One case of cards weighs 60 pounds; discounting the weight of cardboard leaves 57 pounds per case.

5.1.6.3 PDO records showed a monthly usage of 4,465 net pounds per month (4,700 pounds when including the weight of case cardboard) by 17 base users. Average monthly quantity of CC recoverable from these users was 3954.57 pounds. Hence, the recoverable quantity was approximately 88 percent of those cards distributed through the PDO. (Cards used by Supply were kept in the organization and investigations showed that approximately 100 percent of the cards used by Supply were recovered from its headquarters and warehouses, shipping and receiving areas.) Final recovery factor for Tyndall was therefore [(0.88) x (0.98)-the recovery effectiveness]-or 86 percent.

5.1.6.4 Defense Property Disposal Office (DPDO) sales receipts showed that the average quantity of CC historically recovered for sale, was 2.7 tons or 5,400 pounds per month. When compared to PDO records of 4,700 pounds usage per month, the DPDO figure represents 700 pound or approximately 12 cases of cards that must have come from other sources such as the non-appropriated retail activities (Base Exchange, Commissary) and from off-base sources (i.e., from other DOD installations such as the Naval Coastal Systems Center in Panama City, Florida).

5.1.7 Recovery Effectiveness - Offices

5.1.7.1 Overall recovery of computer cards (CC) averaged 92,99 and 99 percent of that which was available during the months of October November and December 1977, respectively. Frequent users of the cards invariably achieved 99 and 100 percent recovery effectiveness consistently.

5.1.7.2 Overall recovery of computer printout paper (CPO) averaged 98, 99 and 98 percent of that available during the October, Novermber, December 1977 test period, respectively.

5.1.7.3 Overall White ledger paper (WLP) recovery averaged 89,90 and 88 percent during the same monthly periods.

5.1.7.4 These excellent recovery figures are summarized, together with compositional and generations rates, in Table 10. Original data is included as Addendum 6.

TABLE 10. SUMMARY OF TYNDALL AFB HIGH GRADE DATA ANALYSIS

I. Composition of Office-Type Buildings*

Component	Percent of Total	Pound/employee/Day
Computer Cards	13.5	0.18
Computer Printout Paper	14.5	0.21
White Ledger	21.5	0.24
Other Material	45.5	

* 16 buildings studied over three month perio ddoes not include Reproduction Center waste.

II. Total Waste Generation Rate Within Office-Type Buildings

1.32 pounds/employee/day

III. White Ledger Paper (WLP) Generation Model:

WLP = (0.247 pounds/employee/day) x (# employees)

Model describes WLP output with 99.5 percent degree of confidence.

Model explains 94.71 percent of the total variation in the quantity of WLP output.

IV. Computer Printout Paper (CPO) Availability:

Approximately 65 percent of CPO purchased from inventory was available for recovery.

V. Computer Card (CC) Availability:

Approximately 88 percent of CC purchased from inventory was available for recovery.

VI. Overall Recovery Effectiveness (percent)#

	CPO	CC	WLP
October 1977	95	97	89
November 1977	99	99	90
December 1977	98	99	88
Average	97	98	89

defined as the percentage of each wastepaper type actually recovered from the total possible recoverable quantity of that type.

5.1.8 Recovery Effectiveness - Aircraft Maintenance

5.1.8.1 Sampling showed that WLP generation is minimal in these facilities ranging from a low of 7.75 pounds per month for one facility to a high of 210.25 pounds per month in another. Computer cards and printout paper were easy to retrieve, but WLP is primarily composed of small maniford forms from which personnel were reluctant and/or unable to separate out the carbon paper.

5.1.8.2 Consequently, much of the WLP ended up in the trash can and effectiveness for all the high grades was only 69 percent.

5.1.9 The base Reproduction Center was analyzed to determine if any indicators could be identified for estimating white ledger wastepaper generation from the function.

5.1.9.1 Waste is produced by malfunction of the presses and collators. The base Reporduction Center produces 5 extra overrun copies of every original to cover potential losses from machine malfunctions and to produce a "rundown" sheet for cleaning off the ink from image producing rubber "blankets" of the printing presses.

5.1.9.2 A record of the number of originals received, total units (copies) produced, collated, and overrun is kept by the staff on AF Form 806, Duplicating Control Register. (The governing Air Force regulation does not require accounting of the overrun, however.) The supervisor indicated that an average of 50 percent of the overrun ends up as waste; the remainder goes to the customer as extra copies (Reference 70). His estimate of this waste factor was derived from a Center conducted one-month sampling survey of a year earlier.

5.1.9.3 Waste white ledger collected from the Reproduction Center over the period 3 Oct 77 - 13 Jan 79 amounted to 1038.75 pounds. Overruns of 140,120 sheets amounted to 1303.12 pounds (140,120 sheets ÷ 500 sheets per ream ÷ 10 reams per case x 46.5 net pounds per case (supervisor estimate)). Consequently, the waste factor was approximately 80 percent of the overrun vis-a-vis the 50 percent Center estimate.

5.1.9.4 Possible reasons offered by the supervisor for the high waste factor included:

5.1.9.4.1 Customer demand for fast duplicative services on the Center's old offset presses and/or low body quality of the paper used by the Air Force led to higher paper rejection by the presses and problems with the collating machinery; collating appeared to be the most destructive process. Although the paper is graded by the General Services Administration (GSA) to a standard, the Reproduction Center has experienced wide variance in quality from one producer to another.

5.1.9.4.2 Although not confirmed quantitatively by Center personnel, qualitatively they believed the problems described above were present during at least some part of the wastepaper recovery test, and were of a higher magnitude than experienced during the period when the Center derived the 50 percent waste factor.

5.1.10 Paper stored in the Records Staging area was investigated for high grade recovery potential. The results were unpromising.

5.1.10.1 Records Staging is a function under base headquarters administration. It serves 175 office on Tyndall and 35 Tenant organizations. It stores files/records from these activities for variable lengths of times, depending upon the data/information contained in them and applicable DOD regulations. Some records are destroyed/disposed of by Records Staging after completion of the required storage period; records requiring storage beyond 8 years are sent to permanent storage facilities in Kansas or Washington DC (Reference 71). Most military installations have a Records Staging function.

5.1.10.2 Seventeen boxes were chosen at random for sampling, out of 138 boxes scheduled for calendar year disposal. Record content varied from retail activity receipts to personnel-related folders. Some of the latter fell under the Privacy Act and would require shredding before use in recovery.

5.1.10.3 The total net weight of the boxes' contents was 408.25 pounds. Of this, WLP comprised 40.9 percent and CP032.0 percent; the remaining contents were composed of cardboard, carbon paper, colored ledger and metal fastenings.

5.1.10.4 In terms of time it took one person 382 minutes to screen through the 408.25 pounds of waste; it took one person 1½ minutes to screen out one pound of the high grade paper. In view of current labor rates and wastepaper revenues, it appears that salvaging the Records Staging material would not be economical, particularly since extra effort would be required to identify Privacy Act protected items and then to shed or tear them before further use.

5.2 Vandenberg AFB

5.2.1 Table 11 lists the white ledger wastepaper (WLP) generation rates for 17 office-type buildings on Vandenberg. Two additional buildings 488 (a missile and space launch tracking facility), and 6523 (a test facility) are included in the testing to demonstrate that some functions that are not considered office-type oriented can be significant generators of recyclable white ledger wastepaper. The period of data collection varied for some of the buildings depending on when they were brought into the program; the minimum period used was 43 days; the median was 90 days, the average 100 days, and the most frequently used period was also the maximum, 157 days.

5.2.2 It is uncertain how close these generation rates come to representing the maximum possible output because, unfortunately, the recycling contractor was unable to guarantee total recapture of the WLP as originally agreed upon.

5.2.2.1 Partially through the contracted 3 month data gathering effort the contractor discovered "slippage" of the high grades into the dumpsters, by unknown means, since janitorial personnel were alerted to retrieve or not pick up recyclable paper, and sampling of wastebaskets revealed inconsequential amounts (0.6-2.9 pounds per building per day) being thrown away in this manner.

5.2.2.2 To obtain an idea of the magnitude of this slippage the contractor sampled some dumpsters and retrieved the recyclable paper. However, the sampling was not statistically adequate nor were the individual high paper grades identified; it only gave an indication that high grade white ledger wastepaper collected by the program represented approximately 84 percent

TABLE 11. WHITE LEDGER WASTEPAPER (WLP) GENERATION RATES - VANDENBERG AFB

Rate* (pounds/employee/day)	Function	Bldg	Employees
0.08	Communications Hqtrs	6510	250
0.09	Civil Engr Staff & Maint Repair	11439	95
0.11	Admin Ctr-Minute Man Maint	6601	250
0.17	Civil Engineering Staff	11433	52
0.17	Hqtrs & Msl Launch Admin	10577	253
0.18	Base Hqtrs, Comptroller & Trans Staff	11777	436
0.21	Admin Base Supply	11248	31
0.21	Staff Offices for West Test Range	7000	494 (C)
0.24	Tracking Facility	488	160 (C)
0.26	Base Supply Staff Offices	11219	100
0.26	Msl Devel Prog Implementation	6523	100 (C)
0.26	Test & Eval Ctr-Staff Offices	8500	320 (C)
0.33	Shipping & Receiving	9360	80
0.37	Msl/Space Computer Programming	852	85 (C)
0.38	Msl/Space Instru Engr Offices	8310	184 (C)
0.46	Msl/Space Defense Program Implementation	6525	358 (C)
0.49	Msl/Space Martin Marietta	8401	360 (C)
0.71	Msl/Space Software Development	860/861	100 (C)
0.94	Space & Msl Systems Office	8510	150 (C)

Note: (C) denotes contractor involved/supported operation and/or unique mission support activities.

* Effectiveness rate uncertain; based on actual recovered WLP.

of that available. Navy studies of overall white ledger recovery effectiveness contrasted sharply with this indication. The Navy determined that 40 percent separation effectiveness was being achieved for the white ledger category for all office-type buildings as a group (Reference 72). (However, see also paragraph 5.2.5.5 for an alternative effectiveness determination.)

5.2.2.3 It will be impossible to assess the actual effectiveness without a "hard" data gathering study. Some of the office-type buildings listed in Table 11 were not included in the Navy's office category surveys (which were established using guidance from installation solid waste managment personnel), thereby raising questions regarding the performance of the individual buildings involved and, since the Navy's findings represent a group, they can't be applied to the individual buildings included within that group. The 40 percent office-category effectiveness also includes buildings in which no recycling was taking place.

5.2.3 Despite the uncertainty with respect to the accuracy or precision of the rates they are still valuable for the following reasons:

5.2.3.1 They show a significant difference between traditional installation military functions and unique mission support functions supported by civilian contractors.

5.2.3.2 The traditional military functional rates fall within the 95 percent confidence interval of rates experienced at Tyndall (Reference Table 9, thus lending support to the hypothesis that civilian-sector derived rates are not appropirate for these functions.

5.2.3.3 The rates represent a real world level of recovered output for a program of the scope and sophistication of Vandenberg's.

5.2.4 Multiple linear regression analysis was conducted on data from 9 buildings occupied by contract and/or unique mission support personnel, and 4 buildings occupied by DOD personnel on which data was available from collection periods of over 100 days (the longest periods were chosen to represent, as close as possible, a steady state separation environment). The non-unique DOD-occupied buildings include many of the functions described at Tyndall; at

Vandenberg the functions were consolidated into fewer buildings than was the case at Tyndall. The same building characteristic variables used for the Tyndall analysis were used, except for (1) SHAOFF which was deleted based on experience with Tyndall's data, and (2) DESKWB represents strictly the number of waste baskets counted and are not directly related to desks as they were at Tyndall; this difference was created by the method in which the contractor listed the building characteristics.

5.2.5 Regression analysis revealed relationships unique to contractor and/or unique mission supported functions vis-a-vis the usual military functions and, within the contractor and unique mission supported facilities, computer programming, software development activities affected the output.

5.2.5.1 For missile and space launch contractor-unique mission supported activities except computer programming, software development, stepwise regression produced the following (seven buildings were used with a total population of 1829):

5.2.5.1.1 The best equation obtained for the quantity of white ledger wastepaper output is:

$$Y = (0.54163)(\text{wastebaskets}) - (0.00074)(\text{SQFTRE})$$

5.2.5.1.2 Statistical Tests

"F" Test

$H_o: B_1 = 0$

$H_1: B_1 \neq 0$

$F_{model} = 27.669$

$F^2_{5,0.95} = 5.7861$; therefore, reject H_o

R^2

$R^2 = 0.9171$

5.2.5.1.3 The statistical test for the overall regression equation explained the white ledger output with a 99.5 percent degree of confidence ($F^2_{5,0.995} = 18.314 < 27.669$).

5.2.5.1.4 The equation explained 91.71 percent of total variation in the quantity of white ledger output. Other variables such as PEOPLE and PHONES raised the R^2 to 0.9241 but are not included here since the correlation between DESKWB and these variables was higher than 0.96.

5.2.5.1.5 An effort was made to include PEOPLE as a variable in an equation but the best R^2 that could be achieved, without variables violating the 0.96 correlation constraint, was 0.8096 using PHONES; or 0.8090 using SQFTRE.

5.1.5.1.6 Using only the variable PEOPLE (employees) produced the the following:

$$Y = (0.34128)(\text{employees})$$

which explained the white ledger output with a 99.5 percent degree of confidence ($F^1_{6,0.995} = 18.635 < f_{model}$ (24.363)), however, it only explained 80.24 percent of the total variation in the output.

5.2.5.1.7 Using only the variable DESKWB (wastebaskets) produces: Y = (0.38413)(wastebaskets) at a 99.5 percent degree of confidence and R^2 equal to 0.8925.

5.2.5.2 For missile and space launch contractor and unique mission supported activities, including computer programming, software development, stepwise regression produced the best equation as follows. (Nine buildings were used with a total population of 2014 employees.):

$$Y = (0.39060)(\text{wastebaskets})$$

which explained output with a 99.5 percent degree of confidence, and R^2 of 0.8710.

5.2.5.2.1 Using only the variable PEOPLE (employees) produced the following equation:

$$Y = (0.34772)(\text{employees})$$

which explained the white ledger output with a 99.5 percent degree of confidence ($F^1_{8,0.995} = 14.688 < F_{model}$ (32.117)), and explained 80.06 percent of the variation in the output.

5.2.5.3 For usual military functions stepwise regression produced the following (4 buildings were used with a total population of 820 employees):

5.2.5.3.1 The best equation for the quantity of white ledger wastepaper output is:

$$Y = (0.18166)(\text{employees})$$

5.2.5.3.2 Statistical Tests

"F" Test

H_o: $B_1 = 0$

H_1: $B_1 \neq 0$

$F_{model} = 421.635$

$F^1_{3,0.95} = 10.128$, therefore, reject H_o

R^2

$R^2 = 0.9929$

5.2.5.3.2 The statistical test for the overall regression equation explained the white ledger wastepaper output with a 99.5 percent degree of confidence ($F^1_{3,0.995} = 55.552 < 421.635$). The equation also explained 99.29 percent of the variation in the output.

5.2.5.3.3 The variable PEOPLE correlated with DESKWB and PHONES at 0.987 and 0.998 respectively and, consequently, the latter were removed from the analysis since PEOPLE correlated with white ledger (WLP) output at the highest level of 0.996. SQFTRE correlated well with both white ledger and PEOPLE (0.929 and 0.943, respectively) but only added 0.0009 to the R^2 value and therefore, was not included in the equation.

5.2.5.4 All military functions at both Tyndall and Vandenberg were analyzed by regression procedure. Most significant of the results was an R^2 of 0.9564 with PEOPLE as the best building characteristic variable.

5.2.5.5 Despite the uncertainty with respect to recovery effectiveness for the buildings at Vandenberg, the similarity of military office-type functions and employee populations studied at both Vandenberg and Tyndall (820 and 1019 employees, respectively), plus results and similarities appeared to provide an opportunity for estimating Vandenberg's effectiveness using the "hard" data results from Tyndall.

5.2.5.5.1 Consequently, if we assume Tyndall's (0.24715) x (employees) model generation as a base for computation purposes, effectiveness for Vandenberg's military functions can be estimated as follows:

$$\text{Effectiveness}_{\text{VAFB}} = \frac{(0.18166)(\text{employees})}{(0.24715)(\text{employees})} \times 100$$

$$= 73.5 \text{ percent}$$

5.2.5.5.2 It is believed that this effectiveness can then also serve as the best available indicator of effectiveness for the other buildings on Vandenberg, as applied to the equations using employees as the independent building characteristic variable. Under this assumption, the generation rate can be approximated to 0.5 pound per employee per day, to wit:

$$\frac{(0.34128 + 0.34772)}{(2)(0.735)} \text{ (paragraphs 5.2.4.1.6 \& 5.2.4.2.1)}$$

$= 0.468$

$\simeq 0.5$

5.2.6 No inventory turnover-to-waste correlations were possible for computer cards and printout paper since contractors handled their own procurement and this data was not available to the Air Force researcher.

5.2.7 Waste generation data

5.2.7.1 An overall solid waste generation factor was difficult to calculate for the office category because the total population of one category was not known. (Although truck routings were established to serve office buildings during the weighing and composition surveys, some maintenance shops-facilities and laboratories were included due to the initial impression by installation solid waste management personnel that they were offices; also some office and shop buildings used the same outdoor containers and could not be separated for purposes of the surveys. Consequently, no data on the number of employees in tense non-office buildings was obtained by researchers primarily interested in the office activities.)

5.2.7.2 Despite the lack of population data on the entire category, this data was obtained on 21 office buildings within the category, not counting the Print Plant. Using the Navy's estimate of recyclables (Reference 73) generated in these facilities (assuming the shops and laboratory contributed an insignificant amount of high grades to the waste stream) resulted in the following high grade generation rates.

Given: No. Employees = 3224
CC generation = 1520 pounds/week
CPO generation = 6080 pounds/week
WLP generation = 11,435 pounds/week (not counting Print Plant)

Rates = pounds/week ÷ No. employees ÷ 5 days/week

$$\begin{aligned} CC &= \phantom{\underline{0}}0.09 \text{ pounds/employee/day} \\ CPO &= 0.37 \text{ pounds/employee/day} \\ WLP &= \underline{0.70} \text{ pounds/employee/day} \\ & 1.16 \text{ pounds/employee/day} \end{aligned}$$

5.2.8 Summary data of composition, prediction models and recovery effectiveness are listed in Table 12.

6.0 CONCLUSIONS

6.1 EPA civilian-sector-derived generation planning factors are not directly applicable to military installations; high grades need to be broken out in categories to be optimally useful.

6.2 The building characteristic variable PEOPLE (employees) statistically demonstrated that it is the best predictor of white ledger wastepaper in a building housing traditional military installation office-type activities.

6.3 Traditional military installation office-type activities, listed in Tables 2 and 9 exhibit a wide range of high grade wastepaper generation output, but collectively can be represented by a model developed from regression analysis.

6.3.1 The following model/equation should be used for predicting daily white ledger wastepaper output in these buildings.

$$WLP_{\text{pound/day}} = (0.25 \text{ pounds/employee/day})\ (\text{No. of employees})\ (0.75)$$

6.3.2 The recovery factor (0.75) applied to the daily quantity provides a conservative estimate of the recoverable portion of the generated white ledger wastepaper. This recovery factor corresponds to the Vandenberg-Tyndall comparisons and to historic EPA experiences with high grade recovery (Reference 74). (Experiences with previous wastepaper recovery program indicate that conservative estimates of recoverable paper increase the possibility that the programs will not be oversold and scoped unrealistically.)

TABLE 12. SUMMARY OF VANDENBERG AFB
HIGH GRADE DATA ANALYSIS

I. Composition of Office-Type Buildings*

Component	Percent of Total	Pound/Employee/Day
Computer Cards	6	0.09
Computer Printout Paper	14	0.37
White Ledger	44	0.70
Other Material	36	-

* 35 buildings, studied by weight and photosort reduction surveys; however data used for generation modeling, Part II below, was based on the recovered recyclables rather than photosort mehtod and accounts for significant differences in white ledger per capita generation rates.

II. White Ledger Paper (WLP) Generation Models:

A. For missile and space launch contractor and unique mission support, without computer programming, software development activities.

Model 1: WLP = (0.54163)(wastebaskets) - (0.00074)(SQFTRE)

- Model describes WLP output with 99.5 percent degree of confidence "F" test significance
- Model explains 91.71 percent of the total variation in the quantity of WLP output (R^2 = 0.9171)
- Actual recovery effectiveness unknown for data used in model development, however, model represents steady state period of collection of up to 157 days

Note: DESKWB represent the number wastebaskets and SQFTRE represents administrative area square footage obtained from installation Civil Engineering Real Estate real property inventory listings.

Model 2: WLP = (0.38413)(wastebaskets)

- Model meets 99.5 percent degree of confidence "F" test significance
- Model explains 89.25 percent of output variation (R^2 = 0.8925)
- Actual recovery effectiveness is a described for Model 1 above

TABLE 12. SUMMARY OF VANDENBERG AFB
HIGH GRADE DATA ANALYSIS (Concluded)

Model 3: WLP = (0.34128)(employees)

. Model meets 99.5 percent significance test

. Model explains 80.24 percent of output variation (R^2 = 0.8024)

. Actual recovery effectiveness is as described for Model 1 above

B. For missile and space launch contractor and unique mission support, including computer programming, software development activities.

Model 1: WLP = (0.39060)(wastebaskets)

. Model meets 99.5 percent significance test

. R^2 = 0.8710

. Recovery effectiveness - see Part A, Model 1 comment

Model 2: WLP = (0.34772)(employees)

. Model meets 99.5 percent significance test

. R^2 = .8006

. Recovery effectiveness - see Part A, Model 1 comment

C. For common-primary military installation functions

Model : WLP = (0.18166)(employees)

. Model meets 99.5 percent significance test

. R^2 = 0.9929

. Recovery effectiveness - see Part A, Model 1 comment

II. Overall Recovery Effectiveness (percent)#

	CPO	CC	WLP
. Weighing and Photosort Survey Determinations (February/March 1978)	69	95	40
. By proxy with Tyndall AFB data	-	-	74

defined as the percentage of each wastepaper type actually recovered from the total possible recoverable quantity of that type.

6.4 Non-traditional military supported functions such as special mission computer programming-software development; contractor supported research, development, test and evaluation of large military technology/ programs; unique mission activities, et. cetera should be physically surveyed to qualitatively assess the white ledger wastepaper output and if it appears higher than observed with the traditional activities use the following models and conservatively choose the lowest of the three estimates resulting from their use:

6.4.1 $WLP_{pound/day} = (0.34)(\text{No. wastebaskets})$

6.4.2 $WLP_{pound/day} = (0.54)(\text{No. wastebaskets}) - (0.00074)$ (administrative square feet)*

6.4.3 $WLP_{pound/day} = (0.35)(\text{No. of administrative employees})$

*Administrative square feet obtained from real property inventory listing.

Note: If activity primarily produces security classified material it will be necessary to estimate the impact on output and reduce the estimates accordingly.

6.5 Computer cards and printout paper should be estimately separately from the white ledger paper and each other.

6.5.1 Computer cards (CC) should be estimated through:

6.5.1.1 Historical sales through the local Defense Property Disposal Office (DPDO); or by

6.5.1.2 Identifying users and historical usage (quarterly or otherwise) through Publications Distribution Office (forms distribution) and Base Service Stores; identifying locations of final usage and applying recovery factor (locally estimated to account for cards non-recoverable because of security classification, permanent filing, off-base distribution and recovery effectiveness.)

6.5.1.2.1 Example of calculation method:

$$CC_{pounds/month} = [(\text{No. of cases used/quarter}) \div (\text{3 month/quarter})] \times (\text{pounds/case}) \times (\text{Recovery Factor})$$

6.5.1.2.2 Factors

- 1 case weighs 60 pounds gross weight; there is no need to account for the weight of the cardboard container since it is included in the weight of the cards when they are sold.

- Recovery Factor = (Recovery Availability) x (Recovery Effectiveness)

- $\text{Recovery Factor}_{Tyndall} = (0.88) \times (0.98)$

$= 0.86$

6.5.2 Computer printout paper (CPO) should be estimated through:

6.5.2.1 Identifying users, type and quantity of CPO used (1 part, 2 part, etc.).

6.5.2.2 Identifying buildings using CPO as an end product; estimate recovery factor.

6.5.2.2.1 Example of calculation method:

$$CPO_{pounds/month} = [(\text{No. of boxes of 1 part CPO used/month}) \times (\text{net pound/box}) + (\text{No. of boxes of 2 part CPO used/month}) \times (0.74)^{\#} \times (\text{net pound/box}) + (\text{No. of boxes of 3 part CPO used/month}) \times (0.74)^{\#} \times (\text{net pound/box}) + \ldots + (\text{No. of boxes of 6 part CPO used/month}) \times (0.74)^{\#} \times (\text{net pound/box})] \times (\text{recovery Factor})$$

0.74 accounts for carbon paper content

6.5.2.2.2 Factors

- Weights of boxes are listed in Table 3, Section X.

- $(0.74)^{\#}$ is factor to account for carbon paper.

- Recovery Factor = (Recovery Avalability) x (Recovery Effectiveness).

- Recovery $\text{Factor}_{\text{Tyndall}}$ = (0.65) x (0.97) = 0.63.

6.5.2.3 Alternative method to inventory analysis: measure CPO waste output from user buildings for period of at least two consecutive week, preferably four; avoid fiscal and calendar year cleanout periods. Results should provide fairly reasonable estimates of the routine waste output.

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AIR FORCE SOLID WASTE RESOURCE

RECOVERY - SOURCE SEPARATION

TEST PLAN

Vandenberg Air Force Base, California

1976 - 1977

Prepared by:
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Air Force Civil Engineering Center/EVW
Tyndall Air Force Base F. 32403

ADDENDUM 1, Appendix I

TABLE OF CONTENTS

SOLID WASTE

RESOURCE RECOVERY - SOURCE SEPARATION

TEST PLAN

1. General: The Department of Defense (DoD) is mandated by Environmental Protection Agency (EPA) Guidelines to establish solid waste resource recovery at most military installations. Although resource recovery can take the form of both refuse source separation and the more sophisticated, highly capital intensive mechanized refuse processing, the absence of high waste tonnages at most, if not all, Air Force bases dictates the use of basic source separation. Firm and proven guidelines for implementation of source separation of military installations is lacking and must be developed if base managers are to avoid historic base recycling failures and effectively meet the requirements of the EPA Guidelines and, concomitantly, reduce their overall solid waste management costs. This test will serve as a model for developing needed DoD/Air Force solid waste source separation guidance. The scheme will involve support of regional resource recovery.

2. References:

a. DoD Directive 4165.60, Solid Waste Management - Collection, Disposal, Resource Recovery and Recycling Program

b. HQ USAF/PREV Ltr, 13 Oct 76, Subject: Resource Recovery Test, Vandenberg AFB CA.

3. Task Organizations:

a. HQ USAF/PREV, Washington DC 20330

b. DLAH-SME, Cameron Station, Alexandria VA 22314

c. CINCSAC/DEP/DEM, Offutt AFB NE 68113

d. 4392 AEROSG/DE, Vandenberg AFB CA 93437

e. AFCEC/EV, Tyndall AFB FL 32401

f. Commercial resource recovery contractor

g. Contractor to analyze test

h. DPDO/SYX, Vandenberg AFB CA 93437

i. 4392 AEROSG/OI, Vandenberg AFB CA 93437

4. Test Objectives:

a. To test the feasibility of EPA recommended source separation procedures (Desk-top container system).

b. To determine the effectiveness of a base-regional cooperative program.

c. To determine the effectiveness of source separating recoverable wastes through a "voluntary source separation" program.

d. To determine cost/benefit factors:

(1) Actual costs to operate the program.

(2) Proceeds available from recovered materials.

(3) Reduction of present solid waste collection and disposal costs.

5. Description: This test will involve recovering the maximum amount of: discarded office hi-grade bond paper, computer paper, and computer punch cards from generating centers on base; mixed glass, newspapers, and possibly aluminum cans from base residential areas; cardboard and mixed glass from the Officers, NCO, and Airmans Clubs; and heavy metal objects at the base landfill. In office areas a desk-top container system will be utilized to collect recoverable office materials. These in turn will be collected by janitorial personnel and stored in labeled, strategically located containers for pickup by the recycling contractor.

In base residential areas, household members will be requested to voluntarily separate their wastes and set them out on the curbside for recycling collection. Preliminary estimates of total base recoverable materials include:

Newspaper	20 tons/mo
Mixed Glass	20 tons/mo
Bond/Specialty Paper	40 tons/mo
Computer Paper & cards	20 tons/mo
Heavy Metal Objects	10 tons/mo

In addition to testing voluntary source separation, the test will include provisions for government-contractor shared reimbursement of revenues received from sales of the recovered materials. Emphasis will be placed on minimizing capital investment in equipment/hardware, and on maximizing utilization of existing equipment/hardware.

6. Responsibilities:

a. 4392 AEROSG/DE:

(1) During Pre-Test Period:

(a) Shall write statement of work to include following provisions:

1. One year duration, with option to cancel after six months. Both Air Force and the contractor shall provide the other party with at least one month's notice of any need to modify or terminate any or all parts of the test.

2. Pick up of computer paper, computer punch cards and hi-grade office paper from generating centers on base.

3. Curbside pick-up of mixed glass, newspaper and possibly aluminum cans in base residential areas.

4. Revenue-sharing scheme between Air Force and contractor based on costs and sales of recovered materials.

5. Compliance with local, regional and state solid waste resource recovery plans. It is further required that the contractor be actively engaged in resource recovery activities involving local or regional governmental agencies.

6. Other provisions as defined under paragraphs 6a (2), and 6b, "Resource Recovery Contractor." (See also paragraph 6a(1)(m) below for related requirement.)

7. Pickup of cardboard and mixed glass from the clubs.

(b) Shall write sole source justification, if applicable.

(c) Shall take action to change existing custodial services contract(s) and document such, as follows:

1. Require resource recovery contractor to label (government furnished) all government furnished desktop containers, and other internal containers as may be applicable, and

2. Require custodial contractor(s) to maintain waste segregation by collecting source separated papers and cards from all office areas and storing them in specially marked resource recovery storage containers.

3. Document additional costs for:

a. Labeling (one time cost)

b. Maintaining segregation in disposing of the waste.

4. Document pre-test and testing period contractual requirements, costs and custodial method of operations. Also, indicate coordination requirements, problems overcome and other factors attendant to effecting changes to custodial services contract(s) (including contract(s) not under 4392 AEROSG/DE control, if applicable).

(d) Shall procure "desk-top" segregation containers. (HQ USAF/PREVP will assist in providing container specifications and funds.) Shall also purchase labels for such containers, and insure significant compatibility with contractor-provided labels used on resource recovery storage containers.

(e) Shall coordinate with existing residential refuse collection contractor to both ensure his understanding of, and cooperation with, the test program, and to negotiate any changes needed in his contract. Fully document costs and coordination requirements, etc., similar to the requirements in paragraph 6a(1)(c) above. Shall also ensure in-house work forces are similarily coordinated with.

(f) Shall fully coordinate with local Defense Logistics Agency/Defense Property Disposal Office (DLA/DPDO) to the marketing procedure of office area waste paper products, and changes attendant (if any) to 4392 AEROSG/DE support of the DPDO waste paper recycling program. In addition, DE shall ensure, through coordination with CINCSAC/DEPP and HQ USAF/PREVP, that DLA is aware of and ready to support the tasks required of DLA prior to and during the conduct of the test (paragraph 6c).

(g) Shall work with the selected recycling contractor to develop a comprehensive Pre-Test, Test and Post-Test Public Relations (PR) program. Shall also coordinate and ensure pre-test PR actions are effected (See paragraph 6b).

(h) Shall identify accounts to which rental and reimbursed funds from the contractor are to be deposited.

(i) Shall assist AFCEC/EV and AFCEC/EV designated "third party" test analysis contractor (a contractor other than the recycling contractor) in establishing baseline characteristics data on present base solid waste management system.

(j) Shall fully coordinate test needs with base legal, procurement, audit, Management Engineering Team (MET), office of information, and other functions as appropriate.

(k) Shall establish and document offices, individuals and telephone extensions involved in all phases of the pre-test and test periods. (See paragraph 12 for support requirements).

(l) Shall furnish and place storage containers not furnished by the recycling contractor.

(m) Shall furnish the recycling contractor a map identifying location of desired waste item pickups. Shall also provide such contractor with description of available containers and equipment/hardware that can be employed in this test. Note: Insure containers and locations meet applicable fire safety regulations.

(2) During Test Period:

(a) Shall provide the contractor:

1: Staging area on base.

2. Forklift and other available equipment on a government-contractor agreed upon fee rental basis.

3. Telephone service, paid by contractor.

(b) Shall coordinate PR program actions and ensure all actions are accomplished on a timely basis.

(c) Shall monitor performance of the contractor (includeing review of contractor's monthly accounting report on quantities of waste items collected and marketed; total revenues received per product marketed; and "purity" of the waste items collected (paragraph 6b(2)(a)).

(d) Shall maintain monthly accounting of non-recycled solid waste quantities collected from those points where waste items are picked up. This can be done on a random sampling basis to minimize disruption of residential refuse contractors and the in-house refuse collection schedule.

(e) Shall assist the AFCEC/EV designated "third party" test analysis contractor conduct man-power and equipment survey(s) designed to compare segregated solid waste management characteristics with the presegregated solid waste system. Shall also coordinate "third party" contractor information requests to the recycling contractor.

(f) Shall advise DPDO, CINCSAC/DEPP/DEMG, AFCEC/EVW, and AFCEC/EV designated "third party" contractor of status of test and periodic (monthly) test results as provided by the recycling contractor.

(g) Shall maintain on file, for test analysis comparison purposes, DLA furnished quarterly reports on market conditions for waste type items being collected for the recycling contractor (See paragraph 6c).

(3) During Post-Test Period:

(a) Shall ensure accomplishment of Post-Test PR program actions.

(b) Shall assist AFCEC/EV and "third party" contractor write up final analysis/technical report.

(c) Shall arrange negotiations for continuation of the source separation operation, modified as necessary, if test results warrant such continuation. Permanent DLA waiver to paper products may have to be coordinated through CINCSAC/DEP and HQ USAF/PREVP.

b. <u>Resource Recovery Contractor</u>:

(1) During the Pre-test Period.

(a) Will work with 4392 AEROSG/OI and 4392 AEROSG/DE to develop a Pre-test, and Test and Post-test PR program. This effort must include:

<u>1</u>. A plan to:

a. Announce the test.

b. Initiate the test.

c. Promote the test.

d. Support the test to its conclusion.

e. Announce results of the test.

2. Source separation guidelines for office and residential areas. (Includes pickup shcedules and other information germane to the test operation.)

3. Rationale for the PR approach so chosen.

(b) Will work with 4392 AEROSG/DE and waste generating organization to identify types of containers to be employed for storage and collection/storage of designated waste recoverable items.

(c) Will coordinate with 4392 AEROSG/DE to identify locations for containers used in the test. Will also provide 4392 AEROSG/DE with rationale for choice of locations, if different than normal refuse container locations. (Generally applicable decision rules/criteria will be sufficient, unless specific location characteristics warrant special emphasis.)

(d) Will label all containers (except those internal to the office area) and provide 4392 AEROSG/DE with rationale for the selection of both the containers and the types of labels used within the office areas.

(e) Will provide transportation of all recoverable items to the staging area and beyond, except where negotiated.

(f) Will provide 4392 AEROSG/DE with required waste item specifications (degree of contaminants allowed, size of bundles, storage bags, etc.) and source separation guidelines.

(g) Will describe incentive awards, if any, applicable to the military base environment.

(h) Will provide description of his organization and capabilities.

(2) During the Test Period:

(a) Will determine "purity" of segregated waste item streams and actions taken to improve the performance of those activities not meeting required specifications. Contractor will provide this data to 4392 AEROSG/DE in a monthly accounting report (paragraph 6b(2)(b) below.)

1. "Purity" will be reported for each waste item.

2. Definition of "Purity:" Ability to meet marketability specifications/the degree of compliance with contamination limitations.

3. Sampling rates will be negotiated with the Air Force.

(b) Will provide 4392 AEROSG/DE monthly reports, not later than the 10th day after end of previous month, on quantities of each waste product collected and marketed; total revenues received per product marketed; and "purity" of the waste item streams.

(c) Will work with 4392 AEROSG/OI and 4392 AEROSG/DE to accomplish PR program actions.

(d) When requested, will coordinate with "third party" test analysis contractor to provide supplementary information that may be required for his test evaluation. Such coordination will be cleared with the base contract monitor (4392 AEROSG/DE).

(3) During Post-Test Period

(a) Will coordinate with 4392 AEROSG/OI and 4392 AEROSG/DE to ensure PR actions are accomplished.

(b) Will provide 4392 AEROSG/DE with summary report on; but not limited to:

1. Quantity of each recycled waste item.

2. Total revenues received per waste item category.

3. "Purity" results over the test period. (including trends or lack thereof)

4. Recommendations for program improvements.

5. Manhours required to operate the recycling system (by "management" and "other").

(c) Will coordinate with "third party" test analysis contractor to provide concluding information that will be useful to the latter's final report on the test. Information will be limited to that previously agreed upon between recycling contractor, 4392 AEROSG/DE and the test analysis contractor.

c. <u>DLAH-SME and Vandenberg AFB-located DPDO</u>:

(1) DLAH-SME shall ensure that the appropriate DLA organization provides quarterly reports to 4392 AEROSG/DE on market conditions/prices (in California and regional area of Vandenberg AFB CA) for waste iemts of the same type being recycled by the base through this test.

(2) DLAH-SME shall ensure the DPDO at Vandenberg AFB CA is fully aware of the DLA waiver to the turn-in requirements for paper products for the duration of this test.

(3) DPDO shall work closely with 4392 AEORSG/DE in collecting data and providing guidance on the test program operation. DLA/DPDO will ensure Air Force personnel are fully aware, before test commencement, of any data requirements DLA may have supplementary to that already identified in this test plan.

(4) DPDO shall provide a report to 4392 AEROSG/DE not later than 45 days after test commencement, characterizing pre-test Vandenberg AFB DPDO related recycling activities as follows:

(a) Known FY76 and FY7T markets for:

1. Hi-grade bond paper

2. Computer paper

3. Computer punch cards

4. Corrugated cardboard

5. Mixed glass

6. Aluminum cans

7. Newspapers

8. Miscellaneous heavy metals

(b) FY76 and FY7T marketing performance of each of the waste items listed in paragraph 6c(4)(a) above (i.e., tons of each item sold, including cardboard from the commissary).

(c) FY76 and FY7T after-cost revenues for each of the above waste items marketed.

(d) DLA-DPDO contract requirements, "purity" (contamination limitations) and processing specification requirements for marketing the waste items listed in paragraph 6c(4)(a) above.

(e) Support required of 4392 AEROSG/DE needed for DPDO recycling program covering marketed waste items listed in paragraph 6c(4)(a). (For example, is 4392 AEROSG/DE required to transport any particular waste item(s) from a generating point to the DPDO processing area?)

(5) Shall provide description of FY76 and FY7T national, California and Vandenberg AFB CA regional market characteristics/ conditions for:

(a) Hi-grade bond paper

(b) Computer paper

(c) Computer Punch cards

(d) Corrugated cardboard

(e) Mixed galss

(f) Aluminum cans

(g) Newspapers

(h) Miscellaneous heavy metals

d. HQ SAC/DEP/DEM:

(1) Shall be responsible for overall test.

(2) Shall assist 4392 AEROSG/DE in the preparation of contract documents.

(3) Shall provide any additonal assistance required by 4392 AEROSG/DE.

(4) Shall advise HQ USAF/PREVP of periodic test results.

(5) Shall fully coordinate this test with CINCSAC/XPMOP.

e. HQ USAF/PREVP:

(1) Shall fund contracts with investigational engineering funds.

(2) Shall fund procurement of "desk-top" containers.

(3) Shall assist in evaluation of test results.

(4) Shall request DLAH-SME to direct the appropriate organization within DLA to provide quarterly reports to 4392 AEROSG/DE on market conditions/prices (in California and regional area of Vandenberg AFB CA) for waste items of the same type being recycled by the base through this test.

f. AFCEC/EV:

(1) Shall draw up this test plan.

(2) Shall investigate the feasibility of procuring a recycling contract through RDT&E channels.

(3) Shall assist in monitoring the test, evaluating the results and publishing the final report.

(4) Shall, in response to the above requirements, write a contract for test analysis and monitoring involving those provisions listed in the following section on third party test analysis.

g. "Third Party Test Analysis Contractor"

(1) During Pre-Test Period:

(a) Shall characterize the pre-test base solid waste management system:

1. Sources of waste

2. Method/type of collection

3. Quantities of waste produced

4. Costs of collection ($/ton) for residential and commercial-institutional waste areas.

5. Disposal quantities and costs ($/ton) for residential and commercial-institutional waste areas.

6. Method(s) of disposal (including "recycling" through local Defense Property Disposal Office (DPDO)).

(b) Shall determine the compositional characteristics of the waste streams originating from waste generating centers on base that will be involved in this test.

(c) Shall determine/estimate the quantities (tonnages) and/or volumes of refuse materials to be recovered druing the test period from waste generating sources identified by 4392 AEROSG/DE. Shall also determine total quantity of the waste streams from which waste items will be recovered.

(2) During Test Period:

(a) Shall conduct a survey of source segregation effectiveness.

(b) Shall assess the impact of source separation to the cost of collection operations, including janitorial services, and disposal operations.

(c) Shall work with 4392 AEROSG/DE and recycling contractor to coordinate data analysis time motion studies and other needs as may arise.

(d) Shall provide interim periodic test evaluation report to AFCEC/EVW and 4392 AEROSG/DE.

(3) Post-Test Period:

Shall provide final evaluation report to AFCEC/EVW and 4392 AEROSG/DE.

h. <u>4392 AEROSG/OI</u>: Shall be responsible for supporting the resource recovery contractor with his overall PR program during pre-test, test and post-test, to include, but not be limited to: editorial assistance, use of base news media, and other news media deemed appropriate to supporting the program.

7. <u>Environmental Assessment and Statement</u>: An environmental statement has been prepared and included as Appendix A to this plan.

8. <u>Test Program</u>:

a. The test will be commenced by the recycling contractor in both the residential and non-residential areas. Selected locations for waste gathering will be identified by the contractor (assisted by 4392 AEROSG/DE) in both areas for initial waste item gathering and program "shake out."

b. Expansion to other locations will be made by the contractor as his on-base experience grows and participatory performance by the base dictates. It would be expected that the entire source separation program would be established and operating as well as it can be by the ninth month after test initiation.

c. Reports on the test will be provided after the test by the recycling contractor and test analysis contractor. A final report will be prepared by AFCEC/EV, which will use conclusions from the test to formulate source separation guidance for Air Force base managers.

9. <u>Test Site Location</u>: All residential and commercial waste generating centers on Vandenberg AFB CA.

10. <u>Test Schedule</u>

a. Vandenberg AFB solid waste management system characteristics survey, 1 Feb - 27 Feb 77.

b. Start Test, 1 Mar 77.

c. Sixth month continuation/termination decision, 1 Sep 77.

- Final report, if test terminated, Dec 77.

d. Completion of test, 1 Mar 78.

e. Final report, Jun'78.

11. Data Acquisition:

a. Data will be furnished as extensively discussed in paragraph 6 of this plan.

b. Data will be collected, compiled, analyzed and distributed in accordance with paragraph 6 of this plan.

12. Support Requirements: The following organizations will provide support to the test (in addition to those task organizations listed under paragraph 3 of this plan).

a. CINCSAC/XPMOP - Plans and Programs; coordination

b. CINCSAC/MET, Vandenberg AFB CA - Plans and Programs', Resources coordination

c. Air Force Audit Agency, Vandenberg AFB CA - contractor accounting requirements

d. Procurement, Vandenberg AFB - contract procurement

e. Judge Advocate, Vandenberg AFB - legal counsel

f. Office of Information, Vandenberg AFB - PR support

g. Comptroller, Vandenberg AFB - Funds accounting coordination

13. Safety: Federal Safety Standards will be adhered to in all phases and oerations of this test.

14. Security: This testing is unclassified in its entirety. However, access to, and operation on, Vandenberg AFB will be controlled in accordance with local base regulations.

15. Coordination: The following organizations will coordinate on this plan, by separate letter to AFCEC/EVW. These letters of coordination will be attached as Appendix B.

a. DLAH-SME
b. HQ USAF/PREV
c. CINCSAC/DEP/DEM
d. 4392 AEROSG/DE
e. AFCEC/EV

CEL[1]

TEST ANALYSIS WORK PLAN

PHASE I

SOLID WASTE SOURCE SEPARATION

VANDENBERG AFB, CALIFORNIA

1.0 INTRODUCTION

This Phase I study will consist of surveying and characterizing the current solid waste management system at VAFB in order to establish an accurate data baseline with which the eventual source separation separate collection program can be compared. This effort shall include a detailed refuse analysis and economic analysis of current solid waste management methods, including janitorial services at VAFB. The study includes determination of the compositional characteristics of the waste stream originating from generating centers on base. It also includes determination of the quantities (tonnages) of refuse materials potentially recoverable from waste generating centers, as well as the total quantity of the waste streams from which waste items will be recoverable.

2.0 CLASSIFICATION OF SOLID WASTE SOURCES

The following classification/type for refuse sources will apply throughout this statement of work.

Source A - Office Space

Source B - Warehouses, storage buildings, receiving buildings

Source C - Shops; e.g., metal working, carpentry, equipment maintenance and repair

Source D - Flightline and missile operations

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[1] Reference: Squier, John L., and Miller, William V., Solid Waste Source Separation Test Vandenberg Air Force Base, California, PhaseI - Characterization of Pre-Test Solid Waste Management System, TM-M-64-77-03, Civil Engineering Laboratory, Port Hueneme, California, pp A2-A5.

Source E - Residential

Source F - Dining hall, officer's club, cafeteria, commissaries, service facilities, etc.

Source G - Dormitories, visiting officer's quarters (VOQ), etc.

For the purposes of this study, Sources B, C, and D have been consolidated into one category.

3.0 TASKS

3.1 Task I. Develop a plan for accomplishing the survey, and analysis, of the current solid waste management system (under Task II, paragraph 3.2).

3.2 Task II. Phase I characterization of the current base waste management system will proceed from February 7 thru March 11.

3.2.1 Waste sources of interest have already been identified and selected by Santa Barbara Recycling (SBR) for inclusion in the program.

3.2.2 The current method of collection is documented in a 1974 study of VAFB collection practices. This information will be updated during the Phase I effort.

3.2.3 The quantity of solid waste generated at VAFB will be determined by a 1-2 week weight survey during the periods 2/14-2/18 and possibly 2/28-3/4. Air force personnel will be used to operate the scales. The weights of solid waste for each source type will be determined by selectively routing the collection vehicles to only one source type per weigh-in. Details of this scheme will be worked out by CEL, SCS, and VAFB/CES personnel on or before 2/11. Data sheets for recording the cumulative weights will be supplied by SCS.

3.2.4 The cost of contract residential collection at VAFB will be obtained by CEL personnel with assistance from CES personnel.

3.2.5 The cost of collection for commercial-instituational collection at VAFB will be obtained by CEL personnel with assistance from CES personnel. This data will include but not be limited to:

Vehicle Costs
  Maintenance
  Operation
  Amortization

Labor Costs
  Drivers
  Mechanics
  Helpers
  Administration

3.2.6 The disposal quantities from residential areas will be determined under 3.2.3.

3.2.7 Same as 3.2.6 as it applies to commercial-institutional wastes.

3.2.8 The methods of disposal/recycling will be fully described by CEL and SCS personnel following the field sampling and time study analysis. This information will be included in the CEL Phase I report.

3.3 Task III. Determine the compositional characteristics of the waste streams originating from waste generating Source Types A, E, and F (clubs only). Waste composition analysis will be accomplished using the photogrid technique. Field sampling will take place during the week of 2/14-2/18.

3.3.1 Sampling will be performed at VAFB by sectors. During any given 3 to 4 hour period, photographs of the contents of as many outdoor waste bins as possible will be photographed in the specified sector. Sheets for logging the photograph location and source type will be provided by SCS. Table 1 shows the tentative schedule for these photographic sorts.

The sort will be derived from the slides at CEL and SCS facilities before 3/4 so that inadequacies, if any, can be corrected before program implementation. The computational procedures and reduced data will be presented in the Phase I report. An 80 percent level of confidence will be used for all data analysis.

3.3.2 The waste categories studied will be as shown below, unless expansion is suggested before data reduction begins. The present categories are as follows:

3.3.2.1 In residential areas:

Newspapers
Mixed glass
Aluminum cans
Heavy metal objects
All remaining waste items

3.3.2.2 Office areas:

White paper products, including computer paper and computer punch cards

All remaining waste items

3.3.2.3 Clubs:

Cardboard
Mixed glass
Aluminum cans
All remaining waste items.

3.3.3 CEL will estimate the quantities (tonnages) of recyclable refuse materials potentially recoverable during the test period from sources (types A, E, and F - clubs only) identified by the technical project officer in paragraph 3.3.2. Estimates will be based on source population, source type total population, and source type total tonnage.

3.4 Task IV. Establish a cost data baseline for assessment of source segregation impact on cost of collection and disposal operations. The effort will coincide and form part of the cost analysis function under paragraphs 3.2.4 and 3.2.5.

3.4.1 A time study of existing VAFB solid waste collection will be performed during the weeks of 2/7-2/11 and 3/7-3/11. Of the vehicular collection operations, only front loader operations will be studied; hoist-and-haul and residential collection should be unaffected by the program.

During the week 2/28-3/4, custodial time studies will be performed at selected source type A and F (clubs only) buildings. These locations will be designated by SBR to correspond with test sites, and will be selected such that the type A studies will consume the greater share of time, to reflect the greater waste volume generated by type A sources.

3.4.2 Sanitary landfill disposal costs, including equipment operations and maintenance, labor and land shall be obtained by CEL personnel from CES personnel. Studies will be performed during the week of 3/1 to evaluate the existing landfill operation. Man-machine analysis will be performed during at least two days of the time study period to establish the pre-test utilization of disposal personnel and equipment.

TABLE 1. FOUR-DAY SAMPLING SCHEDULE**
(Composition Survey)

Day	am/pm	Section* Man #1	Man #2
1	am	1	1
	pm	2	2
2	am	4-A	4-B
	pm	3-B	3-C
3	am	1	1
	pm	2	2
4	am	3-A, 5	3-C
	pm	4-A	4-B

* Section numbers refer to Figures 1-5, not attached.

** Each man will photograph for approximately 3 hours each period. Total number after first week will determine adequacy of data.

ADDENDUM 3

Solid Waste Source Separation
Determination of Effectiveness (Participation)

June 1977

W. V. Miller

APPENDIX I

NOMENCLATURE

V = volume, generally prior to separation

W = weight

v = volume, generally after separation

E = effectiveness, or participation in source separation by the individuals involved

P = purity (based on volume)

Subscripts

m = mix of refuse, prior to separation

x = refuse category

o = other (refuse) than recyclables – a special refuse category

ox = category o in a container intended for category x

xx = category x in a container intended for category x

xo = category x in a container intended for category o

oo = category o in a container intended for category o

to = total refuse in a container intended for category o

tx = total refuse in a container intended for category x

V = volumetric (basis)

W = weight (basis)

Effectiveness (compliance) of separating out a given parameter, x, from a whole, V_m, and keeping parameter x out of a container for other materials, container o, is E_{xo}. It is developed on a volumetric basis as follows:

$$\frac{v_{xo}}{v_{to}} = \frac{v_x}{V_m} - E_{xo}\left(\frac{v_x}{V_m}\right) \quad \text{by observation}$$

or

$$\left(E_{xo}\right)_v = \frac{v_x/V_m - v_{xo}/v_{to}}{v_x/V_m} .$$

Similarly, on a weight basis,

$$\boxed{\left(E_{xo}\right)_w = \frac{W_x/W_m - W_{xo}/W_{to}}{W_x/W_m} .}$$

This analysis assumes uniform separation of refuse constituents (i.e., for each 1% of the original constituent volume, v_o or v_x for one category placed in its designated container, there is 1% of all other category volumes being placed in their designated containers). This assumption does not allow for the case where all of category x is placed in container x, but some of category o is also placed in container x.

Table 1 . Calculation of Quantities of Potentially Recoverable Refuse Materials From Source Type A (Offices)— Vandenberg Air Force Base (May 9-10, 1977 Survey)

Refuse category	V_x/V_t	ρ_x	$\rho_x(V_x/V_t)$	ρ_x/ρ_t	W_x/W_t	W_x	$W_x{}'$‡	$W_x{}'/W_t{}'$	$\rho_x/\rho_t{}'$	$(V_x/V_t)'$
x	%	lb/ft^3	lb/ft^3	—	%	tons/wk.	tons/wk.	%	—	%
computer cards (stacked)	0	45.0	0	8.65	0	0	1.0	6.25	7.87	0.8
computer print-out (stacked)	0.3	38.3	0.115	7.37	2.21	0.3	1.0	6.25	6.70	0.9
computer print-out (loose)	5.9	7.3	0.431	1.40	8.26	1.2	1.2	7.50	1.28	5.9
white ledger (stacked)	2.4	38.3	0.919	7.37	17.7	2.5	2.5	15.62	6.70	2.3
white ledger (loose)	23	7.3	1.68	1.40	32.2	4.6	4.6	28.8	1.28	22
remainder, r	68.4	3.0	2.05	0.58	39.7	5.7	5.7	35.6	0.52	68

$$\rho_t = \Sigma\left[\rho_x(V_x/V_t)\right] = 5.20\ \text{lb/ft}^3\ ;\quad \rho_t{}' = 5.72\ \text{lb/ft}^3\ \text{(by iterative solution)}\ ;\quad \rho_r{}^{*} = \frac{82\ \text{lb}}{\text{yd}^3} = \frac{3.04\ \text{lb}}{\text{ft}^3}$$

$$\frac{W_x}{W_t} = \frac{\rho_x}{\rho_t}\left(\frac{V_x}{V_t}\right) \qquad\qquad \left(\frac{V_x}{V_t}\right)' = \left(\frac{W_x{}'}{W_t{}'}\right)\Big/\left(\frac{\rho_x}{\rho_t{}'}\right)$$

$W_t{}^{**}$ = 14.3 tons per week (normal office refuse stream); $W_t{}'$ = 16.0 tons per week (includes recycled paper)

* "Characteristics of Military Refuse," H. G. Rigo, USA CERL, Table I.
** from Table 10.
‡' indicates values are corrected for 1.7 tons per week sent to old recycling center.

ADDENDUM 4

Tyndall AFB Data Parameters

and

Simple Correlations

Appendix I

Tyndall Input Data For Simple Correlation

OBSERV (Bldg)	1 PEOPLE	2 DESKS	3 DESKWH	4 DESKIO	5 PHONES	6 SECTAP	7 SQFTKE	8 SQFTOC	9 PRIOFF	10 [illegible]	11 [illegible]
1 (751)	38.00	41.00	40.00	26.00	34.00	3.00	8671.00	11036.00	4.00	6.00	197.75
2 (1465)	54.00	54.00	50.00	52.00	49.00	17.00	4054.00	4654.00	16.00	11.00	100.50
3 (916)	36.00	42.00	39.00	39.00	40.00	10.00	9707.00	9190.00	11.00	4.00	28.50
4 (160)	139.00	95.00	91.00	72.00	84.00	10.00	10940.00	13130.00	4.00	16.00	734.00
5 (T47)	44.00	48.00	46.00	44.00	44.00	7.00	10776.00	8929.00	9.00	8.00	2.00
6 (219)	73.00	67.00	56.00	44.00	88.00	14.00	16606.00	13543.00	6.00	18.00	41.15
7 (548)	69.00	72.00	70.00	58.00	74.00	4.00	14220.00	12033.00	6.00	16.00	87.00
8 (647)	120.00	115.00	80.00	102.00	93.00	36.00	24080.00	22972.00	19.00	23.00	867.78
9 (T10)	33.00	39.00	39.00	23.00	35.00	7.00	5701.00	5766.00	1.00	8.00	150.00
10 (T45)	25.00	32.00	28.00	26.00	22.00	6.00	5701.00	3298.00	3.00	4.00	40.57
11 (T57)	68.00	72.00	67.00	62.00	68.00	51.00	10877.00	9535.00	8.00	18.00	171.00
12 (T61)	32.00	30.00	31.00	24.00	28.00	4.00	10877.00	9922.00	3.00	6.00	35.75
13 (421)	103.00	94.00	78.00	78.00	78.00	12.00	12408.00	12443.00	7.00	14.00	176.23
14 (530)	53.00	41.00	39.00	22.00	36.00	7.00	5082.00	4744.00	18.00	5.00	14.50
15 (T48)	32.00	16.00	17.00	9.00	16.00	1.00	5600.00	5253.00	4.00	4.00	177.66

OBSERV	12 CPU34	13 CPU56	14 CPU78	15 CPU910	16 CPU1112	17 ALP12	18 ALP34	19 ALP56	20 ALP78	21 ALP910	22 ALP1112
1	102.50	33.50	40.75	22.50	96.25	173.91	147.33	120.65	41.28	116.20	112.73
2	34.00	94.25	24.75	106.00	42.00	210.50	217.25	170.00	128.63	119.63	107.59
3	22.50	48.00	29.25	17.25	17.00	137.75	92.25	104.25	133.25	91.50	99.18
4	472.75	602.00	594.75	679.75	544.00	302.62	335.62	442.53	302.32	409.46	416.31
5	3.00	17.25	6.00	49.25	3.00	50.25	73.50	134.25	115.50	342.50	72.50
6	16.00	65.28	28.25	18.25	14.25	309.75	145.75	218.50	133.50	155.00	160.50
7	112.25	67.25	52.25	160.75	54.00	193.25	135.50	202.25	171.25	166.50	138.75
8	381.37	565.75	654.25	668.75	387.00	317.78	222.23	313.48	344.25	261.40	159.30
9	23.50	1.00	.50	.50	1.75	80.75	20.50	73.25	37.75	71.00	69.53
10	19.75	12.00	24.00	31.73	38.00	27.50	57.43	71.10	45.00	50.25	45.25
11	150.50	246.00	245.50	277.50	265.00	110.25	94.50	191.25	152.60	158.00	128.00
12	45.75	26.25	40.75	63.50	121.25	72.75	35.65	66.25	50.53	35.25	52.00
13	97.75	245.00	107.50	106.00	77.00	114.18	104.16	201.55	154.87	231.75	109.81
14	29.75	3.37	44.00	3.50	.50	48.25	79.50	77.50	75.00	51.50	75.25
15	225.28	262.60	206.63	274.00	176.88	26.13	19.00	47.49	22.19	26.75	27.53

Tyndall Input Data For Simple Correlation

THE SIMPLE CORRELATION COEFFICIENTS

NR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.00																					
2	.94	1.00																				
3	.93	.96	1.00																			
4	.87	.97	.92	1.00																		
5	.88	.94	.93	.88	1.00																	
6	.42	.56	.50	.62	.53	1.00																
7	.81	.84	.77	.79	.85	.39	1.00															
8	.73	.81	.71	.78	.79	.42	.95	1.00														
9	.27	.35	.23	.42	.27	.42	.17	.24	1.00													
10	.80	.90	.86	.86	.94	.68	.81	.76	.25	1.00												
11	.77	.70	.63	.67	.56	.39	.73	.70	.22	.61	1.00											
12	.76	.61	.60	.57	.50	.30	.66	.58	.08	.52	.92	1.00										
13	.85	.74	.69	.71	.61	.45	.71	.64	.19	.63	.92	.96	1.00									
14	.80	.70	.64	.67	.57	.48	.73	.67	.25	.62	.96	.96	.97	1.00								
15	.79	.69	.65	.67	.57	.45	.71	.63	.20	.63	.93	.97	.97	.98	1.00							
16	.73	.60	.60	.57	.49	.40	.64	.55	.04	.54	.88	.95	.93	.94	.95	1.00						
17	.68	.68	.66	.61	.81	.30	.75	.71	.21	.74	.56	.45	.49	.48	.48	.42	1.00					
18	.80	.72	.76	.68	.69	.26	.62	.53	.31	.61	.71	.67	.66	.66	.58	.46	.79	1.00				
19	.94	.88	.91	.82	.86	.38	.82	.70	.18	.79	.78	.76	.61	.78	.79	.76	.78	.91	1.00			
20	.92	.80	.86	.87	.81	.49	.84	.75	.36	.75	.84	.76	.66	.65	.65	.79	.69	[illegible]	.94	1.00		
21	.79	.73	.79	.70	.58	.23	.70	.57	.10	.59	.53	.63	.66	.54	.67	[illegible]	.51	.74	.87	.83	1.00	
22	.80	.66	.76	.58	.66	.20	.59	.44	.06	.56	.66	.69	.66	.64	.67	.71	.71	[illegible]	[illegible]	[illegible]	.79	1.00

ITER= 0

ADDENDUM 5

Determination of Tyndall AFB Recoverable
Computer Printout (CPO) Paper Output

I. Major Users: Base Supply, Data Automation

II. Inventory Turnover:

CPO Used	Net Weight* (pounds/box)	Monthly Usage (Boxes) Supply	Data Automation
1 Part	41.75	2	22
2 Part	46.62	5	21
3 Part	49.75	8	11
4 Part	49.75	25	21
5 Part	49.75	4	4
6 Part	47.38	36	32

* Without box (determined by sampling 3 boxes of each CPO, includes carbon paper used in multiple part paper)

Total 1 Part CPO used = (41.75) x 24 = 1002.0 pounds/month

Total 2 Part CPO used = (46.62) x (0.74)# x 26 = 896.97 pounds/month

Total 3 Part CPO used = (49.75) x (0.74)# x 19 = 699.48 pounds/month

Total 4 Part CPO used = (49.75) x (0.74)# x 46 = 1693.49 pounds/month

Total 5 Part CPO used = (49.75) x (0.74)# x 8 = 294.16 pounds/month

Total 6 Part CPO used = (47.38) x (0.74)# x 68 = 2384.16 pounds/month

Total 6970.62 pounds/month

\# Factor to account for carbon paper content (determined by sampling CPO with carbon paper)

III. Average monthly CPO recaptured from buildings served by these organizations = 4547.75 pounds/month.

IV. Average monthly CPO available for recovery = $\frac{4547.75}{6970.62} \times 100 \approx 65$ percent

Appendix I

ADDENDUM 6

Tyndall AFB

High Grade Paper Recovery Data

and

Effectiveness

Appendix I

Period: 3 Oct to 31 Oct 77 Tyndall AFB

	Daily Totals (1)			Separated Totals (2)			Total (1)+(2) = (3)			Effectiveness ((2) ÷ (3)) x 100		
Bldg	CPO	CC	WLP	CPO	CC	WLP	CPO	CC	WLP	CPO	CC	WLP
156				381.75	357.0	373.25	381.75	357.0	373.25			
160	14.25	3.25	144.23	1113.25	1964.75	534.6	1127.5	1968.0	678.83	99	99	79
180				17.0		45.0	17.0		45.0			
182				202.75	38.5	210.25	202.75	38.5	210.25			
219	1.75	0.5	72.25	74.0	45.0	480.0	75.75	45.5	552.25	98	100	87
258				37.0		28.0	37.0		28.0			
280				13.5		26.75	13.5		26.75			
421	7.5	.75	46.5	214.5	208.5	176.25	222.0	209.25	222.75	97	99	79
530	0.25		31.25	44.0	0.5	96.5	44.25	0.5	127.75	99	100	76
548	3.75		64.75	148.5	74.5	264.0	152.25	74.5	328.75	98	100	80
580				16.25	1.0	40.5	16.25	1.0	40.5			
647	29.12	2.49	99.25	1146.75	238.5	506.53	1175.87	241.0	605.78	98	99	84
647 Print						218.0			218.0			
649			2.50	41.75	7.0	77.25	41.75	7.0	79.75			
710				106.0		109.25	106.0		109.25			
745		1.0	4.62	80.25	18.0	70.5	80.25	19.0	75.12	100	95	94
747			16.75	4.5		106.5	4.5		123.25	100		86
748	25.75	2.5	12.0	370.0	253.75	32.25	395.75	256.25	44.25	93	99	73
751	4.0		57.0	157.0	22.5	417.27	161.0	22.5	474.27	98	100	88
757	1.0		15.5	325.5	425.75	216.25	326.5	425.75	231.75	99	100	93
761	0.25	1.0	11.75	90.25		112.5	90.5	1.0	124.25	99	0	91
916	3.5		19.5	74.5	7.5	223.75	78.0	7.5	243.25	96	100	92
1283												
1277				575.5	40.0	74.25	575.5	40.0	74.25			
1279												
1465	5.0	1.25	45.25	106.0	36.25	383.5	111.0	37.5	428.75	95	97	89
Totals							5435.62	3751.75	5466.0	98	92	85

CPO = Computer Printout
CC = Computer Cards
WLP = White Ledger Paper

Period: 1 Nov to 30 Nov 77 Tyndall AFB

	Daily Totals (1)				Separated Totals (2)				Total (1)+(2) = (3)				Effectiveness ((2) ÷ (3)) x 100		
Bldg	CPO	CC	WLP		CPO	CC	WLP		CPO	CC	WLP		CPO	CC	WLP
156	13.50	9.74	62.01		464.50	296.00	515.30		478.00	305.74	577.31		97	97	89
160	4.50	1.35	52.28		1206.75	1818.25	871.03		1211.25	1819.60	923.31		99	99	94
180	—	SAMPLED	—		14.25	0	42.75		14.25	0	42.75		(All White Paper = 69)		
182	—	SAMPLED	—		132.75	58.25	77.75		132.75	58.25	77.75		(All White Paper = 69)		
219	0.50	0.25	66.50		60.00	37.00	288.75		60.50	37.25	355.25		99	99	81
258	—	SAMPLED	—		68.25	4.50	75.75		68.25	4.50	75.75		(All White Paper = 69)		
280	—	SAMPLED	—		3.75	0	7.75		3.75	0	7.75		(All White Paper = 69)		
421	2.25	0.50	81.70		300.25	119.25	354.00		302.50	119.75	435.70		99	99	81
530	0.25	17.25	21.50		49.00	0	161.25		49.25	17.25	182.75		99	0	88
548	0.50	0	41.25		115.50	29.25	316.20		116.00	29.25	357.45		99	100	88
580					86.00	0	90.00		86.00	0	90.00				
647	19.75	6.25	117.23		1076.75	469.25	540.00		1096.50	475.50	657.23		98	99	82
647 Print	0	0	7.50		0	0	243.00		0	0	250.50		—	—	97
649					60.50	582.75	79.00		60.50	582.75	79.00				
710					1.50	0	144.25		1.50	0	144.25				
745	0	2.25	9.35		54.50	80.50	135.75		54.50	82.75	145.10		100	97	94
747	2.00	0	45.00		24.50	0	490.00		26.50	0	535.00		92	—	92
748	1.35	0.25	6.48		456.25	180.50	118.58		457.60	180.75	125.06		99	99	95
751	1.25	0.25	33.75		69.50	8.25	162.40		70.75	8.50	196.15		98	97	83
757	0	0	14.60		320.00	364.50	264.00		320.00	364.50	278.60		100	100	95
761	0.50	1.50	29.75		56.25	0.75	84.00		56.75	2.25	113.75		99	33	74
916	0	14.00	34.25		47.25	0	192.00		47.25	14.00	226.25		100	0	85
1283															
1277					327.75	98.00	40.50		327.75	98.00	40.50				
1279															
1465	0	0	54.25		122.25	113.00	307.00		122.25	113.00	361.25		100	100	85
266					49.75	120.50	136.60		49.75	120.50	136.60				
275					107.75	29.00	67.25		107.75	29.00	67.25				
Totals	46.35	53.59	677.40		5275.50	4409.50	5804.86		5321.85	4463.09	6482.26		99	99	90

CPO = Computer Printout
CC = Computer Cards
WLP = White Ledger Paper

eriod: 1 Dec 77 to 31 Dec 77 Tyndall AFB

	Daily Totals (1)				Separated Totals (2)				Total (1)+(2) = (3)				Effectiveness ((2) ÷ (3)) x 100		
Bldg	CPO	CC	WLP		CPO	CC	WLP		CPO	CC	WLP		CPO	CC	WLP
156	17.75	3.85	92.25		346.50	331.00	342.00		364.25	334.85	434.25		95	99	79
160	37.00	1.10	109.86		863.10	1523.25	801.65		900.10	1524.35	911.51		96	99	88
180					12.00	0	55.75		12.00	0	55.75				
182					110.25	47.50	228.93		110.25	47.50	228.93				
219	0	0.25	75.50		32.25	64.25	279.00		32.25	64.50	354.50		100	99	79
258					19.75	0	28.00		19.75	0	28.00				
280					0	0	14.50		0	0	14.50				
421	0.75	2.87	68.28		126.00	85.75	211.50		126.75	88.62	279.78		99	97	76
530	0	0	11.50		0.50	0	147.25		0.50	0	158.75		100	–	93
548	0	0.50	32.00		146.75	25.25	364.00		146.75	25.75	396.00		100	98	92
580					28.25	0	46.00		28.25	0	46.00				
647	41.00	4.85	130.20		869.25	345.50	343.68		910.25	350.35	473.88		95	99	73
647 Print					0	0	448.50		0	0	448.50				
649			4.10		22.00	10.75	58.10		22.00	10.75	62.20				
710	0	0	0		4.50	0	171.50		4.50	0	171.50		100	–	100
745	0	2.50	10.25		58.48	3.75	65.50		58.48	6.25	75.75		100	60	86
747	0	0	15.50		95.50	0	141.75		95.50	0	157.25		100	–	90
748	0.50	1.15	1.45		403.95	416.75	56.68		404.45	417.90	58.13		99	99	98
751	0.75	3.55	39.58		111.75	29.75	206.10		112.50	33.30	245.68		99	89	84
757	0.25	0	18.75		448.75	418.00	325.25		449.00	418.00	344.00		99	100	95
761	0	0	24.25		156.50	6.75	82.25		156.50	6.75	106.50		100	100	77
916	0	0	19.68		38.25	0.25	215.25		38.25	0.25	234.93		100	100	92
1283															
1277					234.50	92.25	74.25		234.50	92.25	74.25				
1279															
1465	1.50	0	46.34		108.75	101.75	239.25		110.25	101.75	285.59		99	100	84
266					71.75	72.50	161.33		71.75	72.50	161.33				
275					29.75	53.25	58.50		29.75	53.25	58.50				
Totals	99.50	20.62	699.49		4339.03	3628.25	5166.47		4438.53	3648.87	5856.96		98	99	88
												GOALS	95	95	90

CPO = Computer Printout
CC = Computer Cards
WLP = White Ledger Paper

APPENDIX J

Analysis of Collection Cost Avoidance Potential

1.0 Analysis of Collection Cost Avoidance Potential

1.1 The Challenge

1.1.1 The commercial and industrial waste collection function presents a genuine challenge to conducting a realistic assessment of impact caused by a waste materials recovery program. The reasons are manifold.

1.1.1.1 One must assume that the current operation is effective; that the number of trucks, employees and containers have been adjusted over time to meet the requirements for safe and sanitary waste removal, coupled with an accomodation of locally desired service levels; that existing resources can not only meet the requirements of "normal" operations but can also handle contingencies resulting from variabilities in refuse density and generation rates, and changes caused by on-base organizational relocations and mission change activities. The challenge arises as to how these contingencies can be best expressed quantitatively in order to assess the impact of a program which will change the amount of waste to be handled.

1.1.1.2 Additionally, one confronts an uncertainty with respect to the efficiency of the system. To what degree could the equipment and labor resources be made more productive? If the amount of waste being handled decreases, will additional time be freed up or will employees expand their task times to maintain a status quo? Or, if the waste decreases, can employees reduce their task times, accomplish more in less time and thereby permit the installation to remove a collection vehicle and crew from the system? In summary, how tolerant is the system to change?

1.1.1.3 Not all cost elements are equally sensitive to changes in refuse quantity. As will be seen, cost changes related to containers are directly proportional to changes in refuse quantities; on the other hand, total collection labor is not. Knowing how each element reacts to changes is critically important in properly assessing the cost avoidance potential.

1.1.2 Resolution of the aforementioned factors can be increased by the use of the waste collection model developed in the following paragraphs and through accurate data collection at the installation level. A proper cost avoidance assessment can be not accomplished without considering the elements of the system and data that represent them.

1.2 Elements and Constraints of the Waste Collection System

1.2.1 As described by Brunner, et al, the following constitute the important elements of the waste collection system (Reference 1).

1.2.1.1 Collection Vehicles: The number of front end (and rear end) loader packer trucks and their respective payload capacities, in pounds and cubic yards.

1.2.1.2 Collection Labor: The size of each truck crew and their pay grades.

1.2.1.3 Vehicle Availability: The percentage of time available for actual waste collection after accounting for down time caused by repairs and maintenance.

1.2.1.4 Containers: The number of containers deployed and their respective capacities in cubic yards.

1.2.1.5 Container Locations: The locations of deployed containers; the size and number placed at each of the collection points; and the average number of containers per collection point.

1.2.1.6 Waste Density in Containers. The average density in pounds per cubic yard (lb/yd3), of refuse in the containers.

1.2.1.7 Length of Collection Day, in hours.

1.2.1.8 Length of Collection Week, in days.

1.2.1.9 Collection Frequency: The average frequency of collection, based on the number of containers per collection point, capacity and rate of fill, and service level required.

1.2.1.10 Equipment Investment Costs

1.2.1.10.1 Collection Vehicles

1.2.1.10.2 Containers

1.2.1.11 Recurring Operations and Maintenance (O&M) Costs

1.2.1.11.1 Vehicles

1.2.1.11.2 Containers

1.2.1.11.3 Labor Rates

1.2.2 Constraints on the operation should include:

1.2.2.1 No Collection of Bulky Wastes: Bulky wastes such as large pieces of wood and metal should be collected separately from the compactable waste.

1.2.2.2 Quality of Service: The procedures for modeling the system in this report assume that containers will not be overfilled more than 1 percent of the time and a vehicle can service a prescribed number of containers 99 percent of the time. 1.3 Modeling The Waste Collection System.

1.3.1 Symbols used to express model elements are listed in Table 1.

1.3.2 Equipment Utilization

1.3.2.1 Research by Brunner, et al at the Navy's Civil Engineering Laboratory (CEL) showed that the elements of the solid waste management system can be mathematically related to container utilization (Reference 2 and Addendum 1). Container utilization is limited by two characteristics of the refuse (generation rate and density in the container) and by the level of service (collection frequency) provided.

1.3.2.1.1 From studies of utilization CEL derived an average container utilization of 70 percent.

TABLE 1. SYMBOLS FOR ELEMENTS OF MODELING

Symbol	Meaning	Unit
U_t	Daily truck utilization	Dimensionless
U_c	Container utilization	Dimensionless
N_c	Average Number of Containers per truck load	Containers/truck
P_t	Truck capacity	Lbs
V_c	Container capacity	Yd3
p_c	Average bulk density of waste in containers	lb/yd3
X_n	Length of working day	Hour
D	Average dispatch/relief time	Hour
TTR	Average travel time from motor pool to route	Hour
T_t	Average time required to fill a truck	Hour
t_1	Average time to empty one outdoor container and move to the next (including inspection time)	Hour
t_2	Average travel time to disposal site (also will equal return time from site to route)	Hour
t_3	Average dump time	Hour
N_t	Average number of collection trips per truck per day	Dimensionless
TM	Average time to return to motor pool at end of day	Hour
Q	Average generation rate	Ton/week
M	Work days per week	Days/week

TABLE 1. SYMBOLS FOR ELEMENTS OF MODELING (Concluded)

Symbol	Meaning	Unit
D'	Average days per collection cycle	Days/week
T	Number of trucks required	Truck
Y	Average truck time availability (also called time utilization)	Dimensionless
C	Total number of containers	Container
E	Number of employees per truck	Employees/truck
K	Average non-productive time (2D + TTR + TM)	Hour
ΔQ	Percentage decrease in quantity of refuse collected	Dimensionless
C	Total number of containers	Containers

1.3.2.1.2 The relationship among the aforementioned factors and utilization was reinforced during analysis of the source separation test at Vandenberg AFB California. For example, the full capacity of the installation's 6 and 10-cubic-yard containers was seldom used unless they were needed to accommodate surges of cardboard or to meet contingency requirements. It appears that the utilization phenomenon can be attributed to a level of service that responds to employee demands that the containers be emptied whenever the refuse reaches the level of the container's side doors, rather than the top. These demands for the service are based on the fact that employees dislike having to throw waste over the side and through the top opening of the dumpsters. Qualitatively, it appeared that the capacity of the containers was being utilized about 70 percent which is in the area of CEL's conclusions. (Reference 3).

1.3.2.2 CEL also showed that the characteristics that affect container utilization affect collection vehicle utilization in the same manner. With a quality of service defined as a 1 percent probability of overflow of both truck and container, they statistically derived the following relationships between daily truck utilization (U_t), containers loaded per truck (N_c), container utilization (U_c) and daily collection trips (N_t). (Reference 4).

$$U_t\ (\max) = \frac{U_c}{U_c + \dfrac{3\,\sigma}{(N_t)\ (N_c)}}$$

where σ = standard deviation of $U_c = 0.1$

(Eq 1) $$U_t\ (\max) = \frac{0.7}{0.7 + \dfrac{0.3}{(N_t)\ (N_c)}}$$

1.3.2.3 The maximum number of containers that can be handled by a collection truck can be expressed by the following relationship:

$$\text{(Eq 2)} \qquad N_c \ (\max) = \frac{(P_t)\ (U_t \ \max)}{(V_c)\ (p_c)\ (U_c)}$$

N_c must be rounded off to the lowest whole number since it is not possible to consider a partial container.

1.3.2.3.1 The value of N_c at U_t (max) represents the maximum number of containers that trucks of specified capacities can accommodate, per load, without constraints on the amount of time it takes to accomplish the function. As seen in paragraph 1.3.3, however, this maximum level may or may not be achievable on an installation because of limited working hours.

1.3.2.3.2 An iteration technique can be used to estimate what the N_c (max) will be at maximum truck utilization if U_t is known (or assumed) and truck and container capacities are known. First, substitute an initial value for N_t (e.g. 1, N_t will always be an integer value) and U_t (e.g. 1.0) into Equation 2 and then place the resulting N_c into Equation 1. The resulting Ut value can then be substituted back into Equation 2 and the process iterated until the values converge without further change, as indicated on page 7 of Addendum 1. The entire exercise can be repeated for different number of collection trips per day, N_t.

1.3.3 Time Elements

1.3.3.1 The total work day (Xn) can be expressed as a summation of time elements associated with the collection operation as follows. (Note that the following equations assume that no overnight storage in the truck is permitted. If overnight storage is allowed, refer to Equation 4b in paragraph 1.3.3.3).

$$\text{(Eq 3)} \qquad X_n = (2)(D) + TTR + (N_t)(N_c)(t_1) + (2N_t\text{-}1)(t_2) + (N_t)(t_3) + TM$$

1.3.3.2 Equation 3 can be simplified to:

$$\text{(Eq 4a)} \qquad X_n = (N_t)(N_c)(t_1) + (2N_t\text{-}1)(t_2) + (N_t)(t_3) + K$$

where K represents all "non-productive" time ((2)(D) + TTR + TM).

1.3.3.3 If overnight storage is allowed, Equation 4 can be modified to the following.

(Eq 4b) $X_n = (N_t)(N_c)(t_1) + (2N_t)(t_2) + (N_t)(t_3) + K'$

where K' = non-productive time including route to storage yard (rather than the time for the last trip from the disposal site to the yard as reflected in Equation 4a

1.3.4 Containers Per Truck Load (N_c)

1.3.4.1 The relationship between the time it takes to unload a container and move to the next (t_1), and the average number of containers handled per truck per collection trip (N_c) can then be expressed as:

(Eq 5) $$N_c = \frac{X_n - (2)(D) - TTR - TM + t_2 - (N_t)\ (2t_2 = t_3)}{(t_1)\ (N_t)}$$, or

(Eq 6) $$N_c = \frac{X_n - K + t_2 - (N_t)(2t_2 + t_3)}{(t_1)(N_t)}$$

1.3.4.2 From Equation 2, N_t can also be expressed as:

(Eq 7) $$N_c = \frac{(P_t)(U_t)}{(V_c)(p_c)(U_c)}$$

1.3.5 Containers Required Per Collection Cycle (C)

1.3.5.1 The number of containers required to handle refuse during a collection cycle can be shown as follows:

(Eq 8) $C = (N_c)(N_t)(T)(D')(Y)$

where Y = percentage of time trucks are available after accounting for down time from repairs and maintenance.

1.3.5.2 If the quantity (Q) is known, it can be shown that:

(Eq 9) $$C = \frac{(D')(Q)(2,000)}{(M)(p_c)(V_c)(U_c)}$$

1.3.6 Number of Trucks Required (T) and Quantity (Q)

1.3.6.1 From Equations 8 and 9

$$T = \frac{C}{(N_c)(N_t)\ (D')(Y)} \qquad \text{(Eq 10)}$$

where T must be rounded off to the next whole number since a partial truck is not possible

$$Q = \frac{(C)(M)(p_c)(V_c)(U_c)}{(D')(2{,}000)} \qquad \text{(Eq 11)}$$

1.3.7 Discussion of Time Related Variables

1.3.7.1 The time variable most likely to change in a collection system is the time it takes to actually collect waste, $(N_t)\ (N_c)(t_1)$ in Equation 3, complemented by a change in the dispatch/relief time (D).

1.3.7.2 The objective of any collection system must be to effectively meet all collection requirements with a minimum of equipment and labor resources. Hence, the objective also means that the average number of containers handled per truck load per day should be as high as possible in order to achieve high truck collection utilization, expressed by Equation 7.

1.3.7.3 From Equation 2 we can determine what the maximum number of containers per truck load can be. If we then determine, from in-situ observations, what N_c is, we may find from Equation 7 that truck utilization is not high. Can it be improved under the restriction of a maximum length work day to provide additional time for other tasks (e.g. example working on the recovery program) or to the point where a truck and crew can be eliminated?

1.3.7.4 From Equations 5 and 6 the candidate variables for change are dispatch/relief time (D), number of collection trips made per day (N_t) and the time it takes to unload a container and move to the next (t_1). Other variables will, for all practical purposes, remain unchanged.

1.3.7.4.1 Unless the system is very inefficient, it is highly unlikely that the dispatch/relief time can be significantly reduced to provide additional time for on-route collection. In effect it can be held as a constant in the equation.

1.3.7.4.2 If the unloading time, t_1, remains constant, reducing the number of collection trips, N_t, will result in a containers per truck load figure that is beyond the physical capability of the truck, and therefore impossible.

1.3.7.4.3 The variable t_1 is essentially the only variable that can lead to productive changes, if it can be decreased. This may be difficult to achieve in an actual situation unless the crew is given an incentive to work faster. Such an incentive is present under the task system in which a crew is assigned a collection area/number of pickups; when the crew is finished, regardless of the time of day, they are paid a full day's work, even if an undertime situation results (Reference 5). A task system may not be possible on a military installation with in-house collection. Even if it could be instituted, the time saved would not be to the government's benefit with respect to freeing up time for other tasks. If t_1 could be lowered and simultaneously coupled with a decrease in refuse quantity, it would increase the potential for reducing the number of truck and crew forces as discussed in paragraph 1.4.3.

1.3.8 Formulation of Cost Relationships

1.3.8.1 Non-recurring and recurring costs should be determined on a life cycle/annual basis. Table 2 lists the elements, their symbols and respective units.

1.3.8.2 Non-recurring Investment Equations.

(Eq 12) Truck Cost/Week/Ton = (T_c)(1/52 week per year)(1/Q)(T)

(Eq 13) Container Cost/week/Ton = $(C_c)(1/52)(1/Q)(C)$

1.3.8.3 Recurring Costs.

(Eq 14) Truck O&M/Week/Ton = $[(TO_c) + (TM_c) + (TL_c)(E)]\ (H_c)(M)(Y)(T)(1/Q)$

(Eq 15) Container Maintenance/Week/Ton = $(CM_c)(1/52)(C)(1/Q)$

1.3.8.4 Summing All Factors:

$$\text{(Eq 16)} \quad \text{Cost/Ton} = (0.0192)\ [(T_c)(T) + (C_c)(c) + (CM_c)\ (C)]\ \ (1/Q)$$
$$+\ \ [(TO_c) + (TM_c) + (TL_c)\ (E)]\ \ (H_c)(M)(Y)(T)(1/Q)$$

1.4 Cost Impact From Reduced Refuse Quantities

1.4.1 System Operation Cost Per Ton

1.4.1.1 The better the match between available time, equipment capacities and quantity of waste handled, the lower will be the cost per ton of the operation. This guidance is graphically illustrated and supported by Figure 1 and Table 3, based on Brunner's et al work with the model described in the preceding paragraphs. For an installation-specific set of time factors (e.g., Naval Construction Battalion Center (NCBC)) the figure and tables show what happens when a system is established to handle a certain quantity of refuse. If the quantity is reduced, the vehicle utilization drops down and the cost per ton increases. If the quantity drops below certain points for each level of truck usage, considerable dollar savings can be realized by dropping a collection vehicle and crew. For example, under the third case where T=3, if an installation was handling 72.19 tons per week and predicted a drop in tonnage to 64.00 tons per week because of a waste materials recovery program, it could realistically plan to drop one truck and crew from its operation because 2 trucks could then manage the waste more effectively at a higher equipment utilization than with the current 3 (i.e., U_t = 0.86 with 2 trucks versus U_t = 0.57 with 3). Such a change would also result in a lower cost per ton of operation.

1.4.1.2 In calculating the values given in the table, it was assumed that the critical time variable, t_1, would change in such a way that no slack time would be available in the system as the quantity of refuse decreased. This assumption was based on CEL's experience that truck crews will increase their container unloading time as the number of containers decrease in order to maintain the status quo (Reference 6). Hence, for each truck the element $(N_c)(N_t)(t_1)$ before the waste recovery program would equal the $(N_c)(N_t)(t_1)$ during the program. The t_1 of 5.7 seconds was believed possible under the NCBC program A similar optimal time may not be possible at other installations. See paragraph 2.2 for dealing with this possibility.

TABLE 2. WASTE COLLECTION COST ELEMENTS

I Non-Recurring Investment Costs

Element	Symbol	Unit
Truck	T_c	$/truck/year
Container	C_c	$/container/year

II Recurring Costs

Element	Symbol	Unit
Truck Operation	TO_c	$/hour/truck
Truck Maintenance	TM_c	$/hour/truck
Truck Labor	TL_c	$/hour/crew member
Container Maintenance	CM_c	$/container/year

III Other Elements

Hours per workday - H_c

Crewmen per truck E

1.4.1.3 It could be argued that the time variable t_1 would not increase or decrease as a function of the quantity of refuse handled (Reference paragraph 1.3.7.4.3). However, it may have minimal impact because the data clearly shows that the system is relatively insensitive (in terms of real cost reduction) to small changes in equipment capacities and operating practices. Only when a collection vehicle is eliminated will substantial cost savings be realized.

1.4.1.4 It is also important to note the historical error of some organizations in attempting to simplify cost avoidance by determining a cost per ton figure and then multiplying that figure by predicted tonnage diversion to produce cost savings.

1.4.1.4.1 First, as evidenced above, cost per ton rises with decreased tonnage, unless the decrease of tonnage allows elimination of a collection vehicle and crew.

1.4.1.4.2 Secondly, there is no simple direct or inverse relationship between quantity reduction and cost per ton behavior.

1.4.2 Container Cost Effects

1.4.2.1 As evidenced by the model and the example provided in Table 3 a direct relationship exists between the quantity of refuse managed and the number of containers needed. Hence, if the quantity, Q, decreases because of implementing a waste recovery program, the percentage of decrease can be applied to the current number of containers to obtain the number of containers that can be removed from the system.

Examples from Table 3 verifying the relationship include:

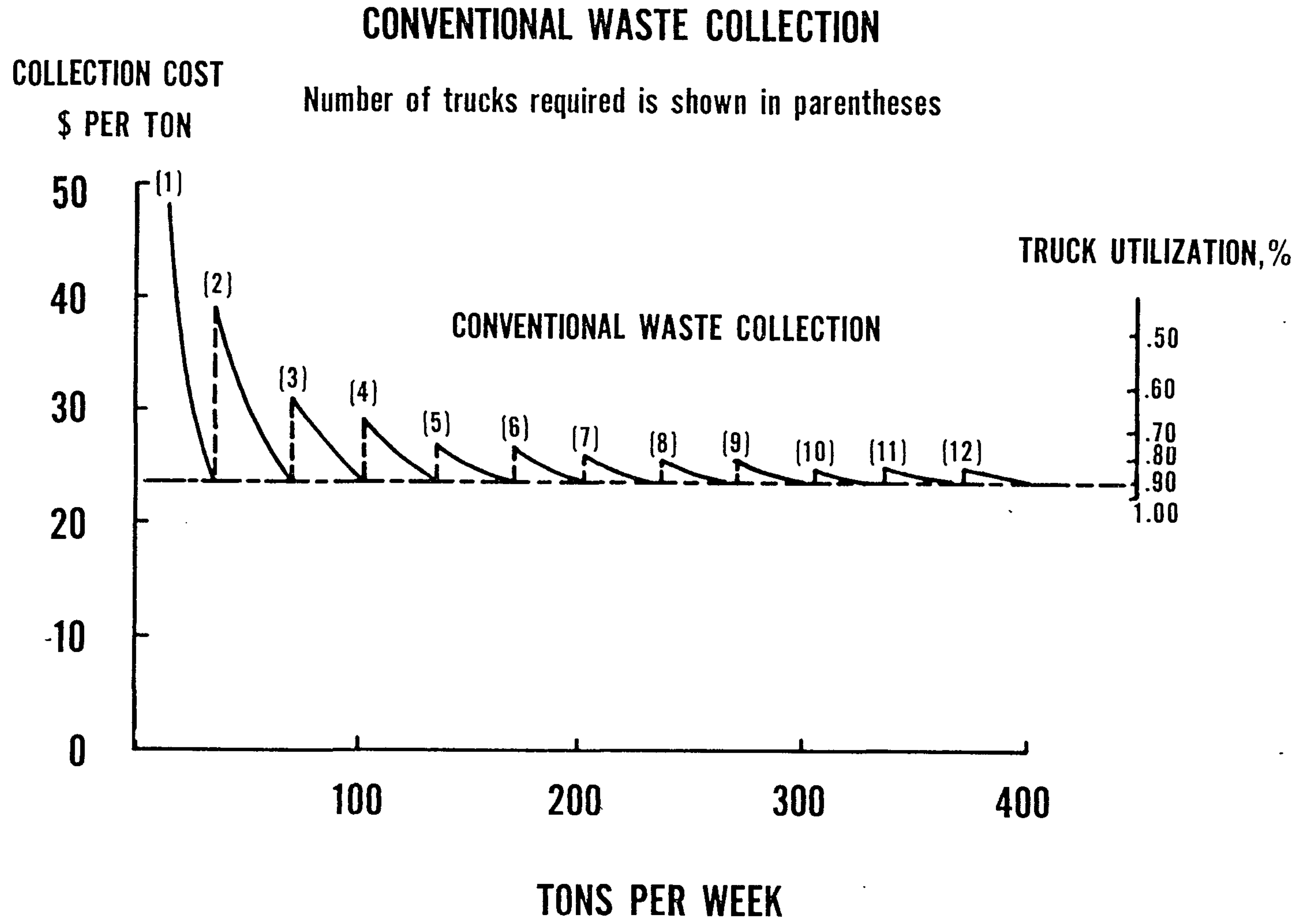

Figure 1. Relationships Among Tonnage, Collection Truck Utilization and Collection Costs

TABLE 3. RELATIONSHIP OF COLLECTION VARIABLES AND COST

T	N_t	t_1 minutes	N_c	U_t	C	Q	Cost/ton ($)
1	2	5.7	25	0.90	96	33.77	23.86
		6.0	24	0.86	91	32.08	24.70
		7.0	21	0.73	78	27.50	27.50
		8.0	18	0.64	68	24.06	30.31
		9.0	16	0.57	61	21.39	33.11
		10.0	15	0.51	55	19.25	35.91
		11.0	13	0.47	50	17.50	38.71
2	2	5.7	25	0.90	192	67.54	23.86
		6.0	24	0.86	182	64.17	24.70
		7.0	21	0.73	156	55.00	27.50
		8.0	18	0.64	137	48.12	30.31
		9.0	16	0.57	121	42.78	33.11
		10.00	15	0.51	109	38.50	35.91
		11.0	13	0.47	99	35.00	38.71
3	2	5.7	25	0.90	288	101.31	23.86
		6.0	24	0.86	273	96.25	24.70
		7.0	21	0.73	234	82.50	27.50
		8.0	18	0.64	205	72.19	30.31
Reduce to 2 trucks		9.0	16	0.57	182	64.17	33.11
		10.0	15	0.51	164	57.75	35.91
4	2	5.7	25	0.90	383	135.09	23.86
		6.0	24	0.86	364	128.33	24.70
		7.0	21	0.73	312	110.00	27.50
Reduce to 2 trucks		8.0	18	0.64	273	96.25	30.31

At $T = 2$, $N_t = 2$

$N_c = 25$, $U_t = 0.90$, $C = 192$, $Q = 67.52$

$N_c = 24$, $U_t = 0.86$ $C = 182$ $Q = 64.17$

$\Delta N_c = 4.2\%$

$\Delta C = 5.2\%$

$\Delta Q = 4.9\%$

At $T = 4$, $N_t = 2$

$N_c = 25$, $U_t = 0.90$, $C = 383$, $Q = 135.09$

$N_c = 21$, $U_t = 0.73$, $C = 312$, $Q = 110.00$

$\Delta N_c = 16.0\%$

$\Delta C = 18.5\%$

$\Delta Q = 18.6\%$

1.4.2.2 If containers of various sizes are used, the percentage should be applied to whatever size (or averaged size) container the analyst wants to include in the calculations.

1.4.2.3 The container cost avoidance possible with a decreased refuse quantity will be of the form:

(Eq 17) Annual Container Cost Avoidance = ACCA

$$ACCA = (\Delta Q)(C_o)(C_c + CM_c)$$

where ΔQ = percentage decrease in quantity

C_o = original number of containers

C_c = annual investment cost of each container

CM_c = annual maintenance cost

1.4.2.3 Do not include this cost avoidance as a first year savings in the overall cost analysis. Include it as a savings beginning in the second year. The reason for this delay is to realistically allow time for the waste materials recovery program to become stabilized before attempting to phase out existing equipment.

1.4.3 Collection Cost Effects

1.4.3.1 The most likely savings in actual refuse collection operation involving trucks and labor will result whenever the refuse quantity decreases to the point where a truck and crew can be removed from the system. Hence, the cost avoidance would be of the form:

(Eq 18) Annual Truck and Labor Cost Avoidance = ATLCA

$$ATLCA = (T_c)(T') + [(TO_c) + (TM_c) + (TL_c)(E)]\ (H_c)(M)(Y)(T')$$

where T' = number of trucks eliminated

1.4.3.2 The cost savings potential without vehicle elimination should be investigated within the context that the resulting estimate is a liberal one and should be used conservatively; any labor savings estimated from analysis must be used constructively or else it is of no value. It should be noted that there is no direct relationship between quantity reduction (ΔQ) and total cost of collection. However, there is a direct relation between ΔQ and the total time to fill the truck per trip. The following paragraphs describe applicable relationships.

1.4.3.2.1 Time elements of the daily collection operation, per truck, are expressed by Equation 3, namely:

$$X_n = (N_t)(N_c)(t_1) + (2N_t - 1)(t_2) + (N_t)(t3) + TM + TTR + (2)(D)$$

1.4.3.2.2 Elements that will be least affected by changes in refuse quantity will be:

$$(2N_t - 1)(t_2),\ (N_t)(t_3),\ TM\ \&\ TTR$$

1.4.3.2.3 Elements that will be most affected by changes in refuse quantity are the following. Wherever there is a change in one element there will be a reciprocal change in the other.

$(N_t)\ (N_c)(t_1)$, D

1.4.3.2.4 Collection labor of current programs involved with the unloading of containers into the truck is expressed by

$(N_t)(N_c)(t_1)$

(Eq 19) Annual Hours/Truck = $(N_t)(N_{co})(t_1)(E)(260)$

where E = number of employees per truck

N_{co} = current average containers per truck load

1.4.3.2.5 It is necessary to calculate the percentage reduction in time needed to unload all containers resulting from reduced tonnage.

1.4.3.2.5.1 It was shown in paragraph 1.4.2.1 that both the number of containers needed (C) and average number of containers unloaded per collection vehicle per trip (N_c) will be changed (for all practical purposes) in direct proportion to the change in quantity of refuse collected, (ΔQ).

1.4.3.2.5.2 If we assume that t_1 does not change, and N_c is the only variable assumed to change in the element $(N_t)(N_c)(t_1)$, this element will change in direct proportion to the change in refuse quantity collected.

1.4.3.2.5.3 Hence, the reduction in this time element from reduced refuse quantities can be expressed as:

(Eq 20) Annual Hours Saved Per Truck = A_T

$A_T = (N_t)(N_c)(t_1)(E)(260)(\Delta Q)$

1.4.3.3 Annual Cost Avoidance Savings can then be estimated as:

(Eq 21) Annual Labor Savings = ALS

$$ALS = (A_T)(\text{Employee Wage Rate})\ (T)$$

Note: If there is more than one employee per truck and each has a different rate, determine A_T and calculate ALS for each employee, as appropriate. The annual labor savings should approach the cost of operating one collection vehicle as the quantity of refuse decreases.

1.4.3.4 As noted previously, the labor "freed up" from the predicted system changes is of no value unless it can be gainfully utilized on tasks that someone else would have had to be paid for (i.e., the task(s) is cost accountable and will save the base Civil Engineer (or other base cost account organizations) actual dollars that would otherwise have had to be expended were it not for the available labor). This could include assistance to the waste materials recovery program itself.

1.4.3.5 Related vehicle operation and maintenance costs can similarly be determined by the following:

(Eq 22) Annual Vehicle O&M Savings = AVOMS

$$AVOMS = (A_T)\ (TO_C + TM_C)$$

1.5 Conclusions

1.5.1 The commercial and industrial compactible waste collection system on an installation can be mathematically modeled to assist in estimating the cost impact resulting from implementation of a waste materials recovery program.

1.5.2 Proper assessment of cost impact requires comprehensive quantitative characterization of the local waste management system.

1.5.3 The highest potential for cost avoidance arises when a decrease in refuse quantity can be accompanied by removal of a collection vehicle and crew.

1.5.4 Some potential for cost avoidance exists when the decreased refuse quantity reduces the number of containers to be unloaded. However, the probability of achieving actual cost savings is low because of uncertainty associated with crew productivity (total collection time may remain constant under changing conditions) and the unlikelihood that any "freed up" hours can be gainfully employed for cost-offsetting tasks. Optimized collection operations are relatively insensitive (in terms of cost reduction) to small changes in equipment capacities and operating problems.

1.5.5 Some potential exists for achieving cost avoidance through reduction of the number of the outdoor containers used in the system, but only if they are actually removed from operation and value is received for them.

1.5.6 Cost avoidance is not achieved instantaneously. Phase out of equipment and labor is a gradual process that accompanies the growth-to-stability stages of the waste recovery program. Subsequently, predicted cost avoidance should not be included as first year savings in the cost analysis accompanying the feasibility studies for the recovery program.

1.5.7 Equations representing a waste collection system can be summarized as: (Reference Table 1 for nomenclature and units).

1.5.7.1 Total Work Day (X_n)

(Eq 3) $$X_n = (2)(D) + TTR + (N_t)(N_c)(t_1) + (2N_t - 1)(t_2) + (N_t)(t_3) + TM$$

(No overnight storage permitted)

(Eq 4a) $$X_n = (N_t)(N_c)(t_1) + (2N_t - 1)(t_2) + (N_t)(t_3) + K$$

(No overnight storage permitted)

(Eq 4b) $$X_n = (N_t)(N_c)(t_1) + (2\,N_t)(t_2) + (N_t)(t_3) + K'$$

(Overnight storage permitted)

1.5.7.2 Containers Per Truck Load (N_c)

(Eq 5) $$N_c = \frac{X_n - (2)(D) - TTR - TM + t_2 - (N_t)(2\ t_2 + t_3)}{(t_1)(N_t)}$$

(Eq 6) $$N_c = \frac{X_n - K + t_2 - (N_t)(2\ t_2 + t_3)}{(t_1)(N_t)}$$

(Eq 7) $$N_c = \frac{(P_t)(U_t)}{(V_c)(p_c)(U_c)}$$

1.5.7.3 Containers Required Per Collection Cycle (C)

(Eq 8) $$C = (N_c)(N_t)(T)(D')(Y)$$

(Eq 9) $$C = \frac{(D')(Q)(2{,}000)}{(M)(p_c)(V_c)(U_c)}$$

1.5.7.4 Trucks Required (T)

(Eq 10) $$T = \frac{C}{(N_c)(N_t)(D')(Y)}$$

1.5.7.5 Quantity of Refuse Handled (Q)

(Eq 11) $$Q = \frac{(C)(M)(p_c)(U_c)}{(D')(2{,}000)}$$

1.5.7.6 Cost/TON

(Eq 16) $$\text{Cost/Ton} = (0.0192)\ [(T_c)(T) + (C_c)(C) + (CM_c)(C)]\ (1/Q) + [(TO_c) + (TM_c) + (TL_c)(E)]\ (H_c)(M)(Y)(T)(1/Q)$$

2.0 Steps to Determine Commercial Area Collection Cost Avoidance Potential

2.1 Quantitatively Characterize the Current System.

2.1.1 Reference Table 1.

Measure time elements by means of time-motion studies.

2.1.2 Determine average weekly quantity of wastes handled by compaction trucks and average density of refuse in outdoor containers.

2.1.3 Determine average time availability of all compacting trucks.

2.1.4 Determine investment and recurring costs for all elements of the system.

2.1.5 Determine average daily utilization of trucks.

2.1.5.1 Determine average daily number of collection trips traveled per truck per day - round off to next highest integer - (N_t)

2.1.5.2 Determine average number of containers unloaded per truck per collection trip - (N_c)

2.1.5.3 Determine container utilization (Uc) or assume value = 0.7 (Reference paragraph 1.3.2.1)

2.1.5.4 Daily truck utilization - (U_t)

(Eq 7) $$U_t = \frac{(N_c)(V_c)(p_c)(U_c)}{(P_t)}$$

2.1.5.5 The above procedure assumes that all trucks are of equal capacity. If they are not:

2.1.5.5.1 Measure time elements for each size truck category, and time availability.

2.1.5.5.2 Determine average quantity (Q) handled by each truck size category, associated containers serviced (C_i) and average number of containers loaded per truck per trip (N_{ci})

2.1.5.5.3 Determine daily truck utilization by weighting as follows:

$$U_t \text{ (weighted)} = \frac{(N_{ci})(V_{ci})(p_{ci})(U_{ci}) \;+ \dots\; (N_{cj})(V_{cj})(p_{cj})(U_{cj})}{(P_{ti}) + \dots + (P_{tj})}$$

where i = 1, 2 ...J different truck size categories

2.1.6 Estimate quantity of materials to be recovered with the waste materials recovery program (Section X) and determine quantity of remaining refuse that must be collected for disposal.

2.2 Determine Potential for Collection Cost Avoidance.

2.2.1 Generate table showing relationship of collection variables and cost, particularly daily truck utilization, refuse quantities and cost per ton behavior. (Reference the example, paragraph 2.2.5).

2.2.1.1 Label a table similar to Table 3.

2.2.1.2 Assume that the frequency of collection, D', and the number of collection trips per day per truck, N_t, remains the same.

2.2.1.3 Fill in the table for the current operation: List the measured T, N_t, t_1, N_c, U_t, C, Q, and cost per ton.

2.2.1.4 Decrease N_c by 1, and calculate and list associated new values of:

(1) C - Equation 8
(2) Q - Equation 11
(3) U_t - Equation 7
(4) Cost/ton - Equation 16

2.2.1.5 Repeat the process until the quantity, Q, is slightly less or equal to the predicted quantity of refuse remaining for disposal after the waste recovery program has stabilized (6 - 12 months after initiation).

2.2.1.6 Decrease the number of trucks used, T, and complete another table as follows:

2.2.1.6.1 Fill in the first row with the same N_t, t_1, N_c, U_t and cost per ton as used for the first row of the first table.

2.2.1.6.2 Calculate associated C and Q and list the values in the table.

2.2.1.6.3 Repeat steps 2.2.1.4 through 2.2.1.5.

2.2.2 From the table determine if a truck (and crew) can be removed from the work force because of reduced refuse loading requirements. This can be determined by comparing the cost per ton, in each table, at the same refuse quantity. If the cost is lower using one less truck the installation can achieve substantial collection cost savings.

2.2.2.1 Cost savings can be estimated from Equations 17 and 18, namely:

(Eq 17) Annual Container Cost Savings = $(\Delta Q)(C_o)(C_c + CM_c)$

or, if the new C can be read directly from the tables,

Annual Container Cost Savings = $(C_o - C')(C_c + CM_c)$

where C' = lower number of containers needed for the operation

(Eq 18) Annual Truck and Labor Cost Avoidance = ATLCA

$$ATLCA = (T_c)(T') + [(TO_c) + (TM_c) + (TL_c)(E)] \quad (H_c)(M)(Y)(T')$$

where T' = number of trucks eliminated

2.2.3 If a collection vehicle cannot be eliminated, some truck labor and O&M savings may be possible if it is assumed that the time to unload one container and move to the next, t_1, remains constant. Savings can be estimated using Equations 20, 21, and 22. As previously discussed in paragraphs 1.4.1.2, 1.4.1.3 and 1.4.3.2 caution should be exercised in judging whether true cost savings can actually be realized without elimination of a vehicle.

2.2.4 There should be a container cost savings whether or not a vehicle is removed from the system. As indicated in paragraph 2.2.2.1 above, these savings can be estimated by using Equation 17.

2.2.5 Example of setting up a table of values using steps 2.2.1.1. through 2.2.1.6.3.

2.2.5.1 Assume that the installation has time elements and costs identical to those used in Addendum 1, except for the following differences:

t_1 = 0.15 hour = 9.0 minutes
Q = 64.17 tons per week
T = 3 trucks
N_t = 2 trips per day

2.2.5.2 Assume quantity reduction will be 12 tons per week as a result of a waste materials recovery program.

2.2.5.3 Determine if it may be possible to increase productivity by decreasing t_1 (if it is, go to paragraph 2.2.6). If the current t_1 is considered optimal, the maximum truck utilization for any number of trucks and quantity will be as indicated by Table 4 namely U_t = 0.57. This value can be obtained by either measuring to determine the average N_c, or by applying Equation 5/6 of the collection model. The results should be the same using either method. Equation 7 can then be used to calculate U_t.

(Eq 6) $$N_c = \frac{X_n - K + t_2 - (N_t)(2\ t_2 + t_3)}{(t_1)(N_t)}$$

Using Addendum 1 data

$$N_c = \frac{7.35 - 1.25\ (N_t)}{(0.15)\ (N_t)} = \frac{7.35 - 1.25(2)}{(0.15)(2)} = 16.16$$

= 16 (round to lower whole number).

$$\text{(Eq 7)} \qquad N_c = \frac{(P_t)\ (U_t)}{(V_c)(p_c)(U_c)}$$

$$6 = \frac{(10000\ \text{lb})(U_t)}{(6\text{yd}^3)(84\ \text{lb/yd}^3)(0.7)}$$

$$U_t = 0.56$$

Note: This differs slightly from that in Table 2.2.1.3.1 because the table was produced using a programmable desktop calculator that did not round N_c (or C) to whole numbers when accomplishing all calculations. Manual rounding was necessary for placing the data in a meaningful manner into the table. N_c is always rounded to the lower, and C to the higher, whole number. The use of the table is not sensitive to slight differences caused by the programmed method viz a viz the long hand effort. All calculations should be consistent.

2.2.5.4 C, Q and cost/ton can then be calculated by using Equations 8, 11, and 16, namely: The results are listed in Table 4. The succeeding rows are then determined by dropping N_c by 1 and recalculating. Rows are calculated until the quantity of refuse is reached which represents the remaining refuse to be collected once the waste recovery program reaches stability. For this example, that quantity will be approximately 52.0 tons per week.

2.2.5.5 The second part of the table can then be determined by using the situation of one less collection truck. In this example, T would now equal 2. The results indicate that the system would not be able to handle 52.0 tons per week with two trucks; under a t_1 of 9.0 minutes, a two truck system would be limited to a maximum of approximately 43 tons per week.

2.2.5.6 Hence, Table 4 shows that the reduction in quantity of waste will be insufficient to allow removal of a truck.

2.2.6 Example of the impact that increased productivity (i.e., reducing t_1) can have on the system is illustrated by the following:

2.2.6.1 Assume that all conditions and data elements are identical to those used in the previous example, paragraph 2.2.5. However, also assume that the system can be tightened up and that productivity can be increased by lowering the time it takes to unload a container and move to the next, t_1.

2.2.6.1 If t_1 can be reduced to 0.116 hours, or 7.0 minutes, it increases the potential for better daily truck utilization and provides an improved opportunity to reduce the size of the collection force when the refuse quantity drops. To illustrate:

2.2.6.1.1 The utilization of trucks can be increased because the average number of containers unloaded per collection trip increases. Given the data from 2.2.5:

$$N_c = \frac{7.35 - 1.25\ (N_t)}{(t_1)(N_t)}$$

$$N_c = \frac{7.35 - 1.25\ (2)}{(0.116)(2)} = 20.78$$

$$N_c = 20$$

2.2.6.1.2 By using Equations 7, 8, 11, and 16 the remaining values of U_t, C, Q and cost per ton can be determined. The remaining parts of the table can then be calculated as described in previous paragraphs. Results are listed in Table 5.

2.2.6.2 The payoff of increased productivity is significantly reflected by the fact that the installation can plan on removing a truck and

TABLE 4. EXAMPLE OF COLLECTION VARIABLES AND COSTS - t_1 REMAINS CONSTANT

T	N_t	t_1 (minutes)	N_c	U_t	C	Q	Cost/TM ($)
3	2	9.0	16	0.57	182	64.17	33.11
			15	0.53	164	57.75	35.91
			14	0.49	149	52.50	38.71
2	2	9.0	16	0.57	122	42.78	33.11

(No truck removal possible)

TABLE 5. EXAMPLE OF COLLECTION VARIABLES AND COSTS - t_1 IS IMPROVED FROM 9.0 TO 7.0 MINUTES

T	N_t	t_1	N_c	U_t	C	Q	Cost/ton
3	2	7.0	20	0.73	234	82.50	27.50
			18	0.64	205	72.14	30.31
			16	0.57	182	64.17	33.11
			15	0.53	164	57.75	35.91
(At this quantity level, a truck could be removed)			14	0.49	149	52.50	38.71
			13	0.46	137	48.12	41.52
2	2	7.0	20	0.73	156	55.00	27.50
			18	0.64	137	48.12	30.31
			16	0.57	121	42.78	33.11

crew when the refuse quantity drops by approximately 12 tons per week, whereas under the current operation it would not be possible.

2.2.7 Earlier discussion indicated that lowering the average number of trips per day per truck under current installation conditions would not be possible. The following example illustrates this.

2.2.7.1 From the example used in paragraph 2.2.5 the following data is used.

t_1 = 0.15 hours
Q = 65
T = 3
N_t = 2

Given: $$N_c = \frac{7.35 - 1.25\,(N_t)}{(t_1)(N_t)}$$

at $N_t = 2$, $N_c = 16$
at $N_t = 1$, $N_c = 40$, which is impossible since N_c (max) = 25

2.2.7.2 Reducing N_t to 1 results in $N_c = 40$, which is impossible. Dramatic improvements in productivity or in extended working hours will provide the only real opportunities to reduce the number of collection trips, if that is desired.

REFERENCES

Appendix J

1. Brunner, D.E.; Saan, R.D. and Braswell, J., Application And Cost Analysis of Refuse Densification Processing, Technical Memorandum 54-76-16, Civil Engineering Laboratory, Port Hueneme, California, November 1976, pp. A-1-3; hereafter cited as Brunner.

2. Ibid, p. A-1-11.

3. Interview with E.P. Riggs, Sanitation Foreman, 4392 ASB/DEMHR, Vandenberg Air Force Base, California, 2 August 1978.

4. Interview with Mr R.D. Saam, Civil Engineering Laboratory, Port Hueneme, California, 20 November 1978; hereafter cited as Saam.

5. SCS Engineers, Evaluation of a Compartmentalized Refuse Collection Vehicle for Separate Newspaper Collection, Report SW-126c, U.S. Environmental Protection Agency, Washington DC, May 1976.

6. Saam.

ADDENDUM 1

TO

APPENDIX J

WASTE COLLECTION COST MODELING

(Excerpted from Civil Engineering Laboratory Technical Memorandum (TM) 54-76-16, Application and Cost Analysis of Refuse Densification Processing, November 1976, Port Hueneme, California.)

A comparison of the costs associated with the collection of solid waste in the conventional (non-densified) and densified form requires the development of a waste collection model. The amount (pounds) of solid waste found in a storage container at the time it is serviced, and the space this waste occupies (volume) are characteristics that control the basic investments (containers, vehicles, landfill) and establish the nominal manpower levels required for solid waste management.

The high variability of solid waste density and generation rate requires an additional level of investment and manpower to meet this unknown contingency. The best available expression of this contingency is the reported container utilization factor.

In the paragraphs that follow, the constraints of the waste collection model are identified, the container utilization factor is used to establish vehicle utilization and the investment in containers and vehicles, and mathematical expressions that make up the model are presented. Using these mathematical expressions, the cost per ton for each method of waste collection is calculated and presented in graphical format as a function of waste quantity.

Note: TM 54-76-16, written by D.E. Brunner, R.D. Saam and J. Braswell, is not available for general distribution.

Constraints:

1. No Collection of Bulky Waste: Bulky waste such as large pieces of metal and

dunnage are currently collected separately from the compactable waste. Densification processing will not change this system. The analysis therefore considers only compactable waste collection.

2. Collection Day: Conventional - 8 hours, densified - 8 hours.

3. Collection Week: Conventional - 5 days, densified - 5 days.

4. Collection Frequency: Conventional - twice weekly, densified - once every four weeks. Collection frequency varies between one and five times per week. Two collections per week of wastes containing little garbage is required by (Naval operating policy) and was selected for use in the uncompacted waste collection system. For the same container capacity, the approximate 18:1 volume reduction and increased biological stability of densified refuse would permit one collection every two months. An examination of the collection system at CBC, Port Hueneme indicated that there is on the average three containers associated with each collection point. The number of containers can therefore be reduced by a factor of three without affecting user convenience. Once every four weeks collection of densified waste was selected to correspond with this change.

5. Vehicles Returned Empty: General operating policy and EPA Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste (CRF 40-243-202-3(b)) recommend against storing refuse within the collection vehicles overnight because of the fire hazard. Since densified refuse does not present the same fire hazard, retaining the densified waste in the collection vehicle overnight may be permitted. However, to qualify for the analysis, this advantage was not considered.

6. Collection Vehicle: Conventional - 10,000 pound payload front end loader packer truck. Densified - 20,000 pound payload open bodied front end loader truck. The 10,000 pound, 24 cu yd truck is almost universally used by the Navy for conventional collection of waste. Densified waste requires no packer mechanism or enclosed body, thus reducing the gross vehicle weight by approximately 10,000 pounds and enabling a 20,000 pound payload for densified waste, using the same truck chassis.

7. Vehicle Availability: Conventional - 75%, densified - 75%. An examination of refuse collection vehicle downtime for repairs and maintenance averaged 25% for CBC, Port Hueneme, leaving 75% of the time available for actual collection of waste.

8. Waste Density in Container: Conventional - 84 lbs/cu yd, densified - 1500 lbs/cu yd. Eighty-four pounds per cu yd has been reported as the average bulk density of Navy waste, with a range of 21-250 lbs/cu yd. Preliminary densification tests have confirmed slug densities greater than 65 lbs/cu ft or 1755 lbs/cu yd. Random stacking of the densified slugs within the container can be expected to result in a bulk density on the order of 1500 lbs/cy yd.

9. Container Size: Conventional - 6 cu yd, densified - 6 cu yd. Activities use containers of between 2 cu yd and 10 cu yd. One of the most frequently used sizes at CBC, Port Hueneme is 6 cu yd. This single container size was selected to simplify the analyses. Since the same size is used for each system, the actual size is not critical and will not affect the relative results.

10. Equipment Cost: Costs used to calculate per ton collection cost were obtained from the following sources:

a. Vehicle Cost - Compactor vehicle - $50,000 - Civil Engineering Support Office, Port Hueneme, CA. Non-compactor vehicle - $50,000 - Motor Truck Distributors, Ventura, CA.

b. Container Capital Cost - $420 each - E. J. Harrison & Sons Rubbish Service, Ventura, CA.

c. Vehicle Operation and Maintenance - Operation - $.0.85 per hour of operation. Maintenance - $2.40 per hour of operation, NAVFACENGCOM P-3000, Management of Transportation Equipment.

d. Container Maintenance Cost - $45 per year plus one-half original cost after 5 years for each container - E. J. Harrison & Sons Rubbish Service, Ventura, CA.

e. Economic Life - NAVFACENGCOM P-3000 indicates 8 years for collection vehicles and containers. (Discount factor from P-442 Table B = 5.597).

f. Labor Rates - $9.00 per hour - CEL Support Operations Department.

11. Quality of Service. Conventional collection - containers will not be overfilled more than 1 percent of the time and a vehicle can service a prescribed number of containers 99 percent of the time. Densified collection - the same as for conventional collection.

Equipment Utilization

Conventional Collection: Container utilization is limited by two characteristics of solid waste (generation rate and density in the container) and by the level of service provided. It was estimated in one study that the expected range of container utilization factors varies between 50 to 90 percent. Four reported values (50, 60, 78 and 90) provided an average of 70 percent, which is used for this study. In using the reported container utilization factors for assessing investment and manpower utilization, it must be assumed that the number and capacities of containers have been adjusted over time to meet the level of service required. It is also assumed that the level of service meets local health and safety standards and that containers will not overflow between collections more than 1 percent of the time.

The refuse characteristics that affect container utilization also affect truck utilization in the same manner. Thus container utilization can be used to establish quantitatively the maximum truck capacity utilization. With a quality of service defined as a 1 percent probability of overflow of both truck and container, it can be statistically shown that:

$$U_t(\max) = \frac{N_c U_c}{N_c U_c + 2.323 \quad N_c \sigma_{uc}} \tag{1}$$

or, $$= \frac{U_c}{U_c + \frac{.29}{N_c}}$$

Where: U_t (max) = Maximum truck utilization

U_c = Container utilization (0.7)

N_c = Number of containers per truck load

Then, given: Truck capacity (P_t) = 10,000 lbs

Container capacity (V_c = 6 cu yd

Bulk density of waste (P_c) = 84 lb/cu yd

An estimate can be made of the maximum number of containers to fill a truck: (Assume initial U_t = 1.0)

$$N_c = \frac{P_t(U_t)}{V_c\ P_c\ U_c} = \frac{10{,}000}{(6)(84)(.7)} = 28$$

Substituting into equation (1)

$$U_t\ (\text{max}) = \frac{0.7}{0.7 + \frac{.29}{28}} = .925$$

By reiterating this process the best estimate for N_c = 26; U_t = .917. For this analysis 90 percent truck utilization was used.

Densified Waste Collection: Densified waste container utilization can be determined from conventional waste container utilization in the same manner truck utilization was determined.

A container filled on the average of twice per week at a utilization rate of 70 percent has an average density of 84 lbs/cu yd. Using an average bulk density of 1500 lbs/cu yd, the same container would theoretically have $\frac{1500}{84}$ = 17.837 times this capacity for densified refuse.

Substituting into equation (1), the container utilization factor would be increased to:

$$U_c = \frac{0.7}{0.7 + \frac{0.229}{17.857}} \quad \frac{0.7}{0.7 + 0.071} = 0.90$$

The maximum truck utilization for densified waste collection for the same quality of service can be calculated given:

- o Truck Capacity (P_t) = 20,000 lbs
- o Container Capacity (V_c) = 6 cu yd
- o Bulk Density of Waste (P_c) = 1500 lb/cu yd
- o Container Utilization (U_c) = 0.90

The maximum number of containers to fill a truck is:

$$N_c = \frac{P_t}{V_c \; P_c \; U_c} = \frac{20{,}000}{(6)(1500)(0.9)} = 2.47 = 2$$

Substituting into equation (1),

$$U_t \text{ (max)} = \frac{0.9}{0.9 + \frac{0.29}{2}} = 0.934$$

Actually, truck utilization is further constrained by incremental numbers of containers. In this case:

$$U_t = \frac{6 \text{ yd}^3}{\text{Containers}} \times \frac{1500 \text{ lbs}}{\text{yd}^3} \times \frac{\text{Truck}}{20{,}000 \text{ lbs}} \times 0.9 \times 2 \text{ Containers} = 0.81$$

Therefore, 0.81 is the maximum truck utilization for densified material in this model.

Mathematical Expressions

Trips per Collection Day: As a part of the waste collection model, a mathematical expression was developed relating (a) the number of trips per day made by each collection vehicle to the disposal site, (b) the containers that can be collected each trip, and (c) the time required to pick up each container. The development of this expression is:

Time elements making up collection day:

- Dispatch/relief time (D)
- Travel from motor pool to route (TTR)
- Time to empty one container and move to next (t_1)
- Travel to (equals return time to route) disposal site (t_2)
- Number of collection trips per truck per day (N_t)
- Dump time (t_3)
- Return to motor pool at end of day (TM)

For an 8-hour collection day:

$$8 = 2(D) + TTR + N_t(T_t) + (2N_t - 1)t_2 + N_t(t_3) + TM$$

rearranging,

$$N_t = \frac{8 - 2D - TTR - TM + t_2}{T_t + 2_{t_2} + t_3}$$

Since the time required to fill the truck depends on the number of containers required to fill the truck:

$$T_t = (N_c)(t_1)$$

Substituting:

$$N_t = \frac{8 - 2D - TTR - TM + t_2}{N_c t_1 + 2_{t_2} + t_3} \qquad (2)$$

The following time elements were selected based on a review of collections operations at CBC, Port Hueneme:

$$D = .3 \text{ hour}$$
$$TTR = .3 \text{ hour}$$
$$TM = .25 \text{ hour}$$
$$t_2 = .5 \text{ hour}$$
$$t_3 = .25 \text{ hour}$$

Then substituting these values into equation (2) yields,

$$N_t = \frac{8 - 2(.3) - .3 - .25 + .5}{N_c(t_1) + 2(.5) + .25}$$

or $$N_t = \frac{7.35}{t_1 N_c + 1.25}$$

rearranging, $$t_1 = \frac{7.35 - 1.25\ N_t}{N_c N_t} \qquad (3)$$

Number of containers per truck: The number of containers per truck (N_c) may be defined in terms of the following factors:

- o Capacity (lbs) of truck (P_t)
- o Capacity (yd3) of container (V_c)
- o Bulk density (lb/yd3) of refuse (F_c)
- o Container utilization (P_c)
- o Truck utilization (U_t)

and expressed in the following equation:

$$N_c = \frac{(P_t)(U_t)}{(V_c)\ (P_c)(U_c)} \qquad (4)$$

Total Number of Containers: The total number of containers (C) required at an activity may be derived as follows:

$$C = \frac{(D)(Q)(2000)}{(M)(P_c)(V_c)(U_c)} \quad (5)$$

where previously undefined variables are:

- o Generation rate (tons/week) (Q)
- o Work days per week (M)
- o Days per collection cycle (D)

Number of Trucks: The number of trucks (T) required at an activity can be expressed as follows:

$$T = \frac{C}{(N_c)(N_t)(D)(Y)} \quad (6)$$

where (Y) = time utilization of trucks. Since a partial truck is not possible, fractional value of T must be rounded off to the next whole integer.

Collection Costs

Based on the following cost factors:

- o Trucks ($50,000 each) (8-year life)
- o Containers ($420 each) (8-year life)
- o Truck O&M
  - Labor = $9.00/hr
  - Operation = $0.85/hr
  - Maintenance = $2.40/hr
- o Container maintenance (½ original cost after 5 years) + $45/year
- o Present value factor at 5 years = .652 (P-442 table A)
- o Truck time utilization (Y) = .75

an expression is derived for the cost/ton of refuse collection:

$$\begin{aligned}\text{Cost/ton} = {} & (50{,}000)(1/5.597)(1/52)(1/Q)(T) \\ & + (420)(1/5.597)(1/52)(1/Q)(C) \\ & + (9.00 + .85 + 2.40)(T)(Y)(M)(1/Q)(8) \\ & + (.5)(420)(1/5.597)(.652) + (45) \quad (C)(1/52)(1/Q)\end{aligned}$$

or

$$\text{Cost/ton} = [172.12T + 2.78C + 98.00\ (T)\ (Y)\ (M)]\ \frac{1}{Q} \qquad (7)$$

Cost Calculations

Equations 3, 4, 5, 6 and 7 were solved simultaneously for the conditions previously defined and the results are presented graphically in Figure A-1.

The discontinuities in the curves of Figure A-1 result from the integer number of trucks used in both collection systems. Given one truck, the cost per ton goes down as tons per week goes up, until the maximum truck utilization is reached. At this point, another truck must be purchased to collect more tons per week with a resultant step increase in cost per ton and lowering of truck utilization. As tons per week increases and more trucks are added, the magnitude of these discontinuities decreases and approaches the cost for maximum truck utilization as a limit. The collection costs have in fact been optimized at maximum allowable truck utilization. For a given refuse quantity vertical (downward) shifts in the minimum costs values for either system will be incremental in nature and will not occur until sufficient changes have been made in the system to permit the elimination of a refuse vehicle.

Using a 3-truck conventional collection system (100 tons per week) as an example, the tons handled per truck per week would have to be increased by 50 percent (from 33 tons/week to 50 tons/week) to enable the elimination of one truck. Thus, the optimized collection operation is insensitive (in terms of cost reduction) to small changes in equipment capacities and operating practices.

The magnitude and frequency of the discontinuities of Figure A-1 are valid only for systems operating within the constraints specified. At any particular refuse collection quantity, the discontinuities of the densified and conventional systems could be brought into phase horizontally by repeating the cost calculation using different container sizes, truck capacities, and collection cycles to obtain minimum collection cost.

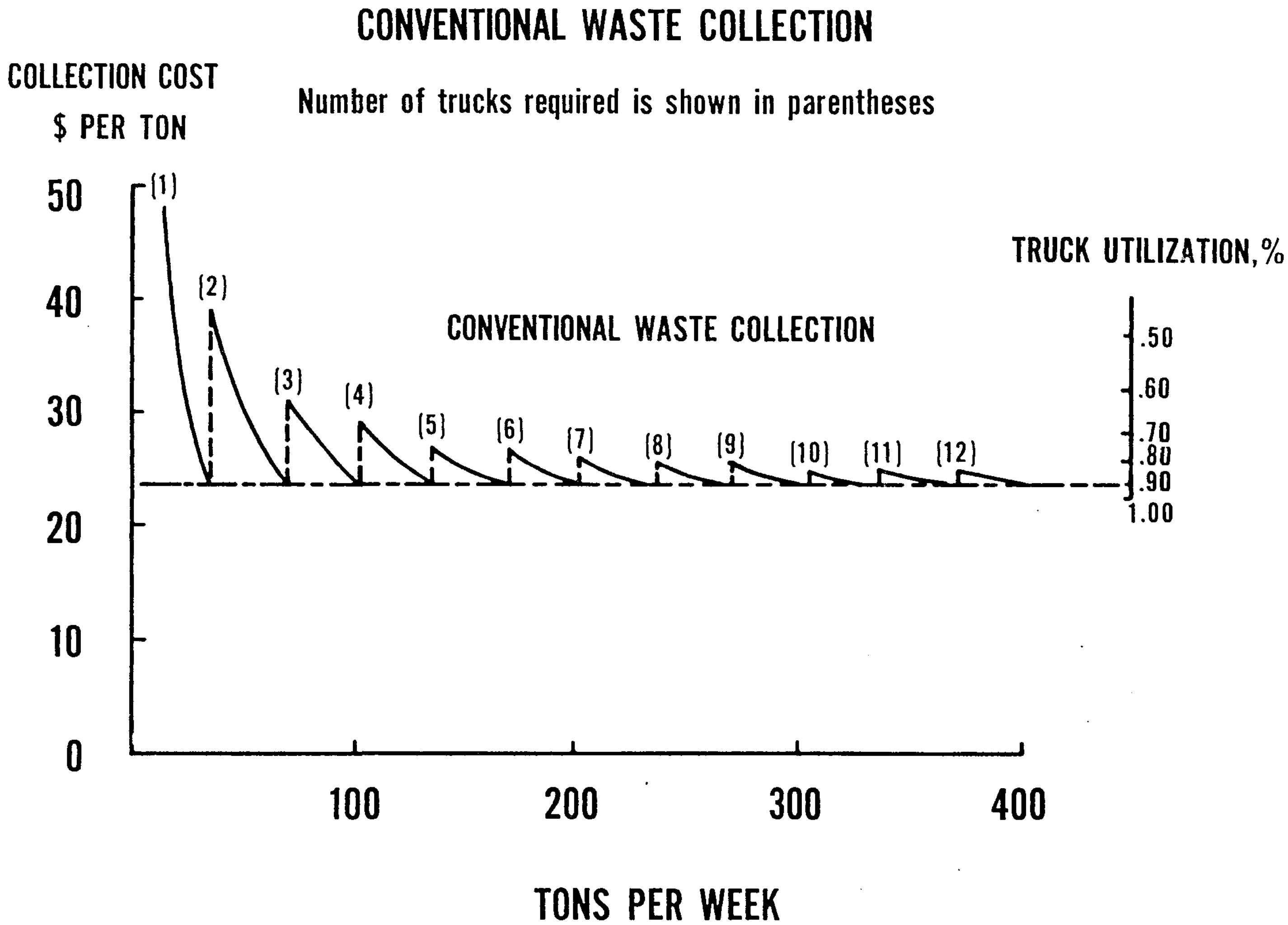

Figure A-1. Relationships Among Tonnage, Truck Utilization and Collection Cost