

Field Weatherization Logistics

Final Report



*Bonneville Power Administration • Hood River Electric Cooperative
Natural Resources Defense Council • Northwest Public Power Association
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FIELD WEATHERIZATION LOGISTICS

Final Report

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Executive Summary

Project Scope

The Hood River Conservation Project (the Project) was funded by the Bonneville Power Administration (Bonneville) with two federal contracts. One contract, with Pacific Power & Light Company (Pacific) and the Hood River Electric Cooperative for \$14 million, funded weatherization operations from May 1983 to January 1985. The other contract, with Pacific for \$7 million, funds the Project's research and evaluation program from May 1983 to March 1989. This study describes the managerial logistics of retrofitting 2,989 residences in the Hood River test area with super-weatherization measures during 30 months of contract time.

The total performance cost of the weatherization contract was \$14 million, with 87 percent of that cost, or \$12.6 million, spent on retrofit measures and air-to-air heat exchangers (Philips et al. 1987). Approximately 14,000 super-weatherization measures were retrofit in 2,989 test-site residences. The Project employed innovative technology to retrofit 530 mobile homes and install 1,200 air-to-air heat exchangers.

Weatherization Personnel

Weatherization operations were located in a field office in downtown Hood River that was the center of retrofit administration, field operations, and marketing for 30 months. The field office, which had six employees in 1983, expanded to 17 employees during the height of retrofit activity in 1985. The Project hired 11 retrofit contractors, five during the first 15 months and six more in the last 15 months. The contractors employed eight subcontractors.

Three Phases of Weatherization

The weatherization contract stipulated operations goals be met within 24 months. However, serious production shortfalls after one year forced the Project to apply for a six-month extension that was granted by Bonneville. As Figure 1 shows, the Project was able to recoup its early production losses with a dramatic turnaround in the number of retrofits during 1985, and achieve penetration goals within the test area.

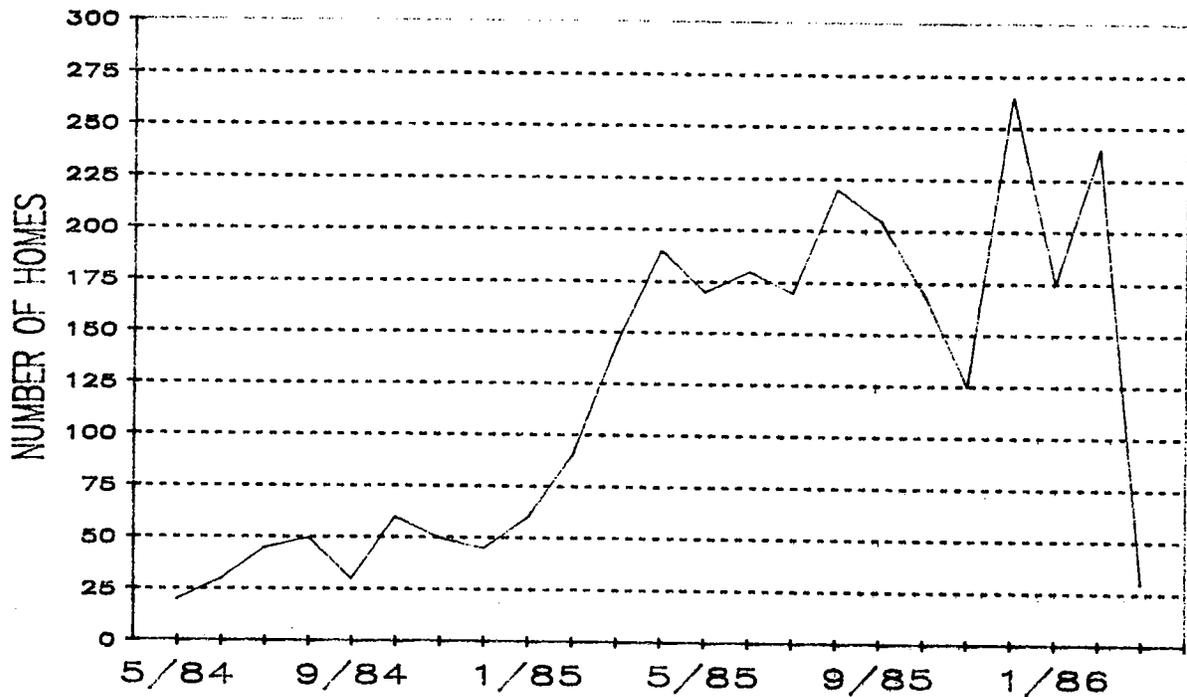


Figure 1. Weatherizations completed.

The topography of 30 months of weatherization segments into the following three phases:

Phase I, May 1983 - May 1984

Phase I is characterized by establishment of the field office and its administrative infrastructure, the overwhelming success of the promotional plan, and serious shortfalls in the number of weatherizations scheduled for completion. During this phase the field office was rented, renovated, and furnished, and the computer was installed. Administrative work processes were documented, an efficient system of records management was set up, and forms were produced. Contractors were hired to program software, conduct audits, and retrofit weatherization measures.

Organization

Authority for management of the field office rested with the Portland based Project manager who worked with an administrator and field coordinator located in Hood River. Decisions on expenditures, hiring, and overtime were made by the Project manager. At this stage, interaction between Bonneville and the Project on important decisions was often through formal written communication that sometimes impeded retrofit production. Toward the end of Phase I closer working relationships between the coordinating staffs developed more informal communication that expedited solutions to many pressing problems.

Marketing

Information about the Project was disseminated in articles in a weekly newspaper, The Hood River News, and through word of mouth. As only light advertising expenditures were needed, only 25 percent of the total marketing budget was spent. The success of the promotional plan is shown by the number of requests for Project audits after the field office was open six months: 1,950, or over 55 percent of potentially eligible homes in the test area.

Pricing

The unit-price system called for in the Project contract could not be implemented because price schedules for super-weatherization did not exist, and prices proposed by contractors were double those of other Bonneville projects. After negotiations with contractors, the Project instituted a temporary competitive-bid system in hopes of bringing prices down.

Production shortfalls

Five retrofit contractors were hired from the Hood River community in the fall of 1984. However, retrofit work was not started until March 1984, ten months after the weatherization contract was signed. After one Project year, less than three percent of the test area's potentially eligible residences were weatherized. With only 14 months of contract time left, Bonneville granted the Project a six-month extension.

Phase II, June - December 1984

Phase II is characterized by organizational changes: expansion of the field office staff, application of corporate management techniques to operations, utilization of the computer as a production tool, creation of a unit-price system, and the firing of two and the hiring of six retrofit contractors.

Organizational changes

There were two changes in field office management, the appointment of a new Project administrator in June and a new field coordinator in August. Both administration and operations were consolidated under the new Project administrator whose position was enhanced by greater autonomy in hiring, expenditures, and the use of overtime. By the end of Phase II the locus of responsibility for daily activity had been transferred from the Project manager in Portland to the Project administrator in Hood River. The Project administrator reorganized field office operations and streamlined office procedures. The field coordinator, hired under the Project administrator, instituted tighter management of contractor work.

There were two field specialists and one inspector during most of Phases I and II. Lack of staff produced backlogs in bid processing, sign-ups of customers for weatherization, and inspections. This caused significant production delays. The hiring of additional help boosted the field office staff to 14 employees who reduced the backlogs by the end of Phase II.

Computer system

A computer consultant was hired who leased hardware to the Project and programmed custom software. The computer system, which did not come on line until a year after it was installed, was plagued with programming and testing problems. Lack of computer tracking impeded the management of operations' procedures and contributed to production shortfalls.

Pricing

A unit-price system based on audits, bids, and invoices was drawn up and instituted in September 1984. Shortly after the second-round contractors

were hired, the pool of 11 Project contractors accepted the unit-price system. Therefore, it was not necessary to hire any of a third round of contractors who had been lined up in case some Project contractors rejected the new unit prices. Adoption of the unit-price system saved the Project seven percent in retrofit costs. The decrease in paperwork under the unit-price system for contractors and field office staff also saved labor costs and time, which enabled the staff to process and award bids at a faster rate.

Production

A second round of six contractors began work in September 1984. Shortly thereafter, two first-round contractors were fired. The two contractors were terminated after five months of customer complaints, and documentation of breach-of-contract. After the computer was brought on line, the Project began to review with contractors the status of their work on a weekly basis.

A backlog of inspections in the fall of 1984 threatened the cash flow of contractors, who were not paid until their work passed inspection. The backlog also seriously impaired the field office's ability to produce customer weatherization agreements and issue contractors notices to proceed with retrofit work. The Project had two inspectors and hired four more. Pacific's accounting department set up a system of advanced payment for uninspected work for contractors who had collateral in a bank of finished but unpaid jobs. To further ease contractor cash-flow problems, payment was withheld only for major inspection failures. Contractors were fined for minor inspection failures, but paid for the job.

By the end of Phase II with 60 percent of contract time elapsed, 450 residences, or less than 15 percent of potentially eligible homes in the test area, were weatherized. Installation of air-to-air heat exchangers and placement of radon monitors in air-tightened homes was begun. Retrofitting of an experimental block of 55 mobile homes to develop installation techniques for their unique construction got underway in December.

Phase III, January - December 1985

Production

Eighty-four percent of all weatherizations, or 2,500 residences, were completed during Phase III. By late winter, production backlogs were replaced by a smooth, managed, high-volume flow of work. Streamlined office procedures and computer utilization paid dividends at this time. Contractor relations, work flow, inspections, invoices, and payments to contractors and suppliers worked smoothly. A general level of skill developed by both the staff and contractors produced the high volume necessary to meet Project goals. However, a third contractor was fired for nonpayment to a subcontractor and the subcontractor was hired to replace the contractor fired.

A closing ceremony commemorating the successful completion of weatherization operations was held in Hood River in early March 1986. More than 100 representatives from the Project's sponsoring groups and the Hood River community attended.

Introduction

The following logistics report documents operation and administration of \$14 million in weatherization work done by the Hood River Conservation Project (the Project) in Hood River Valley from 1983 to 1985. The Project, a model electric energy conservation project, not only installed super-weatherization in 2,989 electrically heated homes, but undertook an extensive research and evaluation program that extended beyond the 30 months of field weatherization work. The field weatherization program is examined in three work phases:

Phase I, May 1983 - May 1984;

Phase II, June - December 1984;

Phase III, January - December 1985.

This report focuses on management strategies, field application of those strategies, and adaptations to new conditions evolving throughout the Project. Analysis and concrete suggestions for effective operation of large pilot retrofit projects like Hood River are offered in the summary chapter.

Project Background

In 1937 when Congress created the Bonneville Power Administration (Bonneville) it was required to construct electric power transmission lines from Columbia River dams and sell power to cooperatives and public utility districts at rates preferential to those charged to private utilities. By the early 1970s all economically feasible and environmentally acceptable dams within Bonneville's region had been built. To supplement regional power, public utility districts and investor-owned utilities built coal-fired and nuclear-powered plants. However, Bonneville projections of regional demand began to outstrip anticipated future energy supply.

Energy shocks

The international energy crisis of the early 1970s coupled with a U.S. recession highlighted the delicate balance between energy supply and demand. In 1976, shortly after Bonneville predicted possible shortages of federal hydroelectric power after 1983, Pacific Northwest legislators petitioned

Congress to make energy conservation a prime goal of every long-range regional energy plan. Congress deliberated for three years before enacting a new law, and in 1980 the Pacific Northwest Electric Power Planning and Conservation Act, or Regional Power Act, became federal law.

Regional Power Act

The Regional Power Act (the Act) made Bonneville the power broker for its customers and set out six main goals: 1) to encourage conservation and renewable resources; 2) to supply regional power; 3) to encourage participation by electric energy organizations in an orderly plan to save energy; 4) to establish a regional rate base; 5) to permit conservation initiatives by states, public agencies, and electric utilities; and 6) to protect fish, wildlife, and the environment.

Bonneville was directed to acquire and adopt conservation measures "to the maximum extent practical," and funds for conservation research and development projects were made available. The Act also called for formation of a Northwest Power Planning Council to guide Pacific Northwest electric power planning and restore fish and wildlife habitats affected by electric power projects.

Regional planning council

Governors of states within Bonneville's energy domain -- Oregon, Washington, Idaho, and Montana -- appointed two representatives each to the Northwest Power Planning Council (the Council). The Council was required by the Act to issue a 20-year regional electric power plan within two years of its first meeting in April 1981, and began to hear expert witnesses.

The Council's regional power plan was built in a public, representative, and organizationally inclusive process. Energy experts from the region's major power organizations and advisory committees appeared before the Council to testify on future energy resources and use. However, when testimony on conservation was given, the Council heard more controversy among expert witnesses than consensus. Much of the controversy was rooted in a lack of hard technical information and in the wide range of approaches to conservation problems, many of which were not clearly defined.

The crux of controversy was how much energy could be conserved under ideal conditions. Some energy groups claimed past conservation programs were expensive, ineffective, and publicly unappealing. Pro-conservation groups argued that reduced energy use, improved residential conservation measures, and better public information would make conservation feasible and attractive. Most experts did agree, however, that conservation had never been adequately tested in the field.

During these hearings, energy groups from all over the nation inspected each other's models, calculations, and assumptions. The Council meetings revealed to all participants the strong national need for solid information on electric energy conservation measures. Incorporating the best information available, the Council issued a regional energy plan that was adopted in April 1983.

NRDC/Pacific project proposal

Among the pro-conservation groups testifying before the Council was the Natural Resources Defense Council (NRDC), a national, private, non-profit, public-interest environmental group established in 1970 by Wall Street lawyers who fought for the clean up of the Hudson River. The NRDC approached Pacific Power & Light Company (Pacific) with the concept for the project.

Pacific had been marketing conservation since the energy crisis of the mid-1970s. In 1977 Pacific offered customers free audits to provide home owners with blueprints for weatherization, and in 1978 weatherization finance packages, including zero-interest loans, were made available. The NRDC idea was attractive to Pacific because the company could: 1) give the project credibility and ensure against errors of fact and interpretation; 2) lead in development of a reasonable and empirically derived estimate of conservation as a resource; and 3) develop a new working style to accommodate the coordinating structure between business and government established by the Regional Power Act.

In February 1982 NRDC and Pacific proposed to Bonneville a full-scale research and evaluation project to test electric energy conservation in a key area -- residential retrofit. The project, if implemented, would be the first of its kind in the nation. Conservation measures tested would be those advocated by pro-conservation groups before the Council and would exceed standards of weatherization measures previously set by Bonneville.

Bonneville initially rejected the proposal in early 1982, but reversed its decision in the spring and came back to Pacific with renewed interest.

Regional Research Advisory Group

During the Project's planning phase, Bonneville and Pacific created an innovative organization to involve some of the energy groups that had been in contention before the Council in developing research design models. The Regional Research Advisory Group (RRAG) was formed with the Northwest Power Planning Council, Hood River Electric Cooperative (HREC), Pacific Northwest Utilities Conference Committee, Northwest Public Power Association, NRDC, Bonneville, and Pacific. During the year and a half of Project planning work between concept and implementation, committees and subcommittees worked out common definitions of research objectives and designs.

Throughout the Project's duration, the RRAG was an instrument through which agreement on the Project's field operations and research was forged. Monthly and occasional weekly meetings were held wherein divergent viewpoints were expressed and decisions made on major policy issues.

Test site selection

During the planning phase, Pacific selected the Hood River Valley as the test site for the Project because the valley's geography, climate, population density, and demographics represent a typical Pacific Northwest community and fulfilled research site requirements delineated by RRAG committees and subcommittees. The Hood River Valley also had the advantage of being within easy driving distance of the headquarters of Pacific and Bonneville in Portland. The RRAG suggested a private social research firm conduct a community assessment of Hood River to identify any barriers that might exist to a large-scale weatherization project.

Community assessment

In the fall of 1982, a social research firm conducted a community assessment designed to identify the community structure, local issues, and barriers to the Project (Flynn 1983). Nine major social groups were identified and their attitudes about conservation, federal programs, big business, and receipt of free services were examined. The Hood River Valley, it was

learned, contains proud communities averse to "handouts" and dictation from outsiders. The community assessment formed the base for the Project's public relations strategy, which had a strong local flavor and played down big business and big government aspects of the Project.

The social research firm that conducted the community assessment was contracted to monitor community attitudes with periodic random surveys throughout the duration of the Project.

Contract negotiations

In the fall of 1982, Bonneville sent the Project proposal, honed by the Regional Research Advisory Group, to Oak Ridge National Laboratory for further refinement. In December, the completed proposal was submitted to a Bonneville internal review committee and then forwarded to a policy committee for permission to proceed. Permission was granted in late December and Pacific and Bonneville entered five months of contract negotiations and budget detailing. In May 1983 two contracts were signed, one for \$12 million to finance weatherization and one for \$7 million to finance research and evaluation.

Project Structure

The Project structure involved three main staffs: a Bonneville staff, a Pacific corporate staff, and a Project staff.

Bonneville Project management staff, located in Portland, Oregon, consisted of a Project manager and an evaluation liaison. Bonneville monitored fulfillment of contract deliverables and oversaw major policy shifts in Project management strategies. Bonneville also set contractor guidelines, weatherization and inspection specifications, and approved evaluation reports.

Pacific corporate staff, also located in Portland, Oregon, included management up to and including the vice president for energy services (see Figure 2). The corporate staff oversaw the Project staff and coordinated the Project related activities of Pacific personnel from the following departments: Contracts, Construction Accounting, Communications, Computer Services, Engineering, and Legal Services.

A Project staff was formed by Pacific employees and new employees exclusively hired to work under the Bonneville contract. In 1983 Pacific was undergoing a company wide staff reduction and employees accepting Project positions signed agreements releasing Pacific from any obligation to rehire them when the Project was completed.

Project research staff was located in Pacific corporate offices in Portland and initially consisted of a research coordinator and three research analysts.

The Regional Research Advisory Group recommended the Project concentrate its marketing efforts to project a local flavor and minimize any big business or big government onus. Findings of the community assessment supported this recommendation. This was primarily done by locating the Project's weatherization staff in a field office in downtown Hood River and hiring several members of the field office staff from the local community.

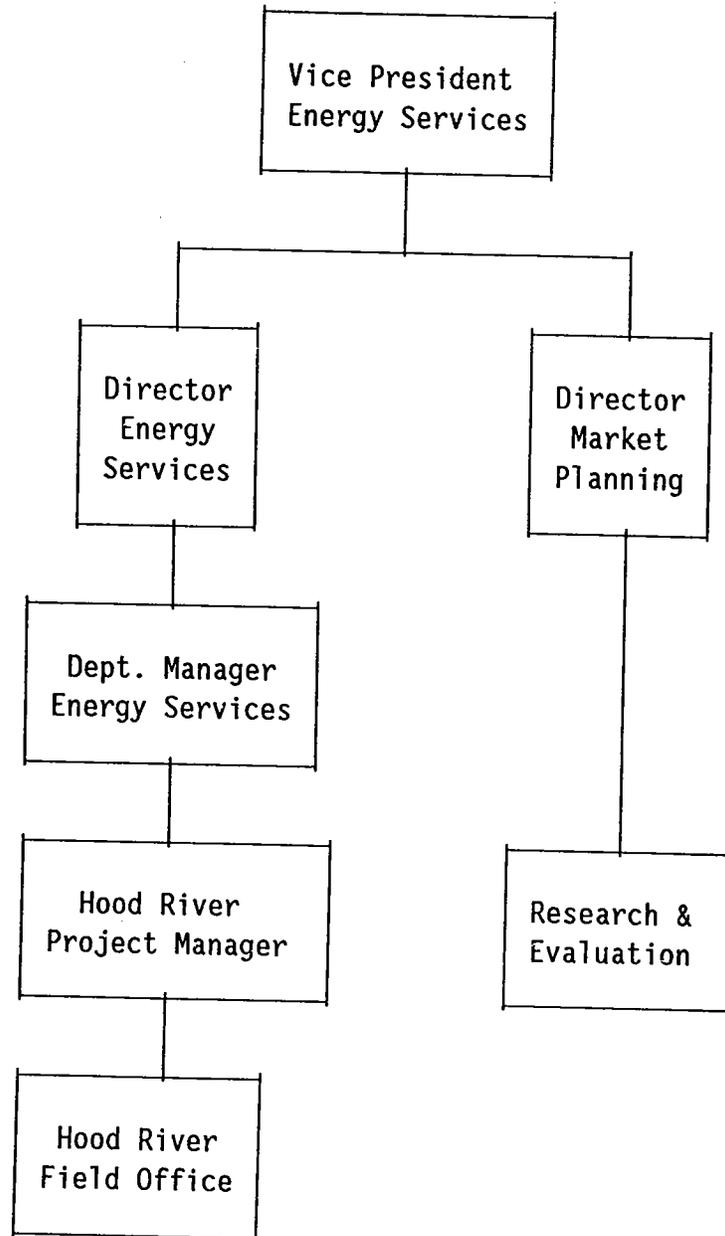


Figure 2. Pacific project organization.

Phase I: May 1983 - May 1984

The discussion of Phase I is divided into three sections: 1) Introduction of the Project to the Hood River community; 2) the Hood River Field Office; and 3) Weatherization Operations.

Introduction of the Project to the Hood River Community

This section covers the Project's promotional plan that guided the introduction of the Project to the Hood River area during Phase I. The main activities outlined in the promotional plan were establishment of the Community Advisory Committee, development of working relationships with city and county officials and local media representatives, creation and placement of advertisements, and presentation of special events. These activities were carried out under the direction of the Project administrator in the Hood River field office. This section also describes creation of a Bonneville contract deliverable based upon the promotional plan, a comprehensive marketing plan for large-scale weatherization undertakings similar to the Hood River Conservation Project.

Promotional plan

A promotional plan was devised by a committee of Project managers to guide the public communications campaign in the Hood River area. The information basis of the plan came from resident employees of the area's serving electric utilities, area surveys conducted by Oregon State University and a marketing research company, the community assessment, and consultation with an advertising agency employed by Pacific (Engels, Kaplon, and Peach 1985).

The promotional plan had three basic strategies:

1. Promotional activities: incremental and cumulative, i.e., new levels of promotion would include previous elements;
2. Project publicity: initial general information geared to a wide audience and subsequent specific information geared to targeted groups; and
3. Promotional expenses: initially low cost, with more expensive promotion purchased incrementally as needed.

Community Advisory Committee

A key component of the promotional plan was establishment of a Community Advisory Committee.

The Regional Research Advisory Group's pre-Project plan advised that a group of community leaders be formed to act in an advisory capacity to Project managers. This idea received the endorsement of the social research institute that conducted the community assessment. Formation of the Community Advisory Committee (CAC) was one of the first promotional undertakings of Project management.

During the summer of 1983 the Project administrator visited local constituent groups identified in the community assessment in search of potential CAC members. The profile of a potential CAC member was a conservation-minded, socially committed, articulate individual who had the respect of his constituent group. Names of potential members were gleaned from discussion with constituent group members and from suggestions of the management of Hood River Electric Cooperative, Pacific's Hood River office, and the editorial staff of the local newspaper, The Hood River News.

Interviews of 35 potential CAC members were conducted during informal discussion of the Project's goals. Those with a CAC-member profile who were legitimately enthusiastic about the Project were ranked on a list of candidates. When invitations to join CAC were extended, 14 of the first 16 candidates accepted.

Group members included a former Mosier mayor, a county budget committee chairman, a county commissioner, an investor who was also a fund raiser for NRDC, a Hood River city building inspector, a realtor, a candidate for state legislature, several orchardists, a forest products industry representative, and a senior citizens' activist.

The CAC held its first meeting in October 1983. Monthly meetings following dinner were held throughout Phase I at various locations in Hood River Valley. The well-attended meetings were publicized in the local press and an open invitation was extended to friends and colleagues of CAC members to join the meetings. Local press coverage helped to establish the meetings as a community event.

Through the meetings, Project management kept the CAC informed about all facets of the weatherization program, including problems. Members contri-

buted concrete advice on how to handle problems and avoid potential problems. A sense of ownership in the Project was gained when members carried out vital tasks. CAC members, for example, helped make arrangements for the Project's open house events and provided introductions between Project managers and community leaders.

The Project administrator developed a personal rapport with group members to seal their commitment to the Project, and this approach worked well in the small, friendly Hood River community. CAC members were made to feel they could walk into the field office at any time and be at home. CAC members were essential to the early promotional success of the Project because their participation gave the Project credibility within the community.

CAC members also gave the Project credibility outside the community as spokespersons to news teams, reporters, and delegations from other states and countries who visited the Project. This benefitted the Project as CAC members were not only informed citizens, but also active participants with a stake in the Project's success. CAC members, furthermore, responsibly represented the community and their constituent groups to the media and visiting delegations. Representation of their fellow citizens required CAC members to present credible, balanced evaluation of the weatherization program's problems and successes.

Relations with city and county officials

The Project administrator made a point of visiting every city, county, and port official to receive their sanction. There was much curiosity on the part of officials that was satisfied in presentation of promotional materials and discussion with CAC members and Project staff.

Hood River city officials were concerned about what impact weatherization would have on the work load of their building inspectors, as they did not have a budget large enough to inspect every site to be weatherized. The city's insect and rodent control inspector wanted assurance that inspection for insects and dry rot by Project auditors, contractors, and inspectors would meet city codes.

Media relations

Hood River, although a city, has a friendly, small town ambiance that encouraged Project managers to personally coordinate contact with the local media instead of working through Pacific's communications department or an advertising agency. Project managers formed good relations with the editorial staff of The Hood River News, a mid-week community newspaper, and the local radio stations, KIHR-AM and KCGB-FM.

The Hood River News provided the Project with most of its media coverage which began with a feature article and photographs in early October 1983. Two feature articles, one with photographs, appeared in November just before the field office's open house. From mid-November to the end of May 1984, five feature articles, eight news items, and several letters were printed in The Hood River News.

Radio coverage was minimal with airing of one AM interview of the Project administrator in October and one press release prior to the open house. Portland media coverage consisted of a TV news story on one channel in June and two channels covering the Project's grand opening in Hood River on the tenth of November. All TV news stories were broadcast in Hood River.

Advertising

Pacific's communications department occasionally sent Project news releases to the Portland media and was a liaison to the advertising agency.

A Project logo was created by Pacific's advertising agency incorporating elements of Hood River's climate and natural beauty -- Mount Hood, foothills, and apple orchards. The logo was presented to the Regional Advisory Group's market planning committee in March 1983 and tested in April on a group of Hood River residents who gave it their unanimous approval. The logo was printed on posters, business cards, stationery, shirts, clothing patches, door hangers, balloons, and two billboard ads. The billboards, endorsed by the Chamber of Commerce in late June, declared Hood River "the conservation capital of the world." One billboard ad was located on Interstate Highway 84 for travelers approaching Hood River west from Portland and the other billboard ad was in the city of Hood River on a main north-south highway connecting surrounding communities.

Ads in The Hood River News were sparse, with only six ads purchased by the Project during the first year. Two ads, one full page and one half page, and two "question-and-answer" ads were placed in early November to publicize the Project field office's open house in November. Two modest ads containing Project updates were run in December. No other advertising was purchased through the end of May 1984.

Open house

Ads and news articles in early November invited the local citizens to the Project field office open house on the two days following the grand opening on the tenth of November. The grand opening and the open house were designed by the Project's promotional planning group, Pacific's communications department, and CAC members.

Invitations to the grand opening were sent to RRAG members, state and local officials, and CAC members. The grand opening ceremony was held in the morning at the Hood River Inn. In the afternoon guests were bussed to a house undergoing weatherization for an on-site demonstration of each super-weatherization measure the Project planned to install. Preparations for the on-site demonstration of weatherization measures began in the summer, but delays in receipt of supplies and lack of familiarity with the high levels of weatherization by contractors postponed preparation of the model house. Contractors and suppliers, who joined the grand opening events at the site bearing their company logos on jackets and trucks, were available for questions and answers. A refreshment tent was erected, which was fortunate because the grand opening was marked by traditional Oregon rain.

The two-day open house provided information to the local citizens in the form of brochures, tours of the office, and conversations with the Project staff. The open house was successful in signing up several hundred citizens requesting Project audits of their homes.

Promotional success

The goals of the promotional plan were to introduce the Project to the community to gain its acceptance and stimulate citizens to request weatherization of their homes. The overwhelming success of the promotional campaign can be seen in the quick acceptance of the Project by most of the groups identified in the community assessment. The keys to Phase I's promotional

success were establishment of the CAC and the extensive public outreach conducted by the Project staff. This success is further illustrated by the number of customers requesting audits -- 1,700 by December 1983 and 2,350 by the end of Phase I, May 31, 1984.

Marketing plan

A marketing plan was one document contract deliverable required by Bonneville necessitating the attention of weatherization management. In July 1983, the promotional plan for the Hood River public relations campaign was submitted to Bonneville to fulfill the marketing plan contract deliverable.

In September, Bonneville said the plan did not meet contract requirements for a marketing plan. They wanted the marketing plan to segment the population by likelihood of participation and identify barriers to participation along with strategies and tactics to overcome potential barriers.

A meeting of Project managers revealed there had been confusion as to what Bonneville wanted. Given the pressures on weatherization managers in the midst of the first phase of Project implementation, it was agreed that Pacific's advertising agency would revise the promotional plan to meet the requirements of Bonneville's marketing plan.

A revised marketing plan prepared by the agency was delivered to Bonneville in January 1984. In May, Bonneville's general critique of the plan was it did not "provide guidance in the instructional sense as well as the operational sense."

At this point it became clear the promotional plan guiding the Project's highly successful public relations campaign in the Hood River Valley was a different document from the marketing plan required by Bonneville as a contract deliverable. Indeed, the promotional plan was primarily a plan of action, not instruction. Bonneville wanted a model instructional piece that small utilities could use after minor tailoring.

A final marketing plan, acceptable to Bonneville, was delivered in early 1985 after being written by the Project's assistant coordinator of research and evaluation (Engels 1985).

The Hood River Field Office

This section describes the Project field office in downtown Hood River, its structure, administrative and clerical procedures, and installation of the computer. Reference is made throughout to the support services provided to the Project by various Pacific departments at corporate headquarters. The field office was the center of Project activity from the time it opened in May 1983 to the end of weatherization work in early 1986.

Field office staff

The Phase I field office staff consisted of a Project administrator, a field coordinator, a field specialist, an inspector, an administrative assistant, a data-entry clerk, and a secretary. Both administrators reported to the Project manager in Pacific's corporate offices who held signature authority for the Project (see Figure 3). The field office was leased in May 1983 and office equipment delivered in July.

Records management

A primary task of the field office was management of records for the 3,100 homes targeted for weatherization. Data collection and record keeping were done manually with plans for computer data entry to replace the manual system when the computer came on line.

Packet identification

Data forms for each house were kept in a manila packet stamped and filed under a numerical identifier that was issued when a customer requested an audit (see Exhibits, Form 1). Originally, houses were identified by their residential electric utility account number, but this presented problems. Master-metered accounts with several separate residences tied into one electric meter made resident identification difficult. Whenever electric utility accounts were changed by customers due to house sales, renter moves, or movement of mobile homes to other metered sites, revision of the packet identifier was necessary (see Exhibits, Form 2). Customers who received house audits were not obliged to notify the field office of these changes and it became almost impossible to monitor these changes through the two electric utilities serving the area. Therefore, the field office staff decided to use

the four-digit bid number as the packet identifier. This simplified the manual record-keeping system.

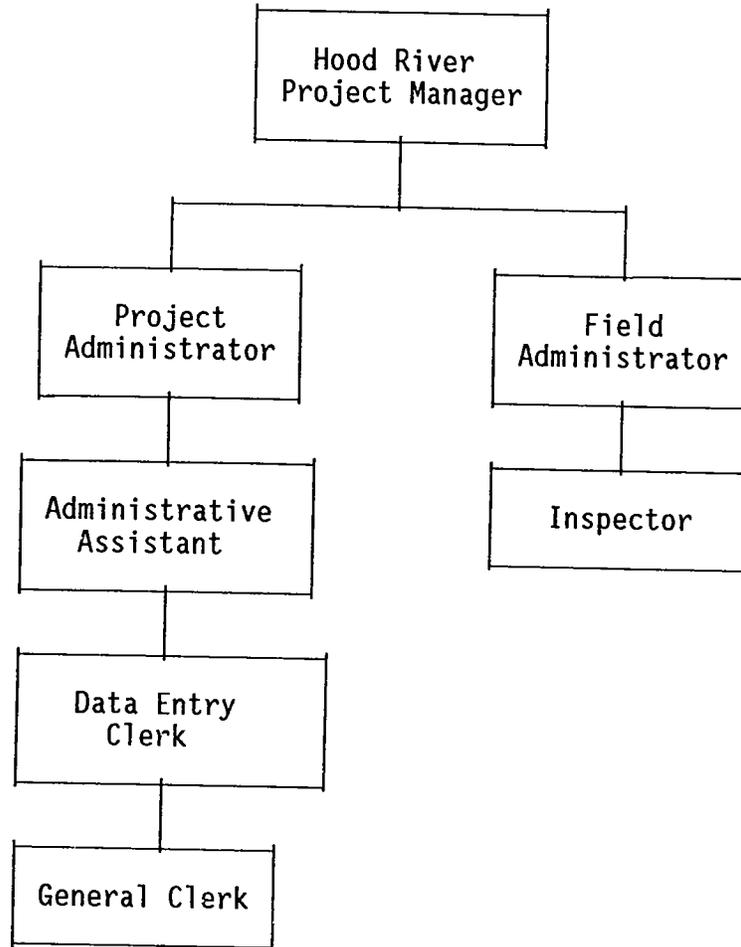


Figure 3. Hood River field office, November 1983.

The computer system, however, had already been installed with the electric utility account number as the universal access key to the data base and it was not practical to modify the system to substitute the bid number. The electric utility account number required numerical suffixes that needed constant modifications to keep up with account changes described above. This proved to be a continuous, time-consuming task involving checking and double checking the status of customer accounts.

Weatherization installation done on a house by a contractor was identified in the packet by a single multidigit number. The contractor invoiced the Project for work completed only once under this number. However, if installation of a measure was necessarily delayed or one measure failed inspection, payment for the entire job was held up. Delayed payment began to cause contractors cash-flow problems. Therefore, measures installed were split into work components identified by separate numbers. This permitted payment on installed work components that passed inspection. Although this provided earlier payment of invoices, it tripled the data-entry work load.

Data collection and storage

Data collected by the field office staff fell into five main categories of information:

1. Location and structural details of the house audited: address, the construction material of the house, dwelling type (single, duplex, mobile home, etc.), heating source, and the residential electric utility account number;
2. Customer identification: name, address, phone number, demographics, and marketing response/motivation questionnaire;
3. Weatherization installation: dates of activity, contractor bids, contractor assignment, work deadlines, job completion, and inspections;
4. Measures installed: an energy audit; an invoice check on square feet of measures installed, and final account of the type and quantity of measures; and
5. Accounting: bids, dollar amounts per measure, customer supplemental payments, contractor invoices, and payments.

Packets were stored in a main filing area in the field office. Record keeping was facilitated by the use of multiple-copy NCR (no carbon required) paper for Project forms. A high-volume copier, available to contractors on a limited basis, also promoted efficiency.

An information packet was started when a citizen requested an audit. Information was added to the packet at the stages of packet review and weatherization noted in the following outline.

Administrative Outline of Field Office Work

Audit:

- Audit requested by customer
- Audit assigned to auditor
- Audit completed

Bid:

- Project calls for contractor bids
- Contractors submit bids
- Contractor bids matched with audit
- Bid approved or denied

Weatherization agreement:

- Field specialist makes appointment with customer to discuss weatherization agreement.
- Customer signs or does not sign agreement

Contractor activity:

- Job awarded to contractor
- Contractor submits invoice for work completed

Inspection:

- Contractor callback (if work fails inspection)
- Deficiency corrected, inspection passed

Payments:

- Contractor's invoice reviewed and submitted to Pacific Accounting
- Contractor paid

Information added during any of above stages:

- Barriers
- Modifications

Accounting

Pacific's Treasury had two objectives in handling Project accounts: 1) freedom from financial liability for weatherization costs, and 2) avoidance of contractor cash-flow problems.

The accounting department was vital to the design and maintenance of the Project's accounting and cash management systems. Systems were set up to facilitate the monetary exchange between Pacific and Bonneville, payment approvals, and vendor and contractor payments.

Field weatherization expenditures were approved by the Project administrator in Hood River who forwarded invoices to accounting. This not only expedited contractor payment, but also situated payment records in the field office where Project staff could quickly verify the status of contractor and vendor payments.

Cash flow was critical to the timely completion of weatherization work and payments to contractors and vendors were made within one week of Accounting's receipt of Project invoices. Often the weekly sum of invoices paid by Pacific was submitted to a Portland bank in a letter-of-credit form and funds were then transferred from Bonneville to Pacific. The submission of a monthly report of letter-of-credit claims to Bonneville was a contract requirement. Preparation of these reports required the Project field office to reconcile its records with those of the accounting department.

Smooth accounting transactions developed from open communication between Project managers and accounting personnel. Accounting was amenable to modifying procedures when necessary. For example, during Phase II when contractors ran into cash-flow problems due to inspections delays, payments were issued to contractors prior to passing inspection. Though Bonneville would not reimburse Pacific for uninspected work, Pacific set up receivable accounts to facilitate contractor payments and delayed Bonneville reimbursement.

Computer system

In October 1982, when the Project was in the planning stage, Pacific's application systems department began laying the groundwork for the computer system. This work, which spanned 16 months, was done in three phases:

1. Program and documentations study completed, submitted, and approved by a computer applications review committee;
2. Survey of the system's direction, cost, and cost-benefit analysis completed; and

3. Analysis documentation of weatherization and research and evaluation systems created.

The analysis documentation completely described each step of Project activity, including detailed data-flow diagrams. At this phase the Project manager and the research coordinator were consulted about the system needs of their programs. Information on weatherization operations was available at this time and was fully incorporated into the analysis documentation.

The Project contract provided for a vendor to write software and documentation. Two Pacific departments, Cost and Scheduling, and Application Systems, made vendor contract proposals to Bonneville, but were rejected. Bonneville encouraged Project managers to seek an outside vendor. After a survey of the limited field of vendors with energy audit experience, a vendor was chosen who had experience with Pacific energy audits. The analysis documentation written by Application Systems became the core of software deliverables stipulated in the vendor contract. When the contract was signed, the vendor relied on the analysis documentation to guide the design of Project programming, documentation, and testing.

The vendor purchased a General Electric (GE) Marklink terminal system that was more powerful than any system owned by the vendor and rented this system to the Project. The field office was partitioned and a computer room with a glass door was built. The computer room was fitted with an air conditioner to ensure 65-75 degree temperature ranges required by the computer system. In August 1983, the system was installed in the field office and a Project data-entry clerk was hired. See Bacon (1985) for a detailed description of the field office's computer system.

Hardware

The heart of the system was a TI800 minicomputer with 80-megabyte fixed disk capacity and a 16-megabyte removable disk. A GE-based Marklink terminal operating system accompanied the minicomputer. Six removable disk cartridges backed up the operating system and disk data base. Three data-entry terminals, a Terminet 200 printer, a modem, and a surge suppressor were installed. A modem connected the computer with two GE national computer facilities, Mark III in Burke Park, Ohio, and Mark 3000 in Rockville, Maryland. Six hand-held HP-75 computers for use by residential auditors also were obtained.

Other systems used by the field office include: 1) an HP1000 minicomputer to translate solid-state memory cartridges containing load data from monitored residences; 2) personal computers to monitor Project progress; and 3) Pacific's mainframe computer that tracked consumption for Pacific and Hood River Electric Cooperative customers within the test area. The mainframe was also used to validate data received from the Project's minicomputer before the data was passed on for evaluation.

Using a minicomputer at the field office to capture and report on local data worked well. All field data was uploaded to Pacific's mainframe where it was combined with consumption information to facilitate analysis. It took almost 24 months of testing and modification of the transfer of data from the minicomputer to the mainframe before it operated correctly. Future projects should require the minicomputer to be able to communicate directly with the target mainframe computer.

Software

Software consisted of TPL and FORTRAN compilers on the GE Marklink. The Project data base was designed in a hierarchical format. A data dump was done periodically into GE's Mark III or Mark 3000 where a file tape was created and sent to Project research staff in Portland.

In October 1983, a Project computer systems team was formed by two Pacific employees -- an Applications Systems programmer analyst and an Energy and Conservation Services user analyst -- and the Project's data-entry clerk. This team traveled over 900 miles to the vendor's office to monitor programming of the software. In November 1983, the vendor's chief programmer traveled to Hood River to get the system running. The Project's data-entry clerk was the main employee assisting the vendor programmer. The programmer, who was under time pressure to get the system working, did not communicate effectively with the data-entry clerk, thereby compounding confusion about use of the software.

Testing of the system rested with the computer system team after the vendor's programmer left Hood River. During the first days of testing, the team realized the vendor had omitted important areas of software design and documentation. The problems were such that system-level testing had to be set aside for lower transaction-level testing of each input and output. Onsite testing had been scheduled for completion by mid-December, but the

lower transaction-level testing forced the date of completion into early 1984.

During the high point of testing in December and January acute problems with the programming were revealed. The vendor sent a programmer to work closely with the Project's data-entry clerk, who had been promoted to an assistant user analyst. After extensive reprogramming, the system went live in March, but there were still serious problems. Parts of the data collection usage designed six months earlier were obsolete and modifications were necessary. The software was supposed to be modular and accommodate easily to changes in the data base, but it lacked flexibility. When software updates were supplied, the vendor did not have time to undertake regression testing, but could only test the new programs. Testing was further hampered because the field office had to process a backlog of six months of data and live debugging was limited to critical corrections of areas affecting data or system operation. The system required modifications throughout the Project, but under these circumstances full-fledged acceptance testing was not completed.

In May the system went down for ten days due to disk fragmentation. It was suggested that the disk be purged regularly, which took 18 hours in May and would take almost 30 hours by the end of the Project. However, the computer systems team avoided this arduous task by providing utilities to allocate enough space in files to prevent fragmentation.

Major problems

The root of the computer system's major problems are as follows:

1. The vendor's offices were located over 900 miles away from the Project, which slowed response time for dealing with problems;
2. The vendor's computer system differed in design and capacity from the GE Marklink, which made duplication of problems by the vendor impossible in cases directly related to the data base size. This problem infrequently occurred, but when it did, it was a serious problem. Also, the system used to generate and test the programs was not compatible with the production system used in regression testing and duplication of problems;
3. The vendor committed to a shorter delivery schedule than was required by the contract and had to hire contract programmers to rush

delivery, installation, and testing. The vendor was thus under constant pressure. When Pacific offered to send its personnel to the vendor's office to assist with Project work, the vendor related his staff did not have time to communicate adequately with the Pacific employees;

4. Programming by Pacific employees was forbidden by the vendor's contract that made the vendor completely responsible for the data integrity of the system. Programming by non-vendor employees would release the vendor from this responsibility; and

5. The day-to-day responsibility for the system fell on the data-entry clerk who had no previous computer experience and had to learn on the job. Although the data-entry clerk showed an aptitude that resulted in promotions to assistant user analyst and user analyst, the period of her initial on-the-job training occurred at a point critical to the system's implementation.

During Phase I, user acceptance of the computer system was low due to numerous system failures and inaccuracies in report transactions. This caused the Project office staff to prefer the manual data collection and record-keeping system to those of the computer during the first year of the Project.

Weatherization Field Work

This section describes the major components of weatherization operations during Phase I. Weatherization operations during Phase I were under the direct supervision of the field coordinator whose staff included two field specialists and two inspectors. Basic activities forming the structure of operations -- auditing, bid evaluation, pricing, contractor work, and inspections -- and their initial application and modifications are described in this section.

Residential and retrofit measure selection

Customer requests audit

A residential audit, the first step in the weatherization process, could be requested by a potential customer either over the phone or in person at

the field office. An audit request form was filled out at this time, a customer packet opened, and a bid number assigned (see Exhibits, Form 3).

Project audits were limited to residences with permanently installed electric space heating equipment. Portable space heaters without dedicated circuits were disregarded in the audit's energy savings estimate. Only the electrically heated living area of a residence was to be retrofit with weatherization measures.

If the residence had unused non-electric space-heating equipment, it had to be removed for the residence to qualify for weatherization. If the structure prevented removal, parts of the equipment that could be dismantled were removed. Electrical service to a non-electric permanent furnace was disconnected.

Exceptions to the above were residences with permanently installed electric heat and a wood stove, a fireplace with or without fireplace insert, or an electric heat-pump system with integral alternate fuel backup.

Residences with oil heat were not eligible for the Project, but were referred to the State of Oregon's Oil Heat Institute for an audit and a chance to participate in its conservation program.

Every customer who applied for an audit, even if they did not qualify for the Project, received an electric water-heater wrap, low-flow shower heads, gaskets for electrical outlets and switchplates located on outside walls, hot-water pipe wrap, and information on energy conservation paid for by the Project. Oil-heated residences that did not qualify for the Project also received these audit measures at Project expense (see Exhibits, Forms 4 A - B).

Audits

The Project hired a vendor to conduct audits. The energy audit vendor periodically sent managers from its offices in Portland to hire and train a crew of four to six Project auditors who were hired locally. Auditors were not drawn from Pacific's pool of employees because Pacific was undergoing a work force reduction that cut more than 500 positions from Electric Operations during 1983-84. Also, it was not economical to temporarily transfer Pacific employees to Hood River to conduct audits.

<u>Measures</u>	<u>Target Levels</u>
Measures installed during audit:	
Cold/hot water pipe wrap	R-3
Electric water heater wrap	R-11
Outlet & switchplace gaskets	Where applicable
Low-flow shower heads	Where applicable
Insulation:	
Ceiling	R-49
Floor	R-38
Wall	R-11 to R-19
Duct	Crawl space R-11, attic R-30
Windows & doors:	
Storm windows	Triple glazed
Doors	
Thermal and/or storm	Where applicable
Sliding	Double glazed
Infiltration:	
Caulking and weather stripping	Where applicable
Clock thermostats	Where applicable
Heat pump conversion of furnace	Where appropriate conventional measures cannot be installed
Air-to-air heat exchangers and dehumidifiers	As required

Figure 4. Hood River retrofit measures.

Auditors completed three forms describing the physical condition of the residence and a customer information form. The auditor left the customer with a form outlining primary weatherization recommendations and obtained a

permission sheet from the customer for contractors to survey the residence and make bids (see Exhibits, Forms 5 A - I). Retrofit recommendations were based on a list of super-weatherization measures drawn up by Project planners. The audit determined the level and number of measures that could be installed, and the monetary amount the Project could provide for each residence (see Figure 4).

The auditor ran calculations on a hand-held HP75C computer programmed with Bonneville's Standard Heat Loss Methodology (SHLM). The SHLM estimated energy savings the first-year after weatherization of the residence (Bonneville 1983). The estimated amount of kilowatt-hour savings was multiplied by \$1.15, and the product equaled the dollars available for weatherization of the residence being audited.

The \$1.15 per estimated first-year kilowatt-hour savings, or the incentive limit, was derived from several figures: Bonneville's "long-run incremental cost" with Bonneville transmission loss and Pacific distribution loss; the capacity savings of a base-load thermal plant; the ten percent conservation bonus provided for in the Regional Power Act; and a 35-year-life utility of conservation measures. The Project's incentive limit was higher than most other conservation programs because it covered super-weatherization measures.

The auditor recommended measures to be retrofit in the residence under audit after the SHLM run indicated these measures might be installed under the incentive limit. Most customers understood the measures recommended by the auditor might be installed. Some customers mistook the auditor's list of recommended measures as a promise and did not realize installation of every recommended measure was contingent upon a review of the audit and the contractors' bids by the field specialist.

Contractor survey and bid

When an audit indicated weatherization of a residence was within the incentive limit, two or three contractors were assigned to make a physical survey of the residence and prepare bids. The contractors were not given the auditor's physical survey or SHLM results.

After the physical survey of the residence, the contractor asked the resident to sign a form acknowledging the premises had been surveyed (see Exhibits, Form 6). However, many customers refused to sign this form entitled "Proposal Acceptance," as it appeared they were agreeing to weatheriza-

tion rather than verifying the contractor had visited the residence to gather information for a bid.

Bid evaluations

When a contractor's bid was submitted to the field office, a Project field specialist reconciled the bid with the audit.

The physical surveys of the bid and audit were compared. When they differed significantly the field specialist double checked the information with both the auditor and contractor. Occasionally, the field specialist had to visit the residence to verify measurements or an existing condition in question. As the Project matured, field specialists weighted judgments of physical surveys toward the contractors who were more knowledgeable of existing and target measure levels and had more at stake than the auditors.

The field specialist also compared the audit's incentive limit with the costs of measure installation listed in the bid. This information was recorded by the field specialist on a Project field office "cost-effective calculation sheet" filed in the bid packet (see Exhibits, Form 7).

If the low bid was \$200 or less over the audit's incentive limit, the field specialist negotiated with the contractor to lower the bid. If the contractor would not lower the bid to the incentive limit, the field specialist asked the customer for a supplemental payment. The Project preferred to negotiate costs with contractors before they spoke with customers because the Project had been advertised as a free weatherization package. Contractors reduced their bids on standard residences only a dozen time during the Project. However, mobile home retrofit required contractors to reduce bids several dozen times to obtain jobs because mobile homes were generally in poorer condition than standard residences.

Customers could volunteer to pay a supplemental amount of money for weatherization if they wanted more expensive measures than the Project offered, or wished a high bidder to weatherize their home.

Carried measures

During the bid evaluation process described above, the field specialist could allocate more measures to a residence than those recommended by the

auditor by "carrying" them. The cost of these measures was usually carried by wall, floor, or ceiling insulation. For example, the cost of installing wall insulation was often lower than the dollars it was estimated to save in the first year after retrofit. The remaining dollars were applied to pay for measures like storm windows that were costly. Thus, wall insulation "carried" storm windows. In general, there were more dollars available for measures in residences needing fundamental weatherization measures, wall or floor insulation, for example, than residences with basic insulation already installed.

The dwelling unit was the basic unit of Project measurement and dollars left over from one house could not be applied to pay for measures in another house. There were, however, about 40 apartment buildings in which measures were carried between apartments. When apartments shared the same roof and basement, the apartment building was considered as one dwelling unit. Duplexes and multifamily dwellings not under the same roof were audited as individual units and dollars left over from installing measures in one unit were not transferred to pay for measures in another unit.

Barriers

Each measure had a target level of installation and if any portion of a measure could not be installed, the reason, or "barrier", was described on the barrier form (see Exhibits, Form 8). Barriers were either physical or customer generated. Most barriers were recorded on the barrier form during the audit. Field specialists, contractors, or inspectors also could add barrier information during or after weatherization. Auditors and office staff recorded most of the barriers. Contractors were not responsible for filling out the barrier form, but would sometimes indicate on their bid sheets or invoices that a particular section of work was "barriered."

In practice, the barrier form was open to a great deal of misinterpretation. Any condition not exactly matching those on the form might simply be indicated by an "X" without further clarification, or slotted under the "other" category. At one point the majority of barriers were being described as "other", and the field administrator had to ban the use of this category. Although some definitions on the form were expanded, the form did not fully reflect field conditions. The time it took to accurately fill out the form was rarely taken and the lack of specific descriptions of barriers hindered the bid review work of the field specialists. During peak office productivity, reporting of barriers was relaxed to manage more pressing tasks.

Most barriers not recorded by the auditor were documented on the barrier form by the field office staff after the job was completed.

Bid awards

When the total package of measures (including "carried" measures) was finalized by the field specialist, the customer was requested to come to the field office to sign the Project weatherization agreement, and, in some cases, the supplemental weatherization agreement. The customer could cancel the agreement within three days of signing (see Exhibits, Forms 9 A - C). After the Project's agreement with the customer was signed the contractor was given a notice to proceed with retrofit work (see Exhibits, Form 10).

Contractor selection

During the Project planning phase, the Regional Advisory Group decided to limit contractors to Hood River Valley businesses for several reasons. If the Project spent \$12 million for retrofit measures in a community, the future business prospects of local contractors would be significantly diminished. Working with local businesses would funnel contract money back into the community. The community assessment, furthermore, indicated citizen participation might increase if the Project hired local contractors.

Contractors whose businesses were established in the Hood River area before May 1, 1983, and who had performed previous weatherization installation for Pacific, Bonneville, or the HREC were eligible to apply to the Project for contracts. There were only five contractors in the Hood River area that met these qualifications. The small number of contractors was attractive to field office management because it kept administration duties and paperwork to a manageable level for the relatively small Project staff.

The schedule demands of the Project meant the five local contractors had to significantly expand their businesses. They handled this expansion by subcontracting some or all of their work. Two of the three subcontractors employed by Project contractors were not local businesses.

Pricing

Unit prices

The Project contract with Bonneville called for implementation of a unit-price system. Pacific had five years of experience in zero-interest weatherization programs and readily agreed to this stipulation because the alternative, the competitive-bid system, was considered an administrative nightmare. Another deterrent was the potential disruption to the privacy of retrofit customers who would be visited by two or more contractors vying to win a bid under the competitive-bid system.

In the fall of 1983, Project managers attempted to set fair unit prices, but discovered price schedules for super-weatherization did not exist. It was decided that contractors should initially make a single round of bids based on their own prices. The Project could then evaluate the bids to create a unit-price schedule. Prior to signing contracts with the Project, contractors were randomly assigned homes and asked to make a first round of unit-price bids based on their own calculations.

Both Pacific and Bonneville found the first round of bids to be unreasonably high. When Bonneville compared these bids with those submitted on several other regional weatherization projects, they were double the cost of most standard programs. These prices, extended to cover the cost of weatherizing the targeted 3,100 homes, would more than double the performance cost of the weatherization contract.

The Project spent several weeks negotiating with contractors over prices in an attempt to develop a price structure. It was feared that a high level of informal communication between the five Hood River contractors might take the edge off the competitive aspect of a bidding system. The contractors' bids submitted in the trial run were very close and uniformly high. Contractors defended their bids by maintaining they wanted a cushion against the fact that they would not be paid for any work not meeting close scrutiny by Project inspectors.

Competitive bids

In order to avoid inflation and possible collusion among contractors, a competitive-bid system was adopted in early January 1984. Bonneville and Project managers agreed to establish the unit-price system after three months

of competitive bidding through evaluating bids and costs. Bonneville suggested the Project develop criteria for a second round of contractors if the five local contractors priced themselves out of the market or could not maintain the Project's schedule of weatherization.

Under the competitive-bid system, at least two bids had to be received for each component measure (ceiling insulation, floor insulation, storm windows, etc.) to be installed. Contractors were not paid for time spent conducting physical surveys of residences or calculating bids. Competitive bidding tripled the paperwork contractors had to process. Although this can be considered a normal cost of doing business, the paperwork for this system was higher than under unit prices used in other projects, and contractors complained their costs increased under the competitive-bid system.

Bids were not posted or discussed with contractors. However, bids did not bring prices down far enough to satisfy Project management. At times one of two bids would be unrealistically high or low, or measurements and descriptions of existing conditions varied so much that competition was a moot point. If all bids were high, the job was either declared by the field specialists to be too costly or was done at a high cost with no corresponding increase in the quality of installation work. Project managers with experience in other weatherization programs could see there was not sufficient level of competition to bring prices significantly down.

Reconciling physical surveys

The differences in physical survey information between audits and contractor bids increased with the assignment of several contractors to a residence. Sometimes as many as four contractors, two insulation and two glass, conducted physical surveys of a residence.

The competitive-bid system was slow during the first months of bidding. It was a rare case when physical survey information on all bids and the audit matched and it became common for at least one contractor to make a second residential survey to verify existing conditions or measurements. At times a third contractor was invited to bid the job, and if this bid matched either of the first two and reconciled with the audit it was matched with the compatible bid and considered for the job award. Inaccurate physical surveys of a residence were not always the fault of the contractors because residents would sometimes show contractors different things while touring their homes.

Specifications

Project specifications (specs) were written by Bonneville engineers and correlated closely to standard weatherization specs local contractors used on other projects. Contractors were given copies of the 150-page Bonneville specs manual during training sessions. Pacific engineers and Project staff worked closely with Bonneville to ensure Project contractor work would meet specs and pass inspection.

Contractors, conscious of having to pass tight inspections, had many questions about Bonneville spec interpretation of super-weatherization retrofit measures. They increasingly asked the field administrator and field specialists for interpretation calls. The field operations staff, mindful of their federal contractual arrangement, preferred to conservatively table spec interpretation calls until official decisions were handed down from Bonneville.

A backlog of spec interpretation calls built up in the field office and production of bid reviews and job awards slowed down. In April, the situation came to the attention of the Community Advisory Committee and they wrote a letter to the administrator of Bonneville asking for help. In March, a Pacific specifications engineer wrote Bonneville for spec interpretations on nine areas and a month later he wrote asking for three more. Field office production was bottlenecked by this problem. Field specialists reported that for every ten bid packets crossing their desks seven fell into one of the categories awaiting Bonneville interpretation.

No structure existed to quickly and effectively address this problem. During Phase I, relationships and procedures between the three coordinated staffs -- Bonneville, Pacific, and the Project -- were evolving and still rather formal. Spec interpretation problems were submitted through documented, written instruments requiring signed approval from a line of managers on all three Project staffs. This delayed submission and resolution of the problem.

Furthermore, Bonneville was in the midst of compiling and evaluating specs used in weatherization programs throughout the region. There was controversy within Bonneville over whether specs for super-weatherization measures should vary from those in other Bonneville projects. In early 1984, Bonneville reversed a previous decision allowing special interpretation of super-weatherization retrofit measures, and during the spring of 1984 all spec interpretation was decided by a Bonneville spec committee. By the end

of Phase I, the field office was still setting aside most spec interpretation calls in anticipation of official Bonneville review. Notices to contractors to proceed on retrofit work fell 50 percent in April (see Figures 8 and 9).

Inspections

Two inspectors were hired to evaluate contractor work and enforce quality control. The inspectors were required to complete 24 hours of classroom training and pass a Pacific examination. They also had to conduct a minimum of five inspections under the direct supervision of a Pacific engineer who was a certified inspector and trainer. Well-trained inspectors were essential to the Project. Not only was payment to contractors contingent upon valid inspections, but Bonneville reimbursement of weatherization costs to Pacific could be forfeited if weatherization work did not pass random Bonneville audit inspections to be conducted after all residences were weatherized. The quality of inspection performed by Project inspectors vitally affected the disposition of the \$12 million in federal funds for Project weatherization.

During an on-site inspection, the contractor's invoice for work completed was checked against the audit and bid for quantity and quality of retrofit installation. Inspection data were noted on a checklist that later was compared to the audit and bid by the field specialist or bid-desk clerk. If the job passed inspection, both inspector and customer signed a work completion form. If the work failed inspection, the contractor was formally notified (see Exhibits, Forms 11 A - D).

Retrofit installation

Preparatory work

Before work could begin on a site, certain physical conditions identified in Bonneville specs had to be rectified by the customer. The Project could not pay for preparatory work such as concrete coring, correction of dry rot, remodeling or repair of window sashes and sills, construction of mobile home skirting, or removal of non-electric heating sources. The cost of these repairs fell on the customer, many of whom balked at having to pay any money to receive a free weatherization package.

If a customer did not complete this preparatory work, the contractor had to delay or cancel the job. Some contractors discovered preparatory work was not done only after they ordered supplies and sent a crew to the site. In some cases preparatory work was not done because the customer was not given a deadline. In other cases the customer had no intention of spending time or money on repairs. Contractors would often rectify the situation by paying for the preparatory work rather than lose the job. In some cases the contractor billed the customer for preparatory work at the recommendation of the field office.

Contractors who installed measures without ensuring that preliminary work was done according to Bonneville specs had their jobs failed by Project inspectors. Contractors argued this was the fault of the negligent customer. However, payment could be made only when Bonneville's strict specifications had been met. Project management took the position that rectification of these physical conditions was a problem between customer and contractor.

Cancellation of a major measure

Sometimes a major measure, like wall or floor insulation, was cancelled by the field office when some level of insulation was discovered after installation work began. The condition was not accurately assessed during the audit or contractor's physical survey because some conditions are not easily detected. Dry rot or areas of insulation, for example, are difficult to discover without very thorough investigation. If dry rot was discovered after floor insulation work began, the contractor had to stop insulating and remove all installed floor insulation in the dry rot area.

If the cancelled major measure was carrying the costs of other measures, the carried measures also were cancelled. Carried storm windows, for example, could be cancelled as a result of the discovery of dry rot.

The supplier's bill for any cancelled carried measure was paid by the insulation contractor who made the original physical survey. In the beginning of the Project several of the contractors installed both glass and insulation, but eventually contractors tended to specialize in either glass or insulation. When a job was awarded, contractors ordered supplies. Sometimes the supplies for the cancelled measures could be used on other jobs, but this was not the case for glass supplies, much of which was specially ordered or custom made. If glass was cancelled because an insulation con-

tractor made an error during the physical survey, the glass was paid for by the insulation contractor.

Often the insulation contractor would try to rectify the physical barrier at the residence at the contractor's own expense. A contractor could, for example, fix an under-floor or pay for concrete coring. The cost for this work was frequently less than the cost of losing work and paying for the glass. Although no records were kept by the Project or most of the contractors on the total dollar amount contractors paid to subsidize major and/or carried measures, it is estimated to be between \$30,000 and \$80,000. Future weatherization projects should provide a mechanism to track these costs.

Exposure to these costs and the specter of failed inspection are some of the reasons contractors gave for the submission of high-priced bids.

The loss of carried measures because existing wall insulation was discovered was difficult to explain to customers who believed they would get all measures recommended by the auditor. Customers could not easily understand the rationale of the incentive limit calculations and carried measures.

The disappointment customers experienced over losing measures was compounded when they observed neighbors with seemingly identical residences receiving a full weatherization package. Customers would sometimes complain this was not fair because the neighbor's residence was worth more (or less) than theirs, or the neighbor was wealthier than they were. Existing conditions in two outwardly identical homes, such as R-19 floors in one home and R-3 floors in another, were not easy for customers to observe.

When the field specialists began to explain to customers existing levels of measures, target levels of measures, incentive limit calculations, and carried measures in non-technical terms that "made energy sense", they were able to quell most customer complaints. However, customer discontent could have been avoided if auditors and field office personnel were trained at the beginning of the Project to explain these things in ordinary terms. The most disappointed customers were those who did not understand that installation of the audit's recommended measures was contingent upon the field specialist's review of the audit and evaluation of contractors' bids. Customers were primarily given information to sell them on a free, total package of weatherization and this sell continued when the auditor and contractor visited their homes.

Contractors

Contractor meetings. Weekly meetings were organized by the field office staff. These meetings provided contractors with the opportunity to share trade secrets, discuss installation difficulties, discover innovative ways of meeting Bonneville specs, and negotiate reasonable solutions to problems. In spite of serious problems and delays, the atmosphere of information exchange and teamwork characterizing daily interaction between the Project staff and contractors was extended to contractor meetings. There were many spirited exchanges in the meetings and at the field office about creative approaches to installation problems that substantially contributed to the knowledge of contractors and staff.

Contractor crews. In anticipation of Project volume demands, several contractors expanded their businesses in 1983-84 by subcontracting and lining up new supervisors and crews. However, work did not start until March 1984, which was much later than contractors had expected. During the first months of weatherization the flow of work was irregular, with the start-and-stop awarding of jobs forcing contractors into intermittent cycles of layoffs and rehiring. Therefore, there was a steady turnover in crew members and a core of experienced installers was slow to develop.

In some cases, this resulted in minimal crew training and poor communication between contractors and their employees. Inspectors reported crews frequently had little knowledge of specs that were discussed with the contractor in detail. In some cases crews did not even have a copy of the specs or bulletins on specs interpretation. Inspectors believed that job failure could have been reduced if crews were better trained and informed.

Contractor cash flow. Contractor cash flow was critical to the life of the Project. It was not unusual for a contractor to have more than \$100,000 invested in jobs completed but not yet paid due to delays in inspection passage. This financial exposure over a long period of time could threaten a contractor's ability to meet payrolls and pay suppliers. Irregular paychecks contributed to the turnover of contractor employees and inhibited maintenance of stable crews of installation workers. Project managers were conscious of the importance of contractor cash flow that occasionally was critical during Phase I when less than two percent of weatherization jobs were finished.

Work warranty. Customers increasingly asked for warranties for work completed and wanted assurance contractors would honor those warranties. The Project assured customers that if a contractor did not honor a warranty or

finish cleanup work the Project would perform the work, bill the contractor, and make a claim on their performance bond. If necessary, the Project would pay for warranty and cleanup work with its own funds.

Customer complaints. At the end of May 1984, only 40 residences had been weatherized. The pace of work was so slow that only one or two residences were weatherized each week. Yet, even with relatively few jobs completed, the staff began to receive many customer complaints about contractor work. Word was spreading in the community about low work standards and encounters between customers and contractors. These complaints were initially addressed individually by the field office staff, but when complaints snowballed the staff took them up during meetings with contractors and the Community Advisory Committee.

Project administrators could not act on many of these complaints because no procedure had been established to document problems with contractors. Documentation was essential before acts of discipline or dismissal could be taken against contractors. In May, the field office staff began to document customer complaints. After complaints had been verified, two contractors emerged as the main source of problems.

The situation was hotly debated in meetings of the Regional Research Advisory Group, the CAC, and the Project staffs. Members of the CAC asserted that hiring local contractors to encourage citizen participation held true only if the contractors' work was of good quality. At this time, however, Project managers were reluctant to fire the two contractors generating most of the customer complaints. Good press had brought the Project its biggest success -- citizens were requesting audits by the hundreds -- and dismissal of two local contractors might have counteracted this success.

It was decided a second round of contractors from outside the Hood River area should be invited to participate in the Project. A wider pool of contractors would not only allow Project managers more leverage if dismissal of a contractor was necessary, but also significantly increase chances of meeting Project goals: weatherization of 3,000 homes in the remaining months of contract time.

Phase I

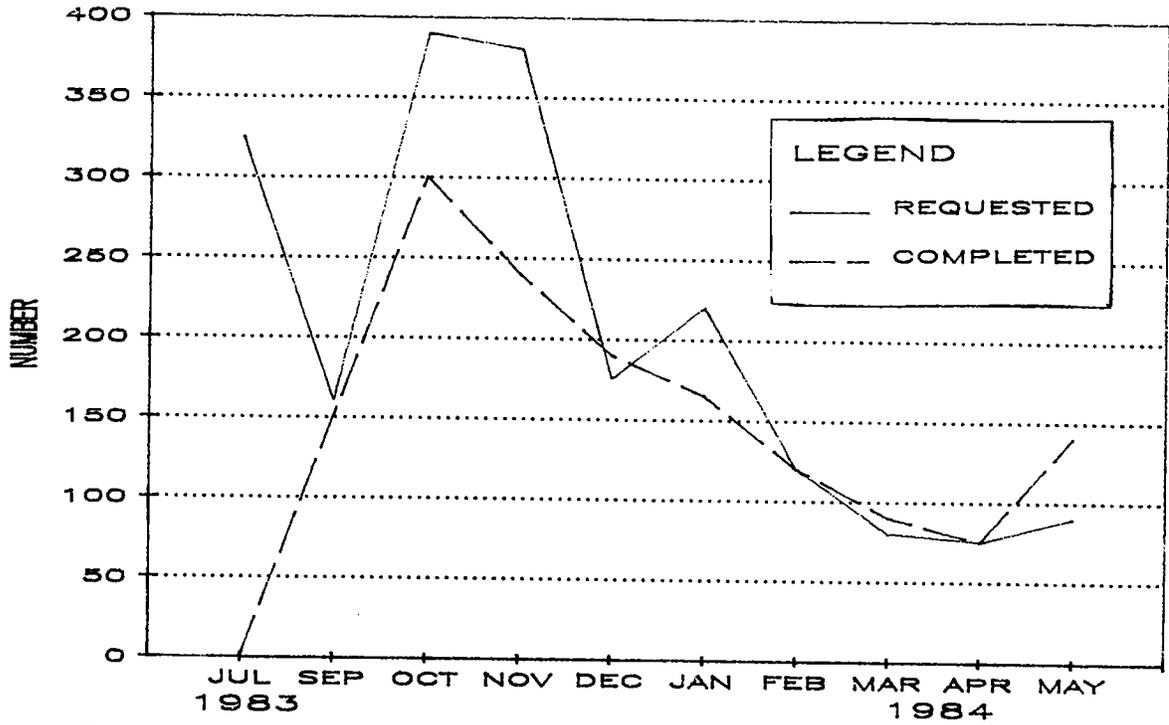


Figure 5. Audits requested and completed (frequency).

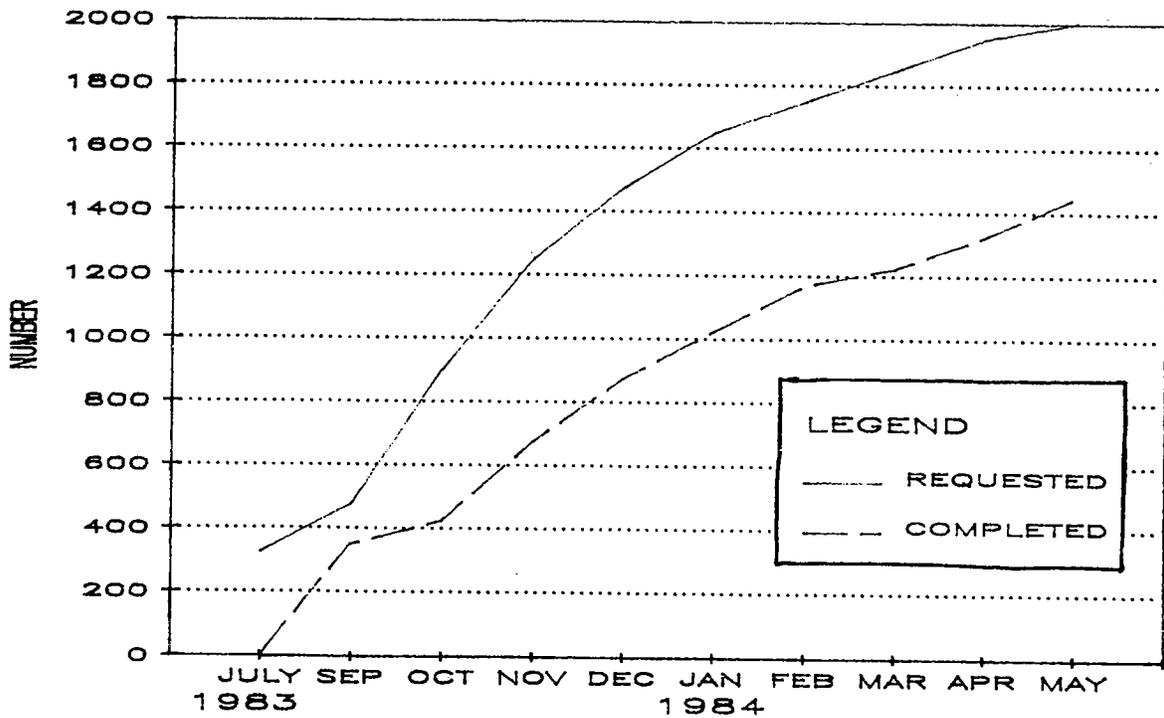


Figure 6. Audits requested and completed (cumulative).

Phase I

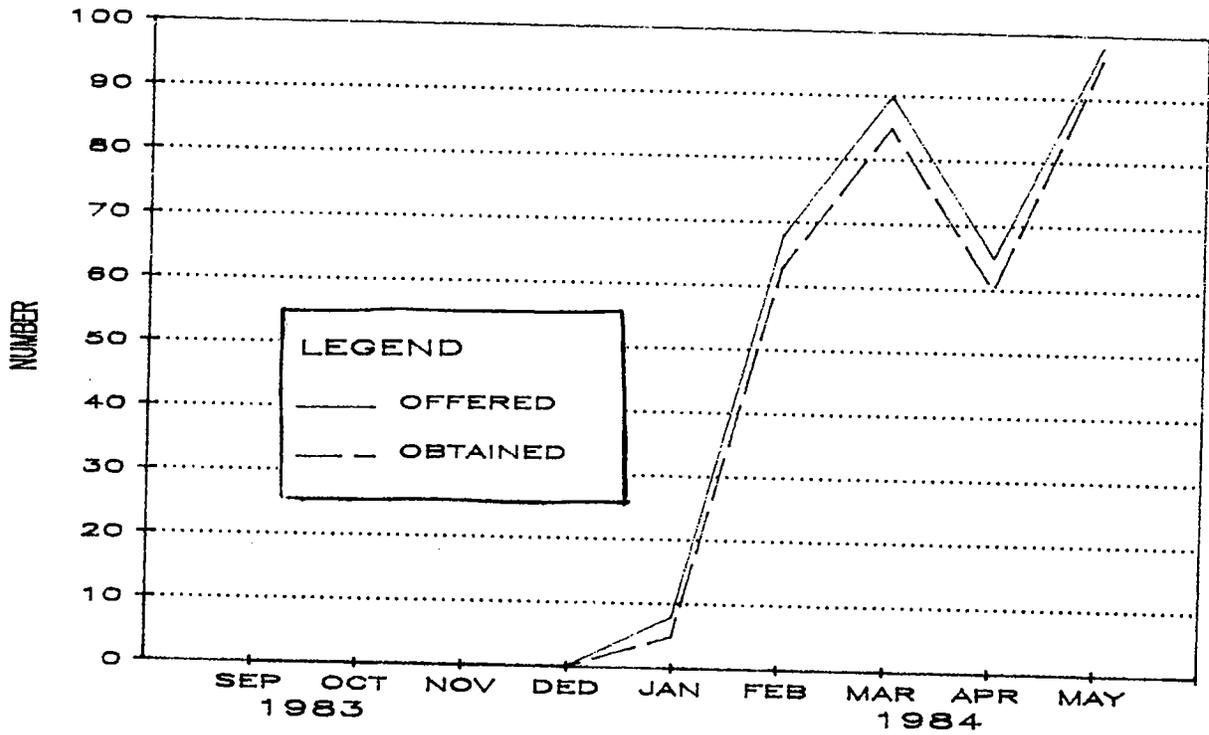


Figure 7. Customer retrofit agreements offered and obtained (frequency).

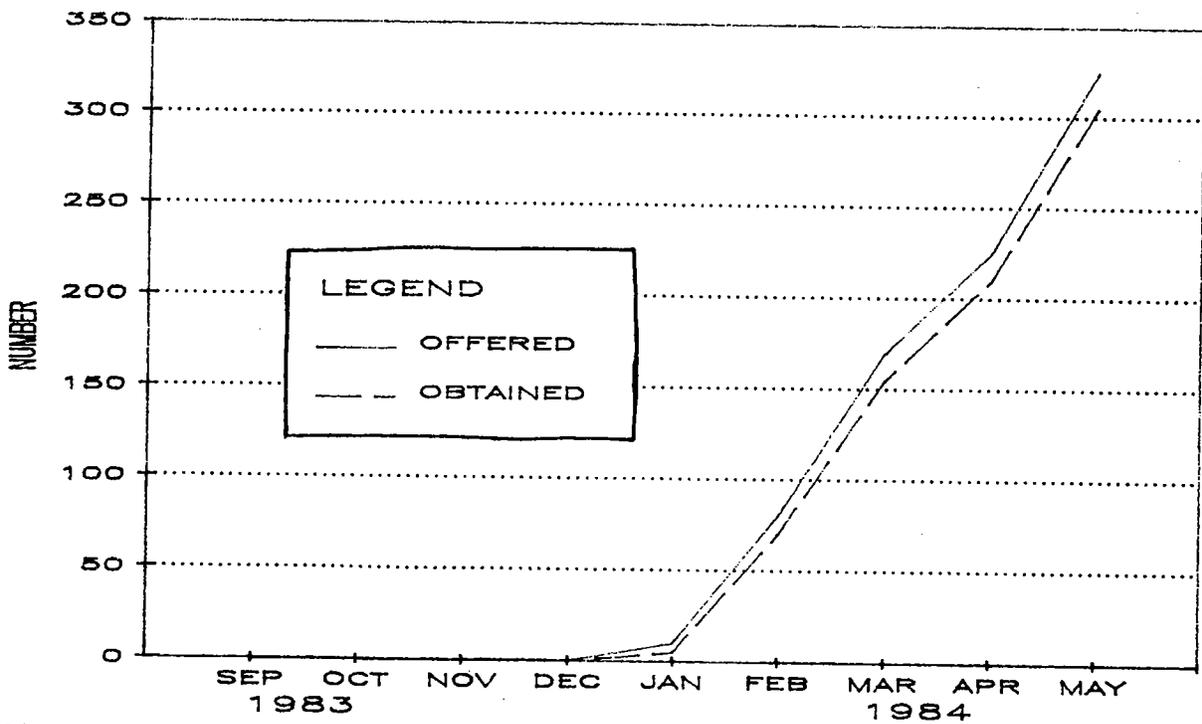


Figure 8. Customer retrofit agreements offered and obtained (cumulative).

Phase I

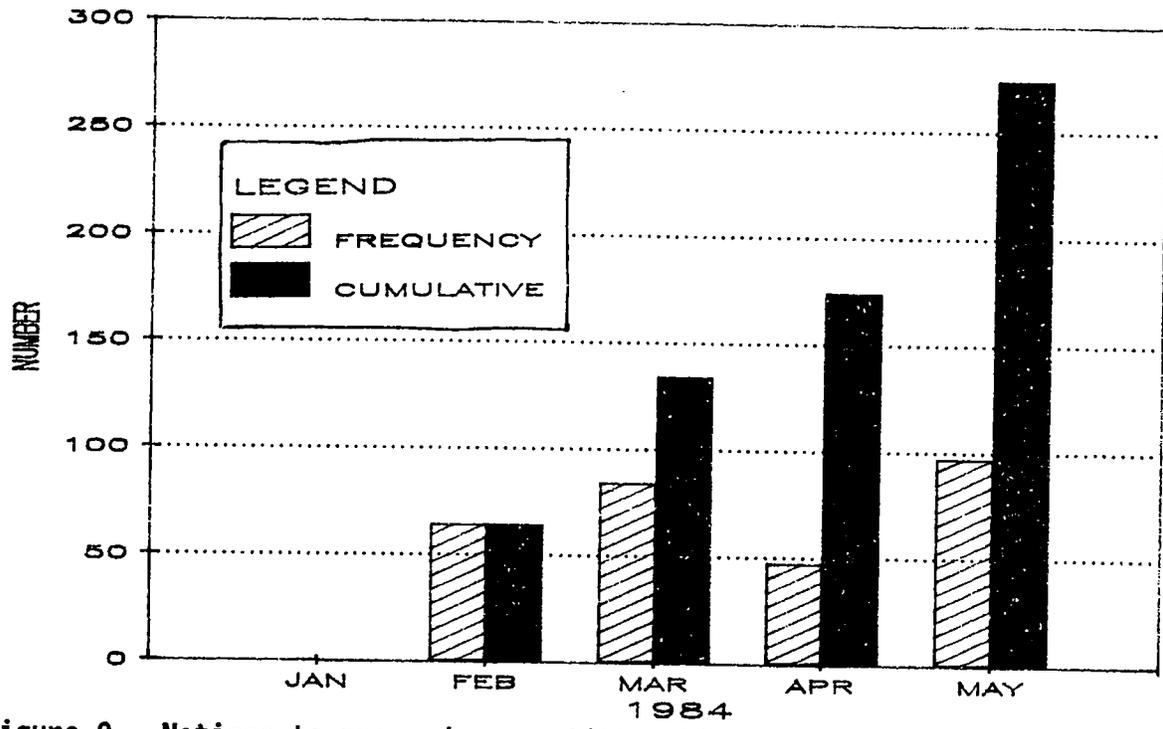


Figure 9. Notices to proceed, competitive bids.

Phase II: June - December 1984

Introduction

Phase I was characterized by the successful introduction of the Project to the community, and creation of the Project's basic physical and managerial structures; and Phase II was marked by positioning of administrative and operations procedures to make full use of those structures.

Organization changes

Phase II begins with assignment of the second Project administrator to the field office in June 1984. The first administrator had been living apart from his family in temporary quarters in Hood River for a year and resigned for personal reasons. His leadership had been vital to the success of Phase I's promotional plan and the development of teamwork between office staff, contractors, and customers. The groundwork of communication between key groups involved in weatherization was complete when the second administrator came on board.

The new administrator had intermittently worked with the Project since February 1984 at Pacific's corporate offices where he assisted in designing the Project's paper flow and measure cost calculation procedures. Both administration and operations were consolidated under the new Project administrator, whose position was enhanced by greater autonomy in hiring, expenditures, and the use of overtime (see Figure 10). By the end of Phase II the locus of responsibility for daily activity was with the Project administrator. During Phase II a main goal of the Project administrator was application of corporate administrative techniques to evaluate and streamline field office procedures and operations.

The discussion of Phase II is divided into three sections: 1) Community Relations; 2) Field Office Administration; and 3) Weatherization Operations.

Community Relations

Community Advisory Committee

The good will of the CAC toward the Project remained strong during the transition between Project administrators. The first Project administrator,

who developed personal ties with CAC members, introduced his successor to the CAC. At this time the primary areas of CAC activity -- community promotion and input into initial community relations' problems -- had been successfully completed. A main task of the Project administrator was to maintain the CAC as a functioning unit. During the summer a strong relationship developed between the Project administrator and the CAC chairman whose understanding of and advice about day-to-day weatherization problems regularly informed the Project.

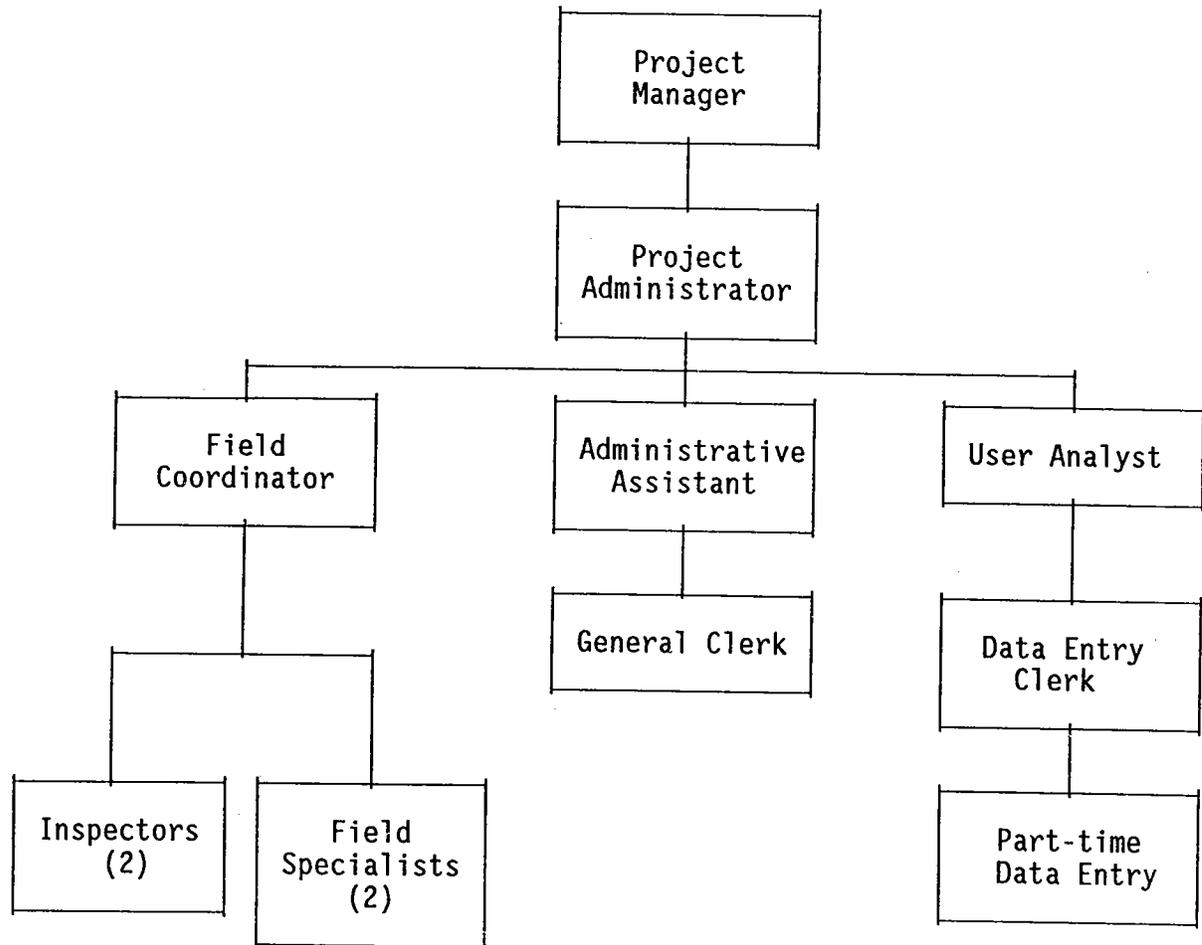


Figure 10. Hood River field office, July 1984.

The June meeting of the CAC was well-attended with members giving voice and support to hiring, if necessary, a second round of contractors from outside the community to increase output and cost competition. CAC meetings

held during the summer drew light attendance, but Project staff continued to update members on production and other activity. Two well-attended meetings in the fall covered important issues such as the termination of two contractors, personnel changes, contractor cash-flow problems, marketing ideas to generate audit requests, and the installation of air-to-air heat exchangers. In November the CAC chairman resigned and another chairman was elected. Although CAC activity began to diminish during the summer and winter of 1984, CAC members continued to meet regularly and act as community representatives to media through the end of 1985. When requested by Project management, CAC members provided community input, support, and advice. However, the CAC did not initiate activities or plan the agendas of its meetings.

Promotional plan

Media from London, England, Cable Network News in Seattle, and a newspaper in Vancouver, Washington visited the Project during the summer of 1984. The Hood River News ran a 16-page tabloid insert on the Project in July. Ads were placed in the tabloid by Project contractors and suppliers. Two news articles appeared in The Hood River News in August and September. The ads placed in this weekly during the remainder of the year were a series of testimonials by satisfied customers that ran for six weeks. A booth at the county fair staffed by CAC members rounded out all the promotional work done during Phase II.

Field Office Administration

The computer system

During the summer of 1984 the software vendor's corrections and modifications of the tracking system were finished. For the first time the computer was available as an effective, reliable management tool.

The field office staff were accustomed to producing manual reports and relying on the manual filing system. They preferred to avoid the computer because of its history of breakdowns. The Project administrator began a two-month parallel checking system to verify computer data with manual data. When the two systems reconciled after the testing period, the staff was more interested in using the computer. To improve accessibility of computerized packets, data-processing staff identified packets by both the bid number and the customer's name.

Project management began to generate computer management reports. At first the computer provided summary reports of production totals, but as the Project matured the need for detailed information increased. Furthermore, accurate accounts of production progress were important to Pacific corporate management.

When the process of field office paperwork flow and/or retrofit production slowed down, it was important to identify bottlenecks before they became serious. The most valuable computer reports were those identifying work flow. Project management was receiving "reports by exception," or reports identifying a problem after it occurred. For example, a report was issued indicating a contractor's job was overdue for completion 60 days after the job was awarded to the contractor. Therefore, 60 days passed before a red flag caused the Project to check on a contractor's progress.

Increasingly refined categories of information were entered into the computer to generate weekly status reports. Reports by status were a better operational management tool than reports by exception. The weekly status reports became a viable method to track each phase of weatherization production.

Audits

Requests by customers for audits continued to increase at a steady pace through June 1984. Audits completed, however, lagged behind customer requests for audits. The Project requested the vendor doing the audits to step up production and from mid-July to mid-August the number of audits completed increased 17 percent. The increase in production meant more requests for bids were given to contractors with a resultant jump in bids submitted to the field office.

Bid evaluations

A backlog of bid evaluations developed in the spring of 1984 because Project staff were waiting to receive Bonneville spec interpretations. Notices to proceed on jobs awarded to contractors fell from 90 in March to 45 in April (see Figures 15 and 16). Many spec interpretations were figured out weeks before by the field office staff, but were set aside pending official Bonneville approval. Less formal routes of communications were set up in late May between the Project and Bonneville to handle this problem and notic-

es to proceed again moved upward. Phone calls instead of formal written communication aided a hands-on, common sense approach to interpreting specs. In mid-June Bonneville forwarded spec interpretations on 11 main areas. Field specialists began to handle bid evaluations with greater dispatch, and in June contractors were awarded 120 jobs, the highest monthly number of jobs since retrofit work began in March.

However, the jobs awarded to contractors in June were only one-fourth the 1,650 jobs bid by contractors. It was apparent a second bottleneck was developing. When office work flow was examined, the bottleneck was found at the stage when customers signed weatherization agreements with the Project.

Weatherization agreements

When weatherization began in March the Project assumed arrangements for customers to sign Project weatherization agreements would easily be made. Project managers also assumed that customers would eagerly sign these agreements. In practice, closing weatherization agreements took an intense effort.

During Phase I and the summer of 1984, field specialists called each customer on the phone to set up an appointment at the field office to discuss the details of residential retrofit and obtain the customer's signature on the Project's weatherization agreement. The majority of appointments were set only after several phone calls to each customer. Many customers worked full-time and were hard pressed to make appointments on work days.

The average appointment took 45 minutes to one hour. Keeping with the promotional goals of Phase I, the appointment was conducted in a friendly, unrushed manner with careful explanation and assurance about the retrofit work to be done on the customer's residence. This soft sell became more difficult when rumors about shoddy installation work, poor clean up, and failed inspections began to circulate in the community during the summer of 1984.

The Project's two field specialists had a wide range of duties and could not devote a great deal of time to customer sign ups. The field specialists also reviewed audits and bids, assigned auditors and contractors to verify costs and/or physical surveys for residences, negotiated costs between contractors and customers, awarded jobs, made spec interpretations, and handled complaints from both contractors and customers. With the general step-up of

field office production and the addition of second-round contractors, the chances of the two field specialists significantly increasing production of customer weatherization agreements seemed low.

Reflecting on how university registrations and mass sales campaigns were conducted, the field specialists initiated a series of customer agreement "sign-up weeks." Instead of calling each customer on the telephone, letters were sent requesting that the customer call the field office for an appointment, which was scheduled during sign-up week. Appointments were set every half hour and averaged ten minutes instead of 45 minutes. Additional staff were drawn from Pacific's district and corporate offices for assignments of three days to two weeks to assist with sign-ups and other work.

Given the short amount of time allocated for each appointment, the field specialists began to employ mass sales techniques to produce signed customer weatherization agreements. Most customers were well prepared for this through previous interaction with field office staff, auditors, and contractors who informed them about what weatherization might entail. The field office staff worked as a team to refine their handling of customers during sign-up week to ensure each customer received all information sought. The tone of appointments during sign-up week was "strictly business", in contrast to the small-town, quasi-social appointments of the first months of the Project.

Sign-up week began in August and was repeated during each of the following three months. The rate of production for sign up of customer weatherization agreements improved 20 percent from June to October, with a total of 1,100 weatherization agreements signed by December 1984. Yet this was not enough of an increase to meet Project goals of 3,100 weatherizations before December 1985.

Weatherization Operations

Production shortfalls

The Project contract target for residential retrofit weatherization was 3,100 residences completed by December 1985. In May 1984, three months after weatherization began, only 66 jobs were finished. The Project applied for and was granted a six-month extension from Bonneville. However, the goal of installing super-weatherization in 3,034 residences in the remaining months of contract time seemed out of reach to most of the Project staff. At one

point the staff questioned whether the goal was to test how much weatherization could be achieved in a given community within the contract time or whether the goal was to weatherize every eligible electrically heated residence in the test area. Bonneville reaffirmed the latter as the goal of Project weatherization.

Production shortfalls drew the attention of the Regional Research Advisory Group members. Several members pressed Project management for a hard schedule for weatherization operations. Although Project managers pled successfully for flexibility, everyone was concerned that installation goals might not be attained.

Operations staff

The field office operations' staff consisted of a field administrator, two field specialists, and two inspectors. Although production increased in July, there was little progress in August. This was due to the loss of two operations' staff members.

On the first of August the field administrator, who was near retirement, was transferred to Pacific's corporate offices. At the same time, one of two inspectors resigned. Replacements were not assigned for three weeks during which time the field office was reorganized (see Figure 10). On the twentieth of August the field administrator was replaced by a field coordinator, and an inspector-in-training was hired. The new field coordinator's main goal was organization of contractor operations.

Second-round contractors

Severe production shortfalls highlighted the strong need to hire additional contractors. Bonneville suggested and approved the hiring of second-round contractors as early as February 1984, but Project managers did not take any action until May.

The first meeting with second-round contractors was held on May 30, 1984 to discuss past problems, specs, insurance, and bonding. A second meeting a week later was held to review specs and take contractors through an on-site weatherization inspection tour. The six second-round contractors selected were not specialists in weatherization, but home builders and remodelers. All second-round contractors were locals and several demonstrated

a high level of managerial ability. None of the second-round contractors worked as subcontractors for the five first-round contractors. When second-round contractors began work, they employed six subcontractors, five of whom were not local.

Project contracts with second-round contractors were signed at various times throughout the summer and fall as each met insurance and bonding requirements. Although second-round contractors engaged in six weeks of competitive bidding, jobs were not awarded until September because of the field office's paperwork overload due to the processing of competitive bids from a pool of 11 first and second-round contractors.

A third round of contractors was identified and contacted in June 1984. These contractors were from the Portland area. It was decided the Project would hire non-local prime contractors if they sent lead personnel to Hood River to hire and train local installation crews. The third-round contractors were contacted as a hedge against rejection by the Project's contractors of the new schedule of unit prices under preparation in June.

The unit-price system

In June the Project manager, Project administrator, field administrator, and Bonneville Project manager developed a unit-price schedule by analyzing past bids and audits, and consulting with contractors. Contractors' books, however, were not reviewed.

In mid-August a proposed unit-price schedule was given to the Project's pool of 11 contractors and negotiations over prices began. Third-round contractors in Portland did not enter into price negotiations, but did receive copies of the proposed unit-price schedule in case some of the Project contractors rejected the schedule outright. In September a basic unit-price schedule was accepted by all Project contractors. This schedule was expanded by the addition of prices for installing measures in residences with special on-site problems.

Under the unit-price system, only one contractor was assigned to conduct a physical survey of a residence and prepare cost proposals for insulation and/or glass (see Exhibits, Forms 12 A - B). The cost proposal was based on the square (or lineal) feet of each measure times the unit price. The physical survey and cost proposal were compared with the audit's physical survey and cost calculations during a computer run that was subsequently evaluated

by a field specialist. If the contractor's physical survey and cost proposal reconciled with the audit, the contractor was awarded the job. When the job was completed, the inspector verified the quantity and quality of the measures installed.

Cost proposal negotiations

When the field specialists reviewed contractor cost proposals that were above the Project's cost limit the proposals were not rejected immediately, but were subjected to a negotiating process.

If the contractor's cost proposal was over the Project's cost limit by less than \$200, the field specialist would ask the contractor to lower the proposal. If the contractor would not re-evaluate the proposal, the customer was asked to pay the amount over the Project's cost limit. If a job was found to be too costly by more than \$200, the field specialist sometimes negotiated the amount between the contractor and customer. Often each would agree to pay half of the difference.

If a contractor found a job impractical under the unit-price schedule, the cost proposal could be submitted as a competitive bid. The Project then sent another contractor to the residence for a bid. Often the second contractor agreed to do the job at the unit price.

The Project did not keep records on how much contractors contributed to weatherization costs by dropping their bids. Approximately 10 percent of all customers contributed to the cost of weatherizing their own residences. The average customer payment was \$520.

Unit-price savings

Although unit prices superceded competitive bids as the Project's primary pricing system, the Project actually continued to use a combination of the two systems with most jobs done under unit prices through 1985 (see Figures 15, 16, 22, and 23). By December 1984 when the notices to proceed to retrofit residences priced under unit prices exceeded notices to proceed issued under competitive bids, 70 percent (880 jobs) of all jobs done under competitive bidding had been awarded. The remaining 30 percent of competitive-bid jobs were issued during 1985 for multifamily buildings containing four or more dwelling units, difficult retrofit jobs that contractors could

not afford to do under unit prices, or jobs where the resident preferred more expensive work and was willing to pay the amount over the dollars the Project had allocated to their residence.

Operations managers announced at the September 1984 meeting of the RRAG that they anticipated the unit-price system would save 20 to 25 percent in retrofit installation costs. They also asserted that not only would real costs fall, but additional savings would accrue from the decrease in time and paperwork demanded of the field office and contractors under the competitive-bid system. The decrease in bid processing work permitted the field office to process and award more bids.

A post-weatherization study compared the average total cost per residence and the average cost per measure installed under the unit-price system and the competitive-bid system. This study showed that if unit prices had been employed from the beginning instead of the combination system of competitive bids and unit prices actually used, unit prices would have saved the Project an additional seven percent. A hypothetical comparison of exclusive use of unit prices and exclusive use of competitive bids for Project weatherization show unit prices might have saved about 15 percent in total retrofit measure costs (Philips et al. 1987).

After introduction of the unit-price system in September, it was suggested that audits of 155 residences classified as too costly under the competitive-bid system be calculated under the unit-price system. This second audit found 72 out of 155 residences were eligible to have contractors submit cost proposals for their weatherization. Of the 72 cost proposals submitted, 42 were found to be within the cost limits set by the field specialists, and these homes were weatherized.

Contractors

Terminations

Complaints about the work of two first-round contractors began to be documented in May. Customer complaints grew during the summer and many customers refused to have their homes weatherized by the two contractors.

By September the Project documented that two contractors had 100 jobs more than 60 days overdue for completion and disciplinary action was taken against the contractors: one was terminated, and the other prohibited from

doing glass work. In October Project documentation revealed the two contractors were responsible for 242 jobs that were not started, outstanding, past due, or failed by inspectors. The second first-round contractor was then terminated.

The Project had hesitated for five months before terminating the two contractors because breach-of-contract charges had to be documented. Project managers also feared the possibility of adverse media exposure that might take the position big business and big government forced two local contractors out of business. If this happened, it might tarnish the Project's image in the community. The Project's hiring of a second round of six contractors in September provided room to take disciplinary action against the two contractors.

Formalization of communication

After two contractors were terminated, there was a great deal of motivation among Project field office management to establish procedural changes to improve communication with contractors and avoid similar occurrences of contractor failure. The first step was establishment of formal communication with contractors through written material such as weekly status reports, extension request forms, and specification bulletins.

The Project field office wanted to provide contractors with individualized weekly computer status reports on the progress of their retrofit work. Most contractors did not have the staff or time to maintain current status reports of their own. Contractor record keeping was rarely complete given the production pressures that contractors found themselves under. There was, however, some resistance within Project management to make this move. It was said contractors should run their own businesses. It was finally agreed that the way contractors ran their businesses determined how well the Project ran its business.

Providing contractors with weekly status reports also was a way to double check Project records. Contractors provided feedback on payments, overdue notices, cost proposals, and job awards noted in their weekly status reports.

The weekly status reports proved to be an excellent tool for both Project managers and contractors. The sharing of hard information between Proj-

ect staff and contractors revived a team spirit that was needed in the aftermath of the termination of two contractors.

Another formal written communication initiated at this time was the extension request form (see Exhibits, Form 13). Contractors were in the habit of verbally requesting extensions for weatherization and clean-up work. An extension was required if a job was not invoiced either 30 days (insulation work) or 60 days (glass work) after a job was awarded to a contractor. Two weeks were generally given for each valid extension request. It was, however, difficult for contractors to keep up with the dates of verbally agreed-upon extensions.

The multiple-copy extension form was filled out by the contractor, submitted to the field office, and entered into the computer. Extension form data was then included in the contractor's weekly status report.

Contractor meetings

Contractor meetings in the beginning of Phase II were held on a weekly basis. By August they were held monthly. As communication with contractors increased through issuance of weekly status reports and as contractors gained experience with retrofit installation, there was less need for meetings. In the late fall and early winter of 1984-85, meetings were held every six to eight weeks.

Inspection backlog

An inspection backlog of almost 200 residences developed in November. Project jobs were not considered complete until they passed inspection and contractor invoices were not paid until jobs were complete.

When production increased, the Project's two inspectors fell behind in their work despite working evenings and weekends. This situation was exacerbated when one of the inspectors resigned in August and a replacement did not come on board until three weeks later. The replacement, an inspector-trainee, was hired from one of the contractor's crews, and after six weeks of being in an adversary relationship with contractors, he resigned to resume contractor work.

During the first two weeks in October, the Project's veteran inspector handled all inspections and reinspections alone. A replacement inspector-trainee was on the job by mid-October, but the backlog of inspections proved too much for two inspectors.

In November production was stymied; notices to proceed and customer retrofit agreement sign-ups plummeted (see Figures 13 and 15). Two inspectors were hired in early November and two were hired in December. By the end of Phase II the inspection team consisted of six inspectors, half of whom were trainees.

Contractors complained a little about the "green" inspectors. Although there was some initial confusion between new inspectors and veteran contractors and among new subcontractors and new inspectors, the inspector-trainees handled their duties well and the backlog in inspections began to clear up in early 1985.

Cash-flow problems

The backlog in inspections resulted in cash-flow problems for contractors. These problems were potentially serious because if crews and suppliers were not paid in a timely manner, production would slow down.

Fortunately, Project managers were able to meet with suppliers and explain that some contractors were behind on their payments because their money was held up by the Project due to severe inspection delays. Most suppliers accepted this, but those who were under-capitalized feared staying afloat.

Pacific took action to head off serious cash-flow problems by agreeing to issue payments to contractors prior to inspection even though Bonneville would reimburse Pacific until the work passed full inspection. Pacific set up receivable accounts to permit contractor payments and delayed Bonneville reimbursement. Payments were issued on uninspected jobs when contractors' invoices were over 20 days old. Pacific issued payments on 166 invoices worth almost \$509,000 for uninspected jobs to contractors before the inspection backlog was cleared up in late January 1985. Early payments were issued as long as contractor collateral in the form of recently completed and invoiced work was available.

Fines instituted

A disciplinary structure established during the late summer of 1984 aimed at producing more efficient contractor production. Contractors were paid only for jobs passing inspection. If 25 percent of a contractor's jobs failed inspection in one week, the contractor was not asked to prepare cost proposals or bids on residences until the rate of failed inspections decreased. If 25 percent of the same contractor's jobs failed a second week, the contractor was not awarded any jobs until the failed jobs passed.

This situation resulted in cash-flow problems for contractors, many of whom had jobs failed for minor problems such as omission of caulk on one door. Cash-flow problems impaired a contractor's ability to fix jobs that failed. To ease this downward cycle, a system of fines for major inspection failures and minor inspection failures was instituted in December 1984. This system was called the "speedy memo" system (see Exhibits, Form 14).

Minor failures noted on the speedy memos meant the contractor had ten days to rectify the situation. Extensions on the ten days were granted for legitimate reasons such as delays by suppliers in their deliveries to contractors. If a minor problem was repaired but failed inspection a second time, the contractor was fined \$50. Fines doubled for each speedy memo issued after the first \$50 fine (see Exhibits, Forms 15 A - B). Contractor payment for the main part of the job passing inspection was not held up for minor inspection failure.

Another form was issued for major inspection failures (see Exhibits, Form 11 D). Contractors were not paid for any work until the major problem was rectified. The same system of fines used for minor failures was applied to major failures: \$50 for a second inspection failure and double fines for each subsequent failure of the same job.

Contractors were also fined \$50 for work invoiced that was not actually completed. If, for example, an inspector found only 800 square feet of insulation had been installed, but the contractor invoiced the Project for 1,000 square feet, the contractor was fined.

The system of speedy memos and fines was possible because of the computerized weekly status reports issued to each contractor. Although imposition of the system of fines took staff time and effort, in the long run it produced a higher rate of contractor productivity without cutting off the contractor's cash flow.

Glass supply shortage

An adequate source of dual- and triple-glazed glass required by Project contractors was difficult to locate and sustain. Concern was expressed by all of the large glass suppliers initially contacted by the Project that residential conservation was not on the upswing. They were therefore reluctant to expand plant production to include dual- and triple-glazed glass products.

Project contractors were able to obtain glass products from two manufacturers, one of whom set up a temporary production plant near Hood River. Although there were occasional quality-control problems, both glass suppliers were able to meet demands during Phase II, if on a delayed delivery schedule.

New technology

The Project encountered two areas where it was necessary to employ new, untried technology: the use of air-to-air heat exchangers to improve indoor air quality, and the retrofit of mobile homes.

Air-to-air heat exchangers

Establishing guidelines. During Project planning in 1983, Bonneville was compiling an Environmental Impact Assessment that evaluated changes in indoor air quality due to residential weatherization. It was believed measures reducing air flow (storm windows, weather stripping, caulking, and wall insulation) might increase indoor air pollution from wood stoves, smoke, or synthetics used in furnishings. Toxic gases such as radon might also be trapped in weatherized residences.

As the reduction in air-flow in super-weatherized homes was unknown when Project retrofit measures were planned, Bonneville chose to conservatively require all residences receiving air tightening measures to be fitted with an air-to-air heat exchanger (AAHX). AAHXs circulate indoor and fresh outdoor air while keeping most of the heat indoors.

Bonneville's Final Environmental Impact Statement of August 1984 (page 4.11) stated residential insulation measures might reduce indoor-outdoor air exchange rates by almost 31 percent. Although this conclusion did not warrant the conservative approach of 1983, the Project began installation of

AAHX units in every air-tightened residence in August (see Exhibits Form 16). However, the Project staff and installers found AAHX units expensive to purchase, difficult to install, and not always welcome by customers. Some customers complained the units were noisy and used too much electricity. A re-evaluation of the need for installation of AAHX units began in August.

Creative installation. When AAHX installation began, contractors and Project staff found they were working with an undeveloped set of specs. Lack of firm installation and product guidelines required manufacturers to hold a series of workshops and provide field support to installers. The workshops illustrated a wide variety of approaches to AAHX design and installation. Installers and inspectors were further stymied by a lack of clear performance evaluation parameters.

Using Bonneville specs as a starting point, Project staff worked with contractors and manufacturers to develop installation guidelines and spec refinement. Bonneville permitted experimental modification of AAHX specs because the installation and quality of the units were a relatively unexplored area of technology. The Project assigned a field specialist to regulate AAHX spec interpretation and quality control and monitor their costs.

Contractors experimented with a wide range of installation approaches and shared their knowledge with each other. Some contractors installed oversized AAHX units to guarantee air flow would meet the most stringent inspection minimums, but this was firmly discouraged as oversized units were expensive.

Pricing. In September 1984 the field office solicited competitive bids from the Project's pool of 11 contractors. Each contractor was responsible for assessing the level of measures installed in a residence to receive an AAHX, and the size and specifications of the AAHX unit suited to mitigate air quality problems in that residence. The Project had minimum standards and specifications as guidelines for contractors, but these guidelines were incomplete, and not easily applicable to many field situations encountered by contractors. The initial round of bids submitted by contractors was inconsistent in terms of ventilation requirements, sizing, and system approaches. The bids were further unacceptable because they were uniformly higher than contractors' prices in other areas of the Pacific Northwest. Therefore, none of the bids were awarded to contractors. The field office decided to devise a system of "cost-plus" pricing.

Under cost-plus pricing the Project paid contractors for their itemized wholesale costs plus \$400 for overhead and profit. However, the itemization of costs by contractors was somewhat inconsistent, and there was no clear interpretation of what costs the \$400 payment covered. This pricing system was employed from November 1984 to January 1985 when it was replaced with unit pricing.

Radon monitoring. A less conservative approach to indoor air quality was suggested to the Regional Research Advisory Group at its October 1984 meeting. The most serious deterrent to reducing the number of AAHX units to be installed was the possibility of radon gas in air-tightened residences.

Radon gas rises from the decay of naturally occurring radium in soil and rock. Few residential areas in the U.S. are on radon-producing earth. Geographical location, climate, building materials, and air flow determine levels of residential radon pollution. Radon is tasteless, colorless, and odorless with detection possible only by a radon monitor. Bonneville's Final Environmental Impact Statement of August 1984 (page ix) states radon might cause seven percent of all lung cancers.

At the October meeting of the RRAG, the Project manager reported several geological surveys indicating Hood River was probably free of radon pollution. However, as no radon monitoring had been done in Hood River, the Project decided to take precautionary measures by installing radon monitors in 1,000 insulated Hood River homes by early 1985. The Project sent customers form letters explaining why radon monitors needed to be installed in their homes (see Exhibits, Form 17). In the meantime AAHX installation continued.

Mobile homes

Mobile home retrofit proved to be a challenge to weatherization contractors. In the Pacific Northwest there are almost 1,000 different makes and models that have a wide variety of construction design and use many different building materials. The unique shapes and sizes of floors, ceilings, roofs, doors, and windows often meant the mobile home could not be fitted with standard retrofit products. Narrow cavities between the inner and outer skin of the ceiling and roof made insulating difficult without risk of structural or aesthetic damage or noise and water leakage.

In July the Project searched for other programs that weatherized mobile homes and found none to match Pacific Northwest conditions. Therefore, a block of 55 mobile homes was set aside for weatherization before work was begun on several hundred additional mobile homes registered for weatherization. A training program for contractors based on lessons learned while retrofitting the test group was planned for January 1985.

Phase II

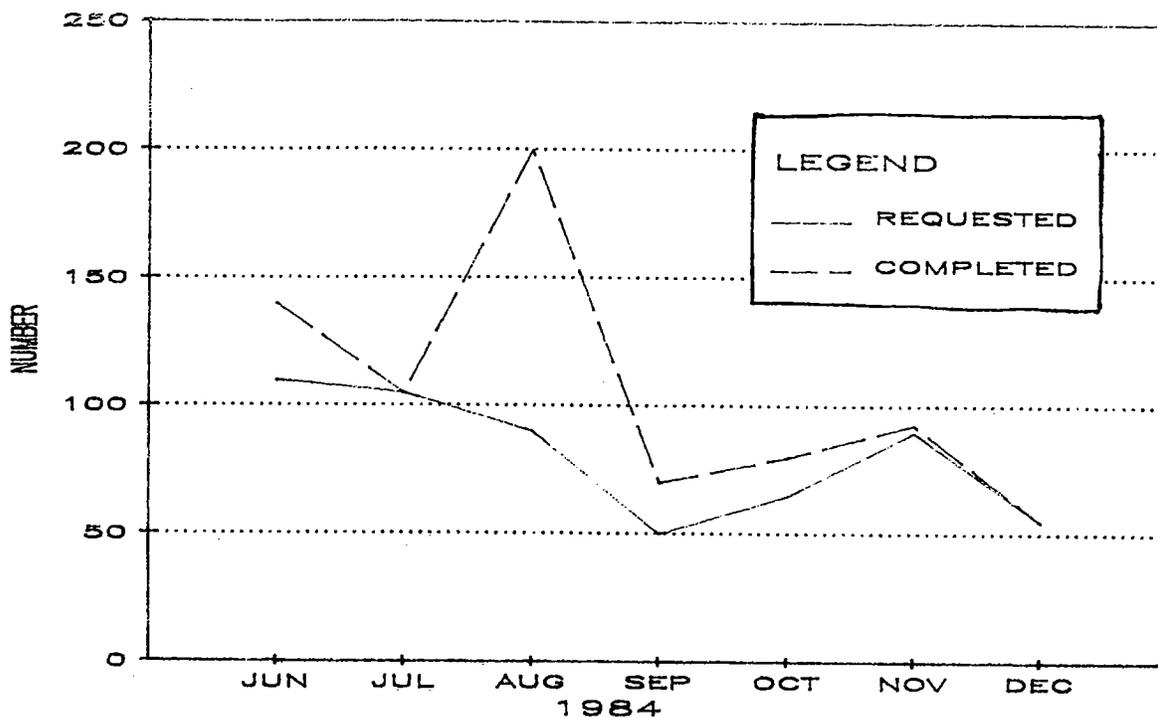


Figure 11. Audits requested and completed (frequency).

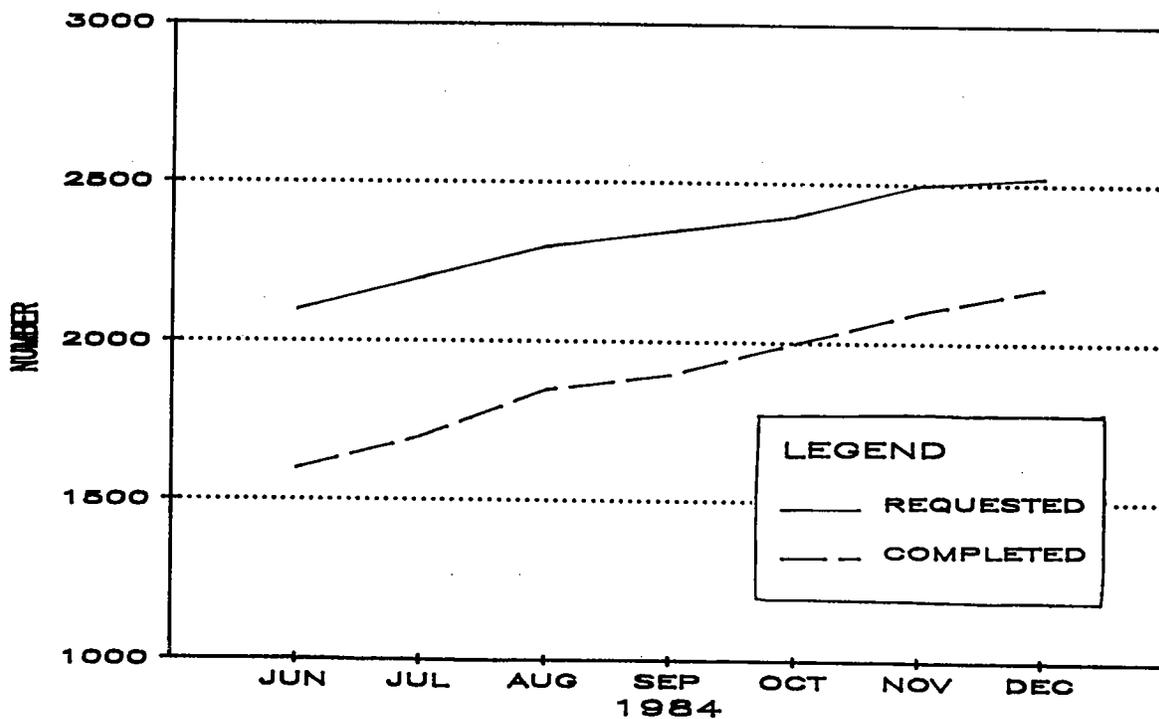


Figure 12. Audits requested and completed (cumulative).

Phase II

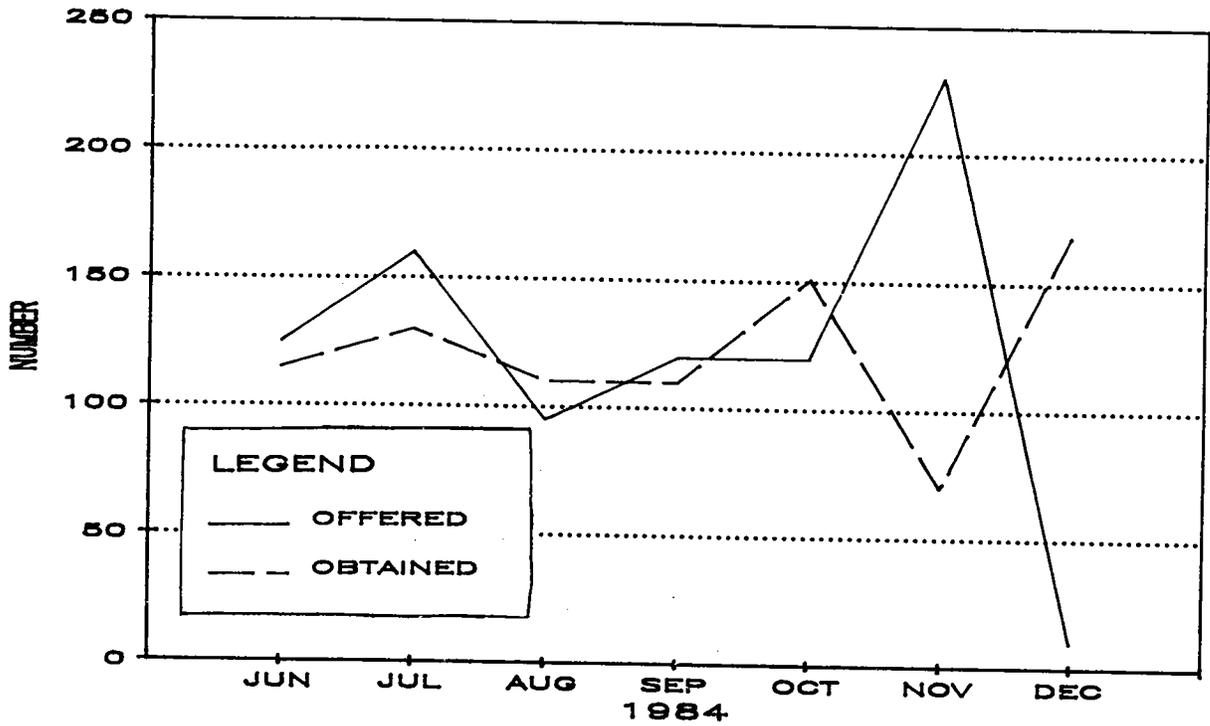


Figure 13. Customer retrofit agreements offered and obtained (frequency).

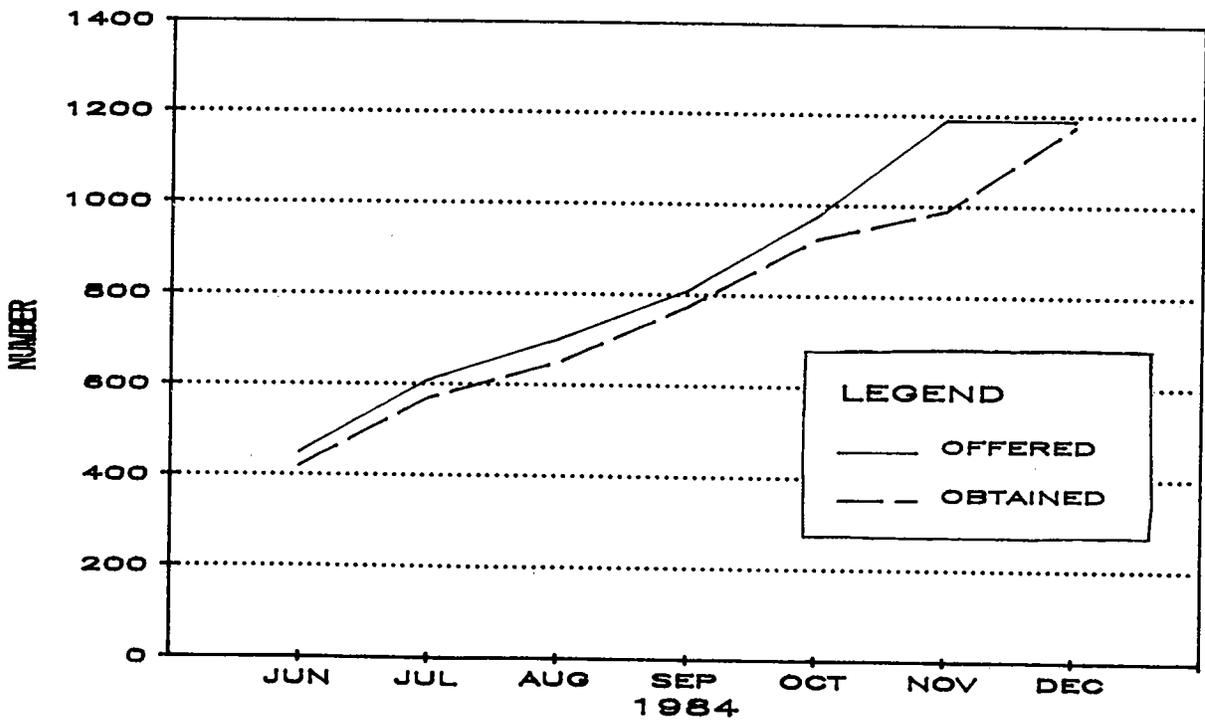


Figure 14. Customer retrofit agreements offered and obtained (cumulative).

Phase II

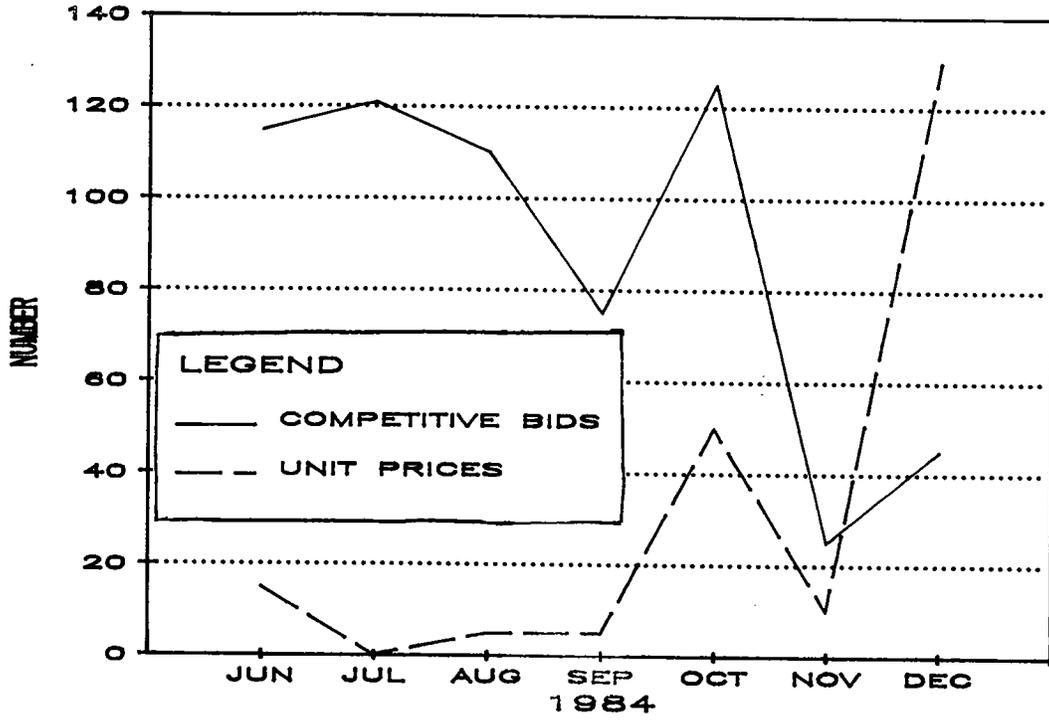


Figure 15. Competitive bid and unit price notices to proceed (frequency).

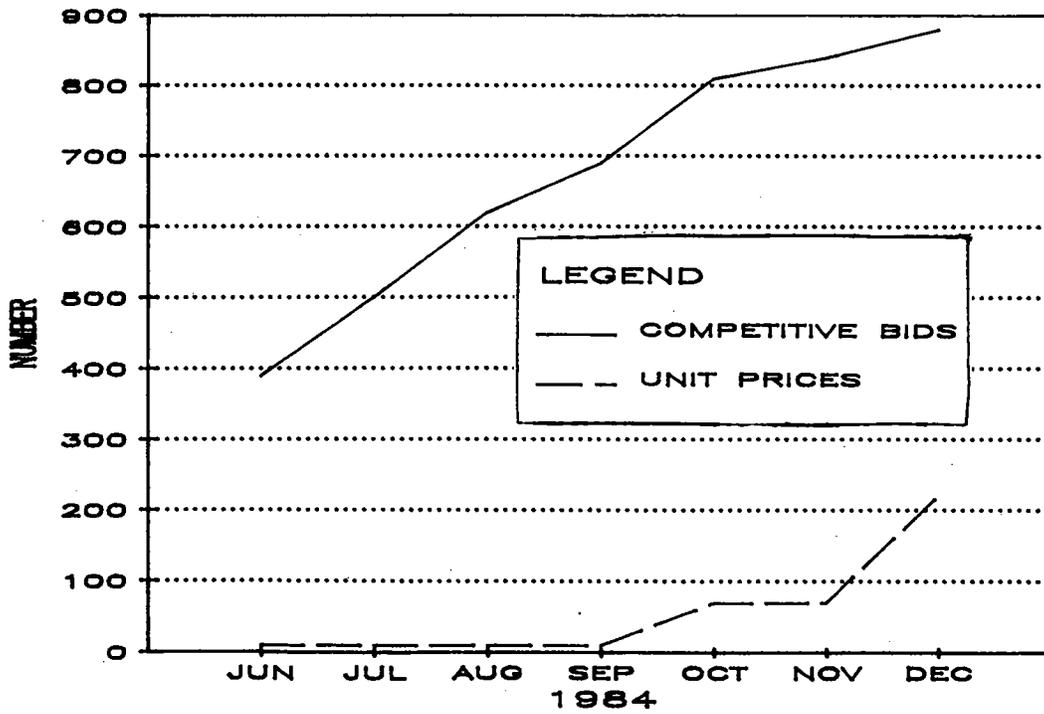


Figure 16. Competitive bid and unit price notices to proceed (cumulative).

Phase III: January - December 1985

Introduction

This section covers the most productive phase of weatherization operations. Almost 2,500 residences were retrofit with super-weatherization during Phase III to completely fulfill the Project's contractual goals. The field office staff was expanded to its largest size, 17 members. The staff worked closely with contractors to achieve the high production numbers that were necessary to achieve contractual goals.

Phase III is described in this chapter in three sections: 1) Promotional Activities; 2) Field Office Administration; and 3) Weatherization Operations.

Promotional Activities

Media coverage

Phase III, like Phase II, was characterized by very little Project advertisement. During 1985 only three ads were purchased, all of them in The Hood River News; a full-page ad in April, one in May with a photo of the Project's field office staff, and an ad in June that was a final invitation to citizens to have their residences weatherized.

In January the Project was visited by a Public Broadcasting System (PBS) producer planning to film a ten- to fifteen-minute segment for national broadcast. In March the PBS documentary team filmed the segment in Hood River. Community Advisory Committee (CAC) members hosted the team and gave interviews on film as the Project's community representatives. The documentary was aired throughout most of the country in January and in the Pacific Northwest in February 1986.

Foreign and national delegations

CAC members joined Project staff in hosting a delegation from the Swedish National Power Board in April. The Board was planning a project similar to the Hood River Conservation Project and was particularly interested in seeing how different entities -- government agencies, a private corporation, the local community, and consumer advocacy groups -- cooperated. The Swedish

delegation attended the April meeting of the Regional Research Advisory Group.

The Project received similar visits from a British delegation and a group of planners from a Niagara-Mohawk Power Project. The latter group adopted an advisory structure similar to the consensus-driven Regional Research Advisory Group employed by the Project.

Community activities

Two other notable public relations activities took place during Phase III. The Project administrator gave a presentation to a well-attended annual meeting of the Hood River Electric Cooperative in the spring. In August the Port of Hood River invited the Project to become part of a permanent exhibition in the Port's energy museum.

Closing ceremony

A closing ceremony commemorating the successful completion of Project weatherization activities was held at the Columbia Gorge Hotel in Hood River in early March 1986. More than 100 representatives from the Project's sponsoring groups (the Regional Research Advisory Group, and the Community Advisory Committee), government posts (city, county, and state), executive management from Pacific and Bonneville, and the Project's management and staff attended the closing luncheon. Certificates of Appreciation were given to each CAC member. Every organization that participated in the RRAG received a brass plaque to commemorate their role in the Project's success.

Field Office Administration

Field office staff management

All field office positions required knowledge beyond the scope of job descriptions and staff members were self-reliant and flexible in carrying out the business of the Project during Phase III. The Hood River field office administrator employed a policy encouraging "autonomy within guidelines", which gave staff members the incentive to "go the extra mile." If advice was sought it was given, but on the whole the staff was well-trained, knowledgeable, and self directed.

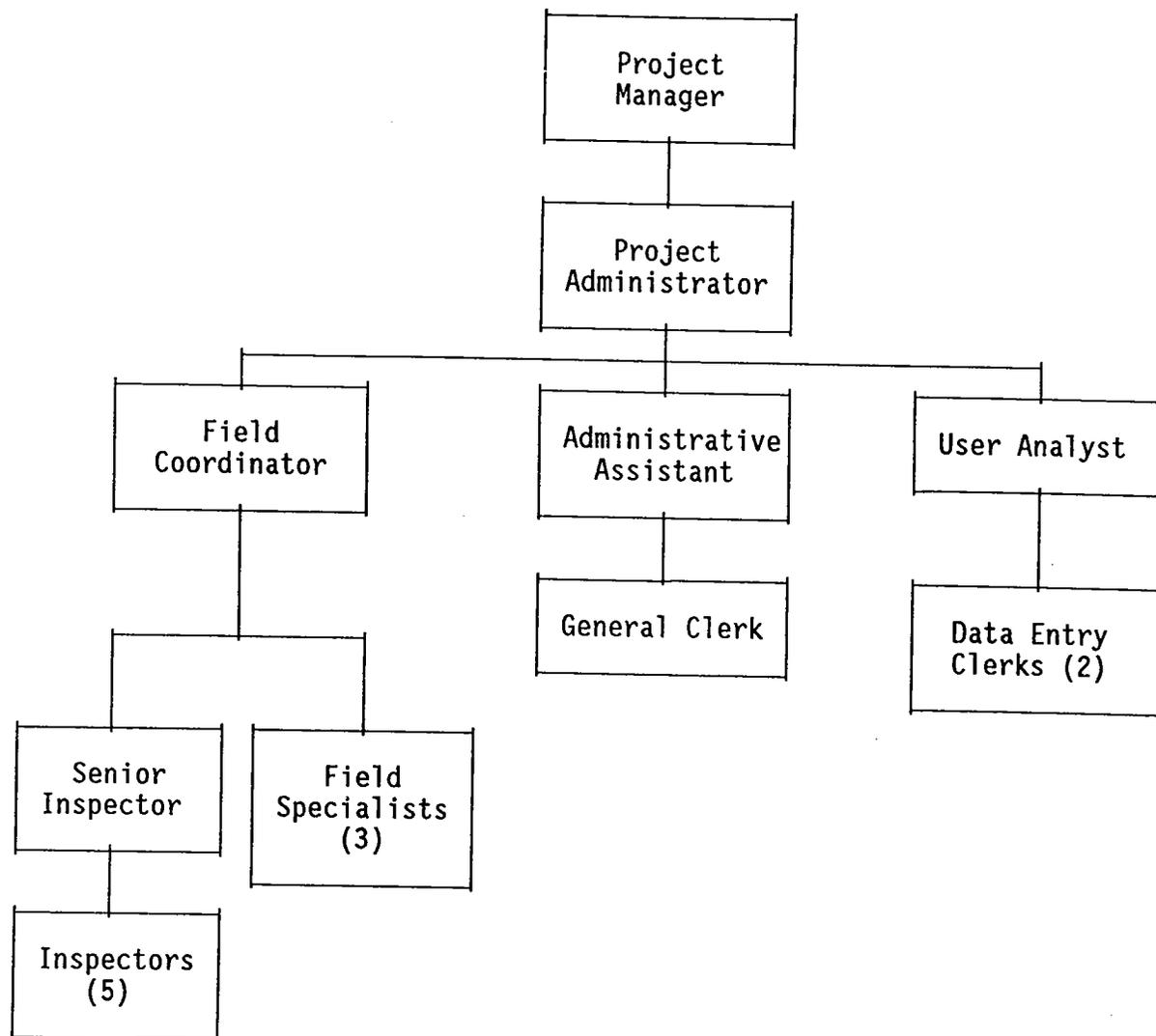


Figure 17. Hood River field office, July 1985.

During Phase III the staff expanded to its greatest number; in February there were 15 full-time employees, and in July there were 17 full-time employees (see Figure 17). By October the staff shrunk to 11 full-time employees and one half-time employee. The core of the field office staff -- the Project administrator, the field coordinator, two field specialists, the senior inspector, the administrative coordinator, and the user analyst -- remained stable throughout Phase III. The important administrative tasks were conducted by this core of seasoned employees.

The few employees who left the staff in the late summer did so to pursue other activities: school, self-employment, or moving to another area. When the Project began to wind down, six Project employees were employed by Pacific, with four receiving promotions. During the Project seven field office employees received promotions and/or higher labor-grade assignments. Only two Project employees seeking employment with Pacific could not be placed. Two field office employees were retained by the Project in Hood River through 1987. The size of the staff during all weatherization phases is shown below.

Size of Field Office Staff

	Employees	
	Full-time	Part-time
Phase I: May 1983 - May 1984		
November 1983	6	0
January 1, 1984	7	1
Phase II: June - December 1984		
June 1, 1984	10	1
October 1, 1984	10	1
Phase III: January - December 1985		
February 1, 1985	15	0
July 1, 1985	17	0
October 1, 1985	11	1

Weatherization Operations

Over 2,500 weatherizations completed

During 1985 the synergism that had developed among those carrying out field operations resulted in the weatherization of 2,500 residences. In 1985 the Project matured and the field office staff, contractors, subcontractors, and suppliers went all out to achieve Project objectives.

By late winter, backlogs in field office production were taken care of and replaced by a smooth, managed, high-volume flow of work. Office procedures and computer responsiveness, so painstakingly worked out during Phase II, paid dividends during Phase III. Contractor relations, work flow, inspections, invoices, and payments were carried out without any major problems.

Audits

An increase in the number of customers requesting audits was seen as necessary to meet Project goals. A member of the Hood River Electric Cooperative, who was on half-salary from the Project, identified and contacted all electric-heat customers in HREC's service area who had not requested Project audits. By February 66 percent of the 400 electric-heat customers contacted had requested an audit. Pacific also reviewed its lists and contacted non-responding electric-heat customers, which resulted in 175 customers requesting audits.

Inspections

Infrared wall scan inspections of 18 randomly chosen residences began in March to determine actual coverage rates of insulation in closed-wall retrofit applications. Results of the coverage rates were compared with square (or lineal) footages of insulation invoiced by contractors. No major insulation voids were found in the 18 residences examined. Coverage in the residences had been adequate or better.

The inspection team easily handled inspection work during most of Phase III. In the fall the team was down to four inspectors, all of whom worked overtime to handle the increase in contractor production. There were no serious delays in inspections.

Bonneville inspectors conducted preliminary audits on 140 houses in mid-February 1986.

Mobile homes

Weatherization of a test group of 55 mobile homes was completed in March 1985. These homes were priced under the competitive-bid system, but the remaining 470 were retrofit under unit prices. Observations of retrofit of the test group made by Project staff and contractors regarding mobile home materials, installation techniques, and spec interpretation formed the basis for training classes for contractor and subcontractor crews. The Project manager visited San Diego Gas & Electric at this time to review its experience with mobile home retrofit ceiling insulation, but found climatic conditions differed enough for its experience to be only partially applicable.

Bonneville forwarded revised and clarified mobile home specs in April just as contractors were receiving their first awards for mobile home jobs.

By May field specialists reported the verification of existing levels of insulation in the mobile homes was difficult without "opening up" the mobile home. It was projected almost 50 percent of mobile homes audited would be found to be too costly to weatherize. Mobile homes are an average of 25 percent more expensive to retrofit than single-family dwellings (Philips et al. 1987).

By mid-summer weatherization at mobile home parks throughout the Hood River area was in full swing. Problems with mobile home construction materials and narrow ceiling and outer wall cavities challenged insulation contractors. Some contractors requested in-progress inspections of ceiling and wall applications, which the field office provided. The field coordinators shared problems and creative solutions to mobile home retrofit encountered in the field through special written bulletins distributed to staff, contractors, and subcontractors. There was enough new information for bulletins to be issued weekly for several months.

Some mobile home residents, like the Project's other customers, had difficulty understanding the Project's cost calculations and bid review procedure. The close communities in mobile home parks encouraged customers to exchange details of measures they were receiving, and this exchange increased confusion about why some owners received more measures than others for seemingly identical mobile homes. In August the Project manager, Project administrator, and field coordinator presented a slide lecture to residents of a mobile home park that promoted customer understanding and Project implementation.

Air-to-air heat exchangers

Installations

In January 1985 letters were mailed to all customers who had received air-tightening measures requesting them to contact the field office if any levels of increased indoor air pollution were detected or suspected. Of 700 customers contacted, only 50 customers requested an air quality inspection (see Exhibits, Form 18). Approximately 1,150 AAHXs were installed in almost one-third of the residences weatherized; some homes received more than one AAHX unit. About 820 AAHXs with 0-70 cfm (cubic foot per minute of air flow)

were installed, and 340 AAHXs with over 70 cfm. AAHX installation was high (40 percent of retrofit homes) compared with that of Bonneville's Regionwide Residential Weatherization Program (less than 0.5 percent).

The Project also installed five exhaust fan heat pumps in five residences where radon gas above Bonneville's minimum standards was detected. Heat pumps were installed as an experimental measure. Four dehumidifiers were provided to customers who only had to plug the units into wall outlets.

Pricing

During Phase III the field office experimented with the following pricing systems:

- Cost-plus pricing - January 1985;
- Unit pricing #1 - January to March 1985;
- Competitive bidding #2 - March to April 1985; and
- Unit pricing #2 - May to December 1985.

In late January the cost-plus pricing system instituted the previous November was replaced with the first AAHX unit-price schedule. Cost-plus pricing proved to be unmanageable as the itemization of wholesale costs by contractors was inconsistent, and the \$400 fee paid to contractors for overhead and profit was widely interpreted. Unit prices were devised from contractors' cost-plus invoices and pricing lists gathered from wholesale suppliers and non-Project contractors in the Pacific Northwest.

One of the field specialists was assigned to AAHX management, and developed uniform unit-price cost proposal instructions and AAHX installation procedures. The field office began to supply contractors with ventilation requirements and sizing calculations for each residence assigned to a contractor. The contractor only selected the brand of AAHX unit and where it was to be placed in the residence. The field specialist also drew up a more comprehensive set of installation specifications than those available from Bonneville. Unit prices were considerably cheaper than all previous pricing systems for AAHXs.

During the spring of 1985, Project management revised their goals for the number of AAHXs installed. Only homes testing positive for radon gas or homes whose owners requested units received AAHXs. This new policy dried up the AAHX market for contractors who began to vie with each other for jobs.

The field office took advantage of this and adopted a competitive bidding system among six AAHX contractors. After two months when prices were driven lower, unit prices based on yet lower costs were again employed.

The new unit-price system was based on analysis of competitive bids and the elimination of two contractors and two AAHX manufacturers whose prices were consistently high. An upper price limit was then set based on contractors' low bids and less expensive units that met Project specifications.

Radon monitors

Of 2,900 air-tightened residences offered radon monitoring on three occasions, 2,000 accepted installation of alpha-track detectors of radon gas (see Exhibits, Form 19). A vendor was hired by the Project to distribute the monitors. This was achieved by the vendor with the help of a service club at the local high school. By February 1986, 800 monitors had been retrieved, with 98 monitors reported "lost" by residents. Analysis of the monitors revealed 75 cases of radon positive readings, about 3.6 percent of the homes monitored. The Project followed the radon mitigation strategy specified by Bonneville, i.e., installation of AAHXs. Participation in radon monitoring was high -- 70 percent as compared with 50 percent for Bonneville's Region-wide Residential Weatherization Program.

Glass supplies

Contractors reported to the field office in October that one of the glass manufacturers was hesitating to negotiate finances and appeared uninterested in increasing their volume of Project business. A month later this company closed its operations in the Pacific Northwest.

The production load on the remaining glass manufacturer caused Project managers to consider a financial package to help the manufacturer pay its suppliers. It was decided to funnel the money to the glass manufacturer through the contractors by paying contractors for glass as soon as it was delivered. This helped the glass manufacturer keep pace with increased production.

Contractors

Contractors join association

Contractors formed a chapter of the Weatherization Contractors and Manufacturers Association of Oregon in February 1985 to "provide contractors with a legitimate forum."

A first action of the chapter was a letter to the Regional Research Advisory Group outlining the reasons unit prices had not substantially decreased. Changing specs, retrofit on substandard houses, inconsistent audits, and high labor costs (especially for non-locals) were reasons given for relatively high costs. Higher than normal target levels for measures required greater contractor attention and were believed to carry a greater risk of inspection failure than other projects. The most serious difficulty outlined by contractors was inconsistent work flow that affected warehousing, material handling, hiring, training, bookkeeping, and record keeping. The short term nature of the Project pressured contractors to expand their businesses without adequate preparation for capitalization or liquidation costs, and this required expensive short-term financing. Also cited were increases in paperwork requirements.

Contractor incentives

A bottleneck began to form in early 1985 because contractors were not submitting job proposals in a timely manner. The Project set up an incentive system to pay contractors \$10 for each proposal submitted within the proposal deadline. This helped to boost receipt of proposals.

Third contractor terminated

During July a third contractor was terminated for non-payment to a subcontractor and suppliers and a low rate of productivity. This was the last contractor terminated by the Project. The subcontractor was subsequently hired as a contractor with good results.

Contractor extensions and fines

All contractors' invoices were required to be submitted to the field office by December 20, 1985. However, because December was plagued by sub-freezing temperatures, icy roads, and heavy snowfall, the deadline for invoices was extended one month. In January a fine was levied against contractors who had outstanding jobs. One week after the deadline, contractors were fined one percent of their invoice amount for every day (except Sunday) the job was overdue. This hastened completion of the Project's last jobs.

Phase III

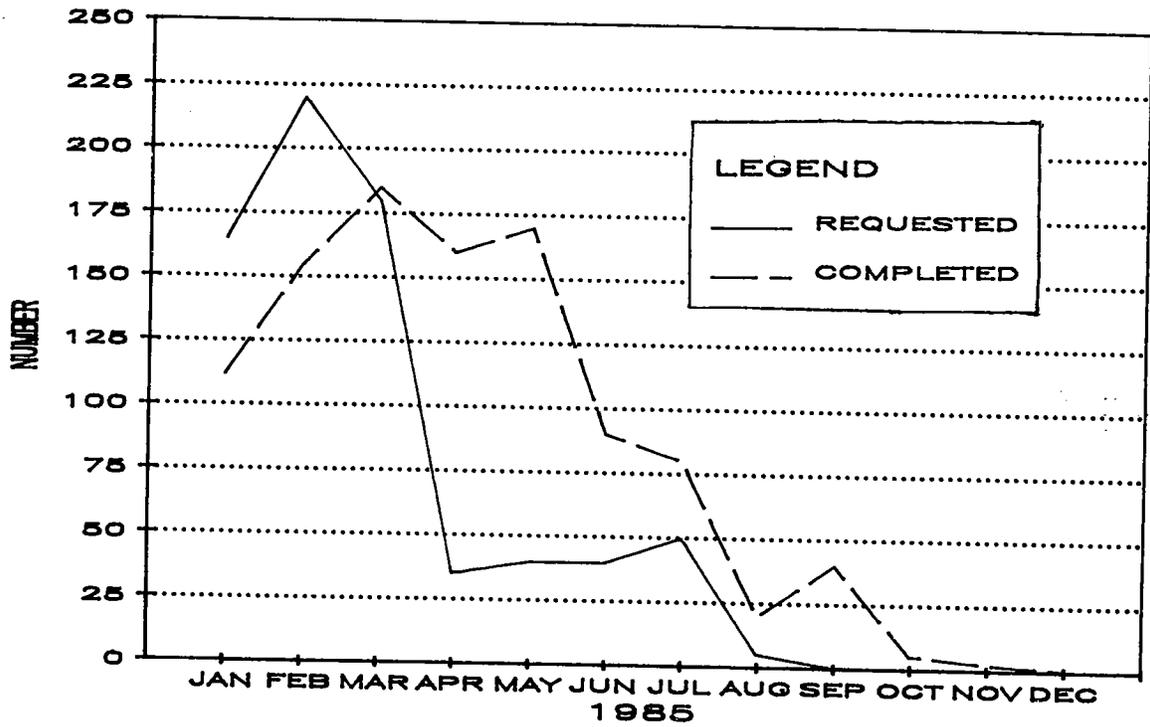


Figure 18. Audits requested and completed (frequency).

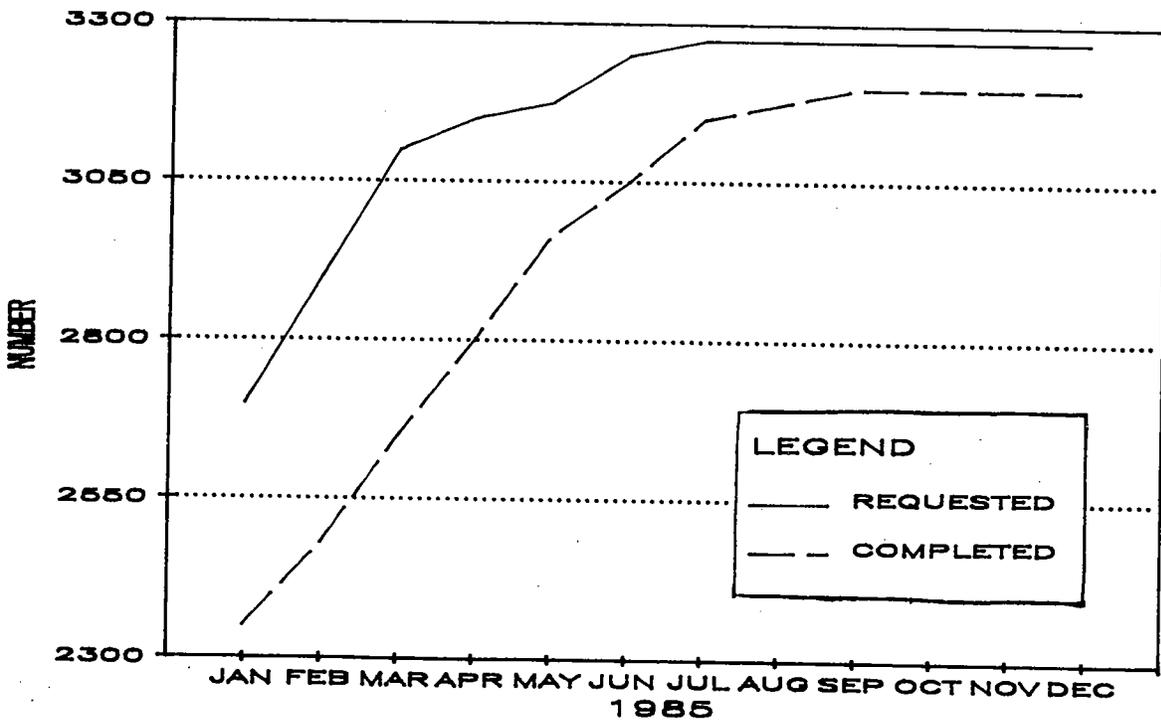


Figure 19. Audits requested and completed (cumulative).

Phase III

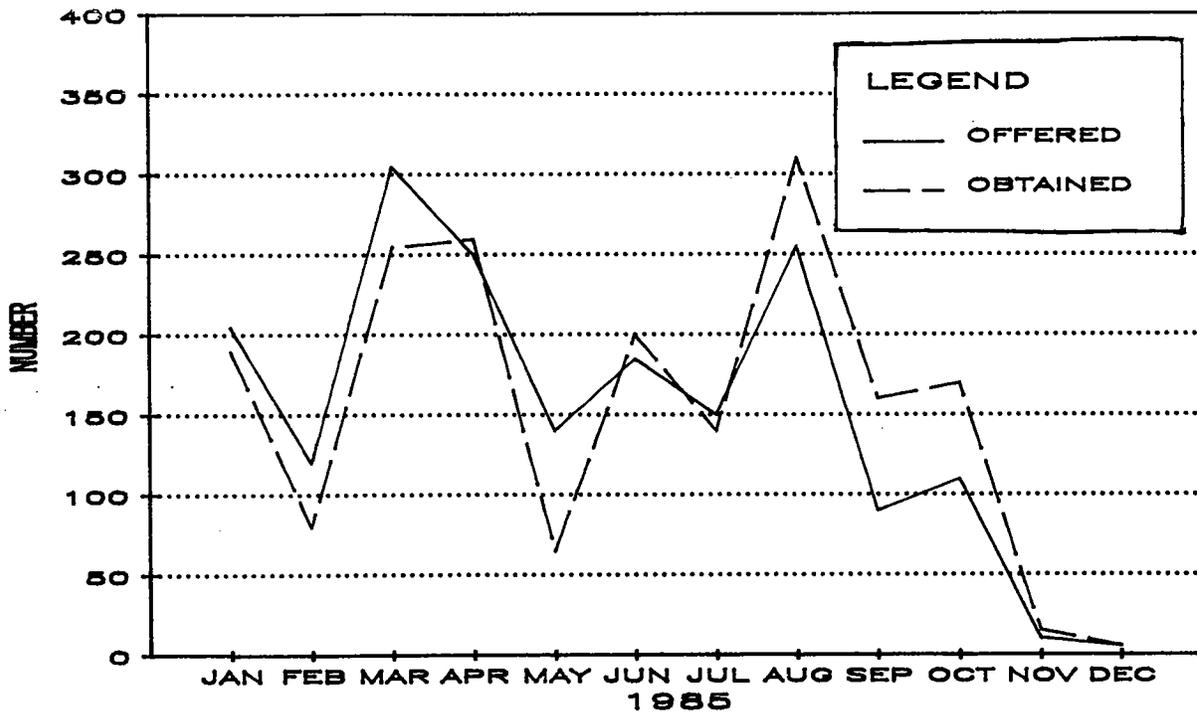


Figure 20. Customer retrofit agreements offered and obtained (frequency).

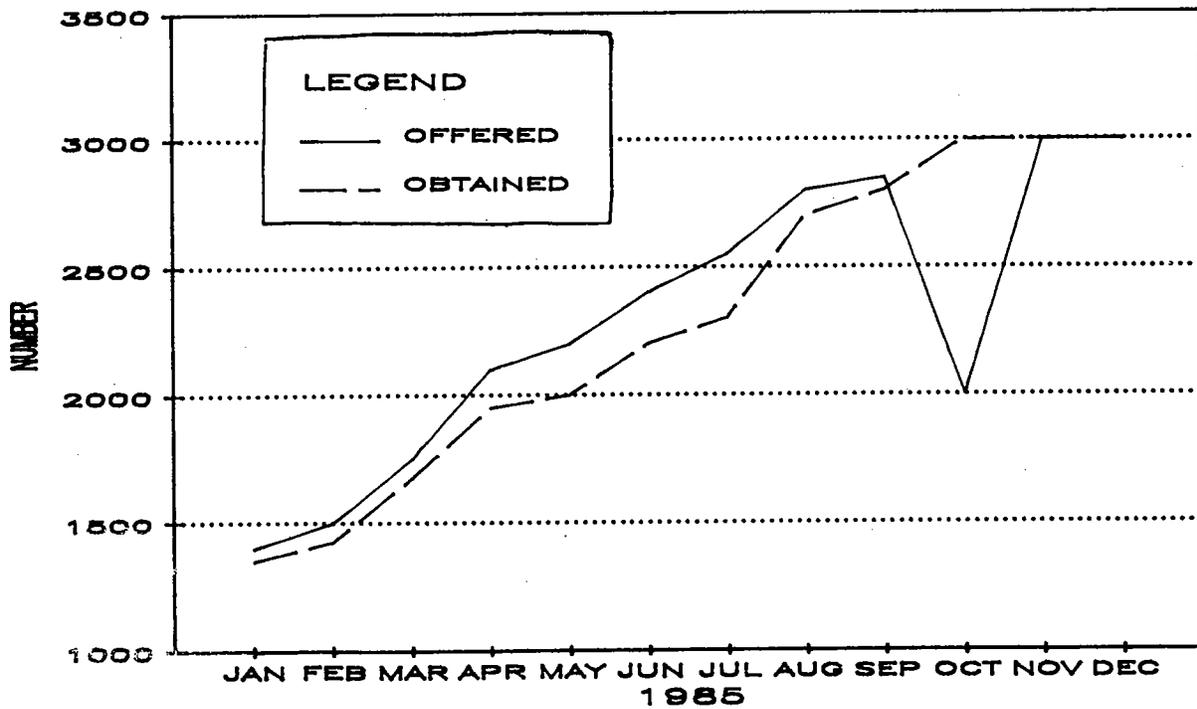


Figure 21. Customer retrofit agreements offered and obtained (cumulative).

Phase III

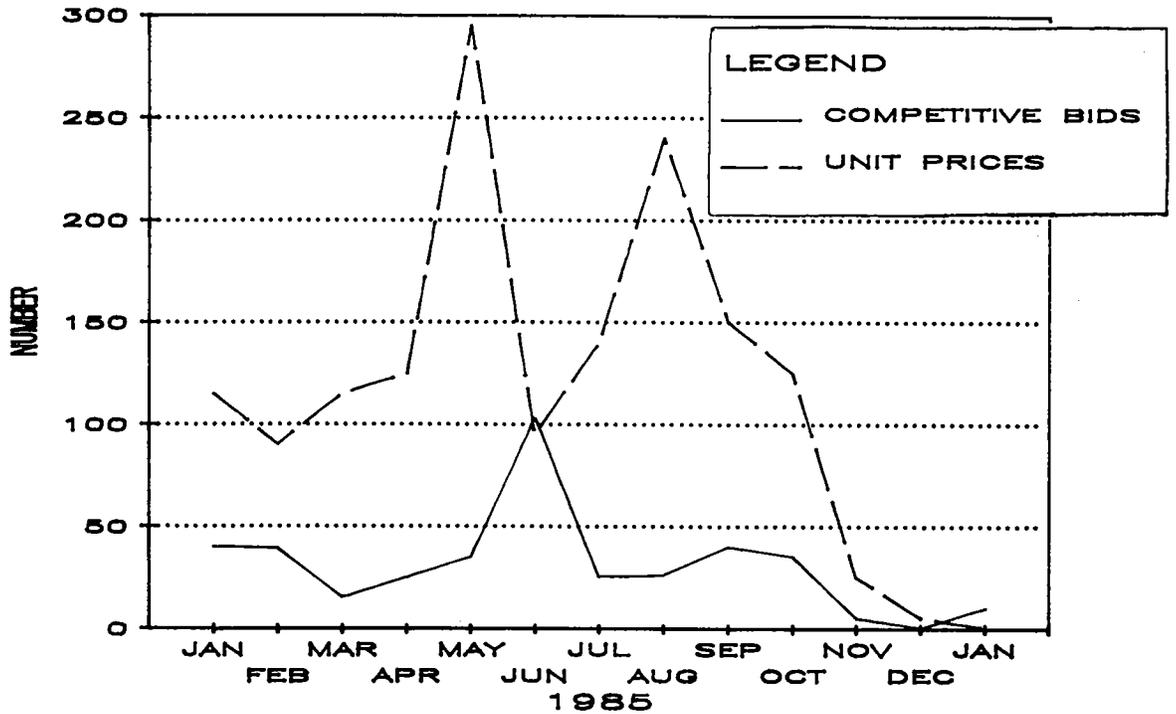


Figure 22. Competitive bid and unit price notices to proceed (frequency).

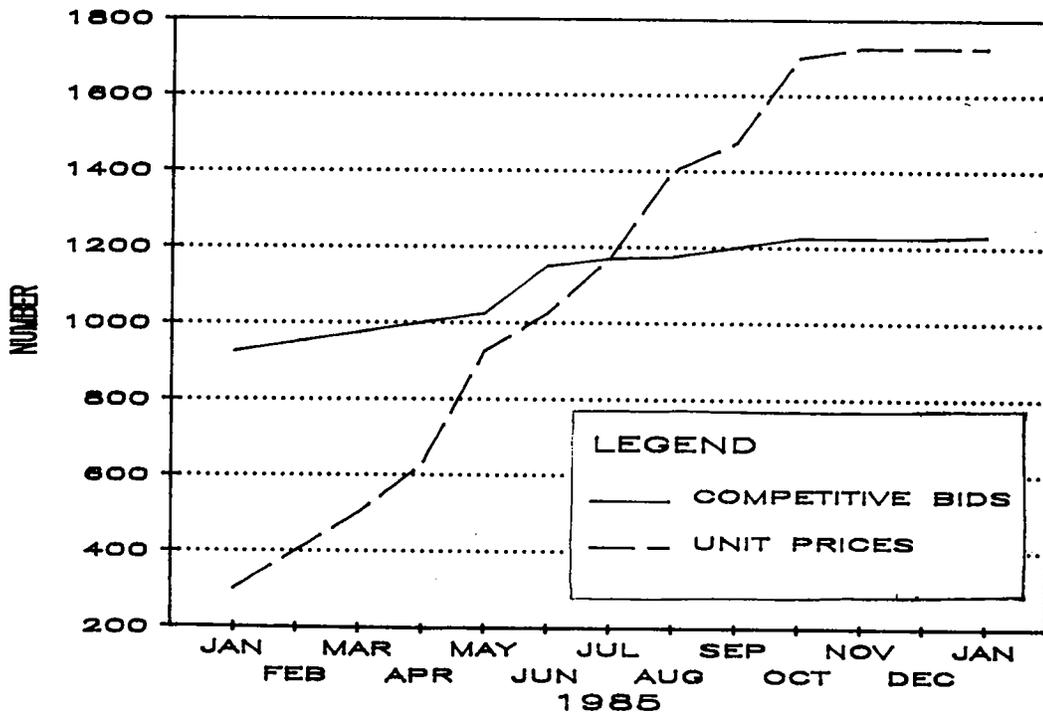


Figure 23. Competitive bid and unit price notices to proceed (cumulative).

Summary

Project Scope

The primary objective of the Project was the production of research and evaluation in several areas of electrical energy conservation. The Project was funded by two contracts from Bonneville: one for research and evaluation and one for the retrofit of electrically heated residences in and around Hood River, Oregon with high levels of weatherization measures.

The Project retrofit approximately 14,000 major super-weatherization measures in 2,989 homes. Single-family homes accounted for 60 percent of all retrofit work. The Project also retrofit 25 duplexes, ten triplexes, 15 four-plexes, six five-plexes, and 38 apartment houses that contained 342 apartments. The Project employed innovative technology to retrofit 530 mobile homes. The Project also retrofit 130 cabins that were primary residences.

The total performance cost of the weatherization contract was \$14 million, with 87 percent of that cost, or \$12.5 million, spent on four measures installed during the audit, 11 major measures installed by retrofit contractors, 1,100 air-to-air heat exchangers, and 2,000 radon monitors (Philips et al. 1987). Of the 2,000 homes monitored for radon gas, 3.6 percent had levels above Bonneville's air quality standards. Radon mitigation through installation of air-to-air heat exchangers was undertaken.

Three Phases of Weatherization

The weatherization contract stipulated production goals be met within 24 months. However, serious production shortfalls after one year required that the Project apply for an extension. A six-month extension was granted by Bonneville in mid-1984 that gave the Project time to recoup its losses with a dramatic production turn around during the last year of weatherization (see Figure 1).

Phase I, May 1983 - May 1984

Organization

Phase I is characterized by establishment of the field office and its administrative infrastructure, the overwhelming success of the promotional plan, and serious shortfalls in weatherization production. In this first year the field office was rented, renovated, and furnished, and the computer system was installed. Administrative procedures were documented, an efficient system of records management was set up, and a series of forms were designed and produced. Contractors were hired to program software, conduct audits, and retrofit measures.

Authority for field office management rested with a Portland-based Project manager who worked with an administrator and field coordinator located in Hood River. Decisions on expenditures, hiring, and the use of overtime were made by the Project manager. The Project manager was also weatherization operations' representative at meetings with Pacific corporate staff, Bonneville, and the Regional Advisory Group. At this stage, interaction between Bonneville and the Project on important decisions was often through formal written communication, which sometimes impeded retrofit production. Toward the end of Phase I closer working relationships between the coordinating staffs developed more informal communication that expedited solutions to many pressing problems.

Marketing

Information about the Project was disseminated in articles in a weekly newspaper, The Hood River News, and through word of mouth. As only light advertising expenditures were needed, only 25 percent of the marketing budget was spent. Major promotional activities included a grand opening in November, formation of good working relations with the local media and government officials (city, county, and state), and establishment of a 15-member Community Advisory Committee. The committee members acted as Project liaisons throughout the test area, represented the Project to the media, hosted visiting delegations, and provided ongoing advice to Project managers and staff about operations' activities. The success of the promotional plan is shown by the number of customers requesting Project audits six months after the field office had opened in November: 1,950, or more than 55 percent of anticipated participation.

Production shortfalls

Five retrofit contractors were hired from the Hood River community in the fall of 1984. However, retrofit work by contractors did not begin until March 1984, ten months after the Project began. Contractors who had expanded crews and ordered supplies in the fall of 1983 experienced cash-flow problems due to the late start and irregular work schedules.

Two major delays during Phase I inhibited initiation of retrofit work. The longest delay, during the first five months of the Project, was due to difficulties encountered in renting, equipping, and furnishing the field office, and planning its infrastructure. Another delay during this time came from late shipments of monitoring equipment for a pre-weatherization study. A second period of delay was encountered during the winter of 1983-84 when the unit-price system, called for in the Project contract, could not be implemented. Price schedules for super-weatherization did not exist and prices proposed by contractors were double those of most Bonneville projects. After negotiations with contractors, the Project instituted a temporary competitive-bid system to bring prices down. Competitive bidding, however, was time consuming for contractors and the field office staff.

After one Project year less than three percent of the area's potentially eligible residences were weatherized. With only 14 months of contract time left, and less than two percent of jobs completed, the Project applied for an extension from Bonneville and was granted six months.

Phase II, June - December 1984

This phase is characterized by organizational changes, expansion of the field office staff, application of corporate management techniques to operations, utilization of the computer as a production tool, reinstatement of unit prices, the firing of two contractors, the hiring of six more contractors, and backlogs in inspections, customer agreements, and job awards.

Organizational changes

Two significant changes in Hood River field office management occurred in Phase II: the appointment of a new Project administrator in June and a new field coordinator in August. Both administration and operations were consolidated under the new Project administrator, whose position was enhanced by

greater autonomy in hiring, expenditures, and the use of overtime. By the end of Phase II the locus of responsibility for daily activity was transferred from the Project manager in Portland to the Project administrator in Hood River. The Project administrator applied corporate administrative techniques to evaluate and streamline field office procedures and operations. The field coordinator, hired under the new Project administrator, instituted tighter management controls for contractor work. Contractors were given weekly status reports generated by the computer to assist them in managing their work schedules.

The field office was chronically understaffed with the result that production was periodically hampered. There were only two field specialists and one inspector during most of Phases I and II. Backlogs in bid processing, customer weatherization sign-ups, job awards, and inspection of retrofit work caused significant delays in production. Pacific tried to alleviate delays by intermittently assigning its employees to the field office for several days during the summer of 1984. The hiring of a third field specialist, four inspectors, a bid desk clerk, and a data processing clerk in the fall of 1984 helped to boost productivity and prepare the field office to handle 2,500 weatherizations in 1985. During Phase II the field office expanded from six to 14 employees.

Pricing

Shortly after the second-round contractors were hired, a unit-price system based on analysis of audits, bids, and invoices from nine months of competitive bidding and prices from other Bonneville projects was proposed and accepted by all 11 contractors. A third round of contractors were lined up in case some of the 11 contractors rejected the new unit prices.

The unit-price system became the Project's main pricing system, but competitive bids were used for difficult retrofit work and apartment buildings. Almost 42 percent of all retrofit work was done under competitive bidding. The Project saved approximately seven percent in retrofit costs by employing the unit price system. Under unit prices, competitive bids submitted in 1985 were almost ten percent lower than 1984. A decrease in paperwork for contractors and field office staff under the unit-price system saved labor costs, and enabled the staff to process and award bids at a faster rate.

Computer system

The Project hired a computer consultant who leased the Project hardware, and programmed custom software. The computer system was plagued with problems in programming and testing. Pacific's application systems department, whose bid to be the software contractor was not accepted by Bonneville, was prohibited by the contractual agreement with the software vendor from modifying software, which was critically inadequate during the first year. The software vendor's office was over 900 miles from the test site, which meant testing and system adjustments by Project staff were largely left to an untrained data processing clerk. Pacific provided the Project with two computer advisors, but they were not permitted to modify the vendor's system.

Lack of computer tracking for weatherization field operations impeded the organization of work flow. When the computer came on line in the summer of 1984 there was a large backlog of data to be processed. After the backlog was handled, increasingly detailed data on the status of retrofit work was fed into the computer to generate status reports that were valuable in analyzing the pace of production.

Production

A second round of six contractors began work in September 1984. Shortly thereafter, two first-round contractors were fired. The two contractors were terminated after five months of customer complaints and documentation of breach-of-contract work by the field office. The Project improved monitoring of contractor work through issuance of weekly work status reports and other written bulletins to contractors. Although communication with contractors improved, one undeveloped area of communication was on the status of bids submitted to the field office. No formal system was set up to notify a contractor if a bid had been 1) awarded to them, 2) awarded to another contractor, 3) calculated as being too costly, 4) refused by the customer, or 5) held for specification interpretation.

A backlog in inspections occurred after the second-round contractors began work in the fall. The Project had only two inspectors on staff and four more inspectors were hired in late November. The number of weatherization agreements and notices to contractors to proceed on work awarded fell during this time. Inspection delays also threatened the cash flow of contractors, who were not paid until their work passed inspection. Pacific's accounting department and Project management set up a system of advanced

payment for uninspected work for contractors who had collateral in a bank of finished, but unpaid jobs. To further ease contractor cash-flow problems, contractors were only fined for minor inspection failures and payment for the job was not withheld. Major inspection failure resulted in both a fine and nonpayment of the contractor's invoice.

By the end of Phase II, with 60 percent of the extended contract time gone, 450 residences, or less than 15 percent of potentially eligible homes in the test area, were weatherized. Weatherization of an experimental block of 55 mobile homes to develop installation techniques for their unique construction was started in December. During this phase, installation of air-to-air heat exchangers in every home receiving air-tightening measures was begun, along with placement of radon monitors.

Phase III, January - December 1985

Eighty-four percent of all weatherizations, or 2,500 residences, were completed during Phase III. By late winter production backlogs were replaced by a smooth, managed, high-volume flow of work. Streamlined office procedures and computer utilization paid dividends at this time. Contractor relations, work flow, inspections, invoice processing, and payments to contractors and suppliers were carried out without any major problems. A general level of skill developed by both the staff and contractors produced the high volume necessary to meet Project goals. The Project did have to fire a third contractor who was not paying his subcontractor and suppliers. The subcontractor was then hired to replace the fired contractor. When the Project wound down in December, an extension for submission of contractors' invoices was given due to winter storms.

A closing ceremony commemorating the successful completion of weatherization operations was held in Hood River in early March 1986. More than 100 representatives from the Project's sponsoring groups and the Hood River community attended.

Recommendations

This logistics study is by its nature primarily descriptive, but it is appropriate to make some general recommendations for future similar large-scale weatherization projects.

1. Management should expect rapid changes in project plans as administration and operations evolve through actual practice. Relationships with the administrative utility, the government, community groups, and other organizations should be characterized by open channels of communication and flexibility. The ability of organizations to meet new challenges when working within a short contractual period is essential to success.

2. Weatherization administration and operations should be consolidated under one manager. The manager should have enough autonomy in expenditures and personnel matters to run the project as a small business that will be evaluated on bottom-line results. The project manager should be exempt from centralized personnel directives, position control, and rigid pay or grade systems. The manager should also have the freedom to hire, fire, use overtime, adjust salaries, and grant merit pay in relation to performance. Flexibility in these areas is necessary to meet the uneven development of a large-scale project.

3. Access to departments within a corporation provides high quality structural support that could not be developed within a short period of time. A large-scale project needs areas of expertise in business procedure such as corporate management techniques, accounting, records management, marketing, computer systems, and forms production. The Project was greatly assisted by the fact that these areas were housed within one corporate entity that had established professional business procedures and good channels of communication.

4. Contractors should be selected from an unrestricted pool with preference, not exclusion, granted to local contractors. Although there is initially more administrative complexity in dealing with a large pool of contractors, as work progresses there is more leeway to take disciplinary measures and manage quality control, prices, and high-volume production.

5. Use of a computer system as a management tool from the beginning of operations activity is essential. Installation, testing, and functioning of reliable hardware with appropriate software should be a priority. The project should have a fully qualified team of computer professionals at the site who are able to run, test, and modify the system. The computer team should be supported by a large computer systems group, such as a corporate department. Hiring of a vendor to program custom software is not recommended.

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Marion Philips,
Principal author

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Exhibits

CUSTOMER MOVE-IN/MOVE-OUT INFORMATION

CUSTOMER MOVE-OUT

Customer Name: _____ Owner/Renter: _____
Customer Account Number: _____ Suffix/CID: _____
Date Moved Out (or service discontinued): _____
Homeowner Name (if different than customer): _____

CUSTOMER MOVE-IN

New Customer Name: _____
Previous Customer Name: _____
New Customer Account Number: _____ Suffix/CID: _____
Date Moved In: _____
New Phone Number: _____ Owner/Renter: _____
If Rental Unit: Homeowner Name: _____
Homeowner Address: _____
Mailing Address (if available): _____
Homeowner Phone Number: _____

CHANGE OF OWNERSHIP (no one moves in or out)

Previous Owner Name: _____
New Owner Name: _____
New Owner Address: _____
New Owner Mailing Address: _____
New Owner Phone Number: _____
Other Change (explain): _____

FOR OFFICE USE ONLY:

Demographics Requested: _____
Demographics Received: _____



216 Cascade St., Hood River, OR 97031
386-5030

Date: _____

Name: _____

Service Address: _____

Mailing Address: _____

Phone No. Home: _____ Work: _____

Owner (if renting): _____

Owner Address: _____

Owner Phone No.: _____

Main Space Heat Type: Electric Wood w/Electric Other (Gas, Oil, Coal or Wood Only)

Electrical Service Provided By: Pacific Power & Light Hood River Elec. Coop.

Comments: _____

Account No.

HRCF #105

DATA ENTRY

Transfer the completed answers from the Questionnaire to the following data summary:

- (1) 1 2 3 4 5 6 7 8 A B C D E F G H I J K
- (2) A B C D E F G H I J K L M 2
- (3) A B C D E F G H I J
- (4) A B C D E F G H I J

DATA ENTRY QUESTIONS

Question 1:

"Where did you first learn about the Project?"

(Prompt for response: another person, newspaper, radio, etc?)

(circle one)

1. Person

- A. Community Leader
- B. Project Representative
- C. Neighbor
- D. Relative
- E. Friend
- F. Other _____

2. Newspaper

- G. Hood River News
- H. Oregonian
- I. Other _____

3. Radio/TV

- J. Hood River
- K. Other _____

4. Poster/Yard Sign

5. Community Center

6. Billboard

7. Don't Know

8. Other _____

Question 2:

"Were there any other ways you learned about the Project?"

(circle all that apply)

1. YES

- A. Community Leader
- B. Project Representative
- C. Neighbor
- D. Relative
- E. Friend
- F. Hood River News
- G. Oregonian
- H. Other Radio/TV
- I. Poster/Yard Sign
- J. Community Center
- K. Billboard
- L. Don't Know
- M. Other _____

2. NO

Question 3:

"People often have several reasons for deciding to participate in projects.

"What would you say is the single most important reason for your decision to participate?" (DO NOT READ LIST)

(circle one)

- A. It's free
- B. Rising electricity rates/to control costs
- C. Belief in conservation/protect the environment
- D. Like hi-tech equipment/measures/research
- E. Good for local economy
- F. Friends, neighbors, community doing it
- G. Community spirit/patriotism
- H. Times are tough
- I. Don't Know / None
- J. Other _____

Question 4:

"Are there any other main reasons that influenced your decision?" (DO NOT READ LIST)

(circle all that apply)

- A. It's free
- B. Rising electricity rates/to control costs
- C. Belief in conservation/protect the environment
- D. Like hi-tech equipment/measures/research
- E. Good for local economy
- F. Friends, neighbors, community doing it
- G. Community spirit/patriotism
- H. Times are tough
- I. Don't Know / None
- J. Other _____

Question 5:

"Is there any aspect of the Project that you would like to know more about?"

(circle)

1. YES

2. NO

3. UNCERTAIN

"This concludes our survey. Thank you for your help. We are pleased that you are participating in the Project, and look forward to working with you."

(TRANSFER ANSWERS TO QUESTIONS 1-4 TO DATA ENTRY BOX)

Hood River Conservation Project Energy Analysis

Prepared for _____ Phone _____

Address _____ City _____ Zip _____

ENERGY CONSERVATION PRACTICES

(✓) Item is checked if applicable to your home. It is recommended that these practices be implemented before installation of any conservation or renewable resource measures.

- 1) Clean and perform combustion efficiency adjustment on your gas or oil furnace regularly, at least once per heating season.
- 2) Replace the air filters on your central heating system regularly.
- 3) Lower the bonnet or plenum thermostat temperature to 80°F on your gas or oil forced air furnace.
- 4) Lower the thermostat control setting for the furnace in the heating season to a maximum of 55°F during sleeping hours. Heat pumps should be reduced only five degrees below the daytime temperature setting.
- 5) Limit the thermostat control setting for the furnace in the heating season to a maximum of 68°F during waking hours.
- 6) Limit the thermostat control setting for the air conditioner in the cooling season to a minimum of 78°F.
- 7) Restrict the flow of water in your shower heads or faucets to a maximum of three gallons per minute either by using flow restrictors or by replacing existing shower heads and faucets with those having built-in provisions for water flow reduction. Also further conserve water in the toilet tank by reducing water usage.
- 8) Reduce the water heater thermostat setting to 120°F and reduce use of heated water for clothes washing. (Caution: some dishwashers require 140°F water.)
- 9) Turn the water heater off when your home is vacant for two days or longer.
- 10) Lower the thermostat setting to 55°F when your home is empty for four hours or longer in the heating season. Heat pumps should be reduced only five degrees below the daytime temperature setting.
- 11) Install scrap insulation or other pliable fireproof material in gaps around pipes, ducts, fans, or other items which enter your attic or basement from a heated space.
- 12) Install fireproof material to plug any holes around the damper in your fireplace. When using the fireplace, open a window slightly in the same room and turn the heating system off. Close the fireplace damper when the fireplace is not in use.
- 13) Add insulation to your attic access door and/or basement door.
- 14) Seal leaks in your heating or cooling ducts.
- 15) Tighten or plug leaking joints in your hot water pipes.
- 16) Replace the washers in your leaking water faucets.
- 17) Use your shades and drapes to:
 - 1) Allow the sunlight to enter your home during the heating season,
 - 2) Cover your windows tightly at night during the heating season, and
 - 3) Block sunlight from entering the building during the cooling season.
- 18) Turn off pilot light on a gas furnace during the summer.
- 19) Turn off the air conditioner in the cooling season when no one is at home.
- 20) Install UL approved foam gaskets or other pliable materials behind switch plates on outside walls.
- 21) Use lower wattage incandescent lamps and convert incandescent lamps to fluorescent lamps of a lower wattage.
- 22) Select energy efficient appliances when purchasing a new appliance. Maintain and operate existing appliances with regard to conservation and efficiency.

ENERGY CONSERVATION PRACTICES – Page 2

(✓) Item is checked if applicable to your home. It is recommended that these practices be implemented before installation of any conservation or renewable resource measures.

- | | |
|--|---|
| <p><input type="checkbox"/> 23) Repair holes in roofs, walls, doors, and windows with a suitable building and insulating material to prevent outside air from penetrating to the inside of the house.</p> <p><input type="checkbox"/> 24) Shade air conditioner condensers with suitable materials or deciduous trees or plants in a manner that the unit is shaded from direct sunlight but air flow around it is not blocked.</p> <p><input type="checkbox"/> 25) Remove refrigerators or freezers which are used for nonessential food and beverages.</p> <p><input type="checkbox"/> 26) Use a foam insulating pad on a waterbed and turn waterbed heater off or down.</p> <p><input type="checkbox"/> 27) Reduce the number of hours for filtering and sweeping the swimming pool. Lower the temperature of the pool and keep equipment cleaned and lubricated.</p> | <p><input type="checkbox"/> 28) Use deciduous trees and plants to shade the south and west sides of the home to assist in controlling solar radiation throughout the year.</p> <p><input type="checkbox"/> 29) Close off rooms or other parts of the residence which do not need to be heated or cooled, if the house has zoned or individual room control of heating equipment.</p> <p><input type="checkbox"/> 30) Apply plastic sheets inside windows of a home to create an extra level of insulation during the heating season.</p> <p><input type="checkbox"/> 31) Control lights with dimmer switches or timers.</p> <p><input type="checkbox"/> 32) During the heating season, wear clothing that will keep the heat from leaving the body.</p> |
|--|---|

Notes and Comments:

The Energy Conservation Practices as checked above have been explained to me.

Customer Signature _____ Auditor _____ Date _____

CONSERVATION MEASURES
INFORMATION & COMPLETION ACKNOWLEDGEMENT
HOOD RIVER CONSERVATION PROJECT

Address: _____ Phone: (H) _____ (W) _____

Measures Completed

Residential Energy Analysis electric space heat non-electric space heat

Water Heater Wrap _____ # installed _____ total # of water heaters in home

Water Heater Pipe Insulation installed

Low Flow Shower Heads _____ # installed _____ total # of showers in home

Outlet/Switchplate Gaskets installed

PLEASE CHECK ITEMS LISTED TO INDICATE COMPLETION

- Water heater wrap was installed on an electric water heater.
- There are no leaks or obvious defects on the heater.
- Pressure/temperature valve is installed on tank.
- Hot water temperature has been measured and water heater thermostats adjusted as necessary so water temperature is 140° or lower.
- Sides and top of water heater are covered with insulation, except for areas around pressure/temperature valve, wire entry point, and tank drain valve.
- All seams are neatly taped.
- Safety label has been installed.
- All extra material has been removed from the area.
- I HAVE READ THE NOTICE PRINTED BELOW.

I have reviewed the above and certify completion at the above address.

Customer Signature _____

Auditor/Installer Signature _____

Date _____

NOTICE TO CUSTOMER

Dear Homeowner: Data obtained from you may be used in research and project evaluations in the Hood River Conservation Project. This will involve the development of summary statistical information for groups of homes and may involve the modeling of selected individual homes. Data may also be used in secondary analysis by the Bonneville Power Administration, Pacific Power & Light, the Hood River Electric Cooperative, the Oak Ridge National Laboratory, and by other research and educational services and institutions. Data released to parties other than the project sponsors and their contractors will be edited to delete customer names, street addresses, account numbers, and telephone numbers.

Thank you for your patience,

The Hood River Conservation Project

21. Number of wall groups

22. Existing wall type

23. Proposed wall type

	NO SHEATHING/ CAVITY INSULATION	SHEATHING/ CAVITY INSULATED	SHEATHING/ CAVITY UNINSULATED
Board siding	11	31	41
Plywood siding	12	32	42
Shingles	13	33	43
Brick veneer	14	34	44
Partition to buffer space/ attic kneewall	15	35	45
Stucco	16	36	46
Concrete block above grade	17	—	47
Concrete solid above grade	18	—	48
Logs, solid-whole	19	—	49
Below grade wall	20	—	50
(inc. basement slab heat loss)			
Ext. wall insul.-2 ft. below grade	21	—	51

24. Wall area in sq. ft.
Perimeter in lineal ft. (items 20, 21, 50 & 51 only)

25. Existing insulation R-value

26. Total insulation R-value

27. Average depth of basement floor below grade

22	23	24	25	26	27	Existing Type	Proposed Type	Area	Existing R	Total R	Av. BG Fl. Depth

This table has 10 groups

28. Number of ceiling groups

29. Ceiling type

	ATTIC WITH VAPOR BARRIER	ATTIC WITHOUT VAPOR BARRIER	NO ATTIC
Gypsum board/plaster	11	21	31
Ceiling cable	12	22	32
Acoustic ceiling tile	13	23	33
Exposed wood deck	—	—	—
w/wood shingles	—	—	34
w/built up roof (asphalt)	—	—	35

30. Ceiling area

31. Existing insulation R-value

32. Total insulation R-value

29	30	31	32	Type	Area	Existing R	Total R

This table has 10 groups

33. Sq. ft. of existing attic vent openings

34. Number of floor groups:

35. Floor type

1. Over vented crawl space
2. Over non-vented crawl space
3. Over unheated basement
4. Exposed to ambient temperature
5. Slab on grade
6. Existing perimeter insulation - insulate floor

36. Floor area in sq. ft. (items 1, 2, 3, 4, 6)
Perimeter in lineal ft. (item 5)

37. Are ducts present in floor group?
1. Yes - insulated 3. No
2. Yes - uninsulated

38. Existing insulation R-value

39. Total insulation R-value:

35	36	37	38	39	Type	Area	Ducts in Floor	Existing R	Total R

This table has 10 groups

40. Sq. ft. of ground cover required

41. Are uninsulated ducts taped or sealed?
1. Yes
2. No
3. Not applicable

42. Number of duct groups

43. Estimated duct length

44. Existing insulation R-value

45. Total insulation R-value

42	43	44	45	Length	Existing R	Total R

This table has 10 groups

CONSTRUCTION NOTES

WALLS: Gross Wall Area _____ - (Window Area _____ + Door Area _____) = Net Wall Area _____ sq. ft.
CEILING _____ sq. ft. **FLOOR** _____ sq. ft. **LOT SIZE** _____ **DOMESTIC PIPE** _____ ft.
PASSIVE/ACTIVE SYSTEMS APPLICABILITY? _____

SKETCH OF STRUCTURE

Sketch each level, windows, and door openings (3' x 5' etc.). Indicate North (**N**) with arrow. Weatherstripping (**WS**), Storm Door (**SD**), Storm Door and Weatherstripping (**SW**), Single Glazed Window (**SG**), Double Glazed Window (**DG**).

HRCP #124
8/83

Form 5 D

CUSTOMER NAME:
CUSTOMER ACCOUNT #:

CUSTOMER APPLIANCES/EQUIPMENT

ENTER

0=NONE

1=1

2=2 OR MORE

- Air Conditioner
- Clothes Washer
- Dishwasher
- Electric Dryer
- Electric Range/Oven
- Freezer
- Gas Dryer
- Gas Range/Oven
- Home Computer
- Hot Tub
- Microwave Oven
- Portable Heater
- Power Tools
- Pump
- Refrigerator/Freezer
- Sauna
- Swimming Pool Heater
- Television
- Waterbed Heater

HOME INFORMATION

Year Built: _____

Primary Construction Material: Stucco Brick Wood

Conditioned Area: _____ sq. ft.

Dwelling Type: Single Family Duplex Triplex Moreplex Mobile

Owner Renter

Space Heat Type: Electric Non-electric

AUDITOR

DATE

CUSTOMER INFORMATION

1) How many years has your family lived in this house?
years

2) # How many people live in this house? Please indicate below each person's age, and if they live in the home more than 6 months of the year.

age	In the home more than 6 months of the year	
	Yes	No
HH 1)	Yes	No
HH 2)	Yes	No
3)	Yes	No
4)	Yes	No
5)	Yes	No
6)	Yes	No
7)	Yes	No
8)	Yes	No

3) Please indicate the category which best describes how much formal education Householder #1 (HH1) and Householder #2 (HH2) has received. Check next to the category which includes the last grade (or year) completed.

HH1	HH2	
<u> </u>	<u> </u>	(01) Never attended school
<u> </u>	<u> </u>	(02) Some elementary school
<u> </u>	<u> </u>	(03) Completed elementary school
<u> </u>	<u> </u>	(04) Some high school
<u> </u>	<u> </u>	(05) Completed high school
<u> </u>	<u> </u>	(06) Completed trade/vocational school
<u> </u>	<u> </u>	(07) Some college
<u> </u>	<u> </u>	(08) Completed college
<u> </u>	<u> </u>	(09) Some post-graduate
<u> </u>	<u> </u>	(10) Completed post-graduate
<u> </u>	<u> </u>	(98) Don't know
<u> </u>	<u> </u>	(99) Refused

4) Which group best represents your annual household income before taxes? (check one)

- 1 = under \$5,000
- 2 = \$5,000 - \$9,999
- 3 = \$10,000 - 15,999
- 4 = \$16,000 - 19,999
- 5 = \$20,000 - 29,000
- 6 = \$30,000 - 39,999
- 7 = \$40,000 - 59,999
- 8 = \$60,000 or over
- 98 = Don't know
- 99 = Refused

Thank you for your cooperation. Please return this form to your Hood River Conservation Project representative.

INDOOR AIR QUALITY CHECKLIST

AIR TO AIR HEAT
EXCHANGER NOT
REQUIRED

Residence has a full crawl space with cross ventilation and a net free ventilation area of no less than 1½ sq. ft. for every 25 lin. ft. of exterior wall, ground cover vapor barrier, and second vapor barrier between insulation and heated space.
Basis for Air to Air Heat Exchanger

- 1. Residence has a basement.
- 2. Residence is constructed in whole or in part on a concrete slab or garage is located below conditioned living area.
- 3. Residence does not have a full crawl space; a ground cover vapor barrier; a second vapor barrier between insulation and heated space; or cross ventilation greater than 1½ sq. ft. per 25 linear ft. of exterior wall.

Residence does not contain either wood stoves or unvented combustion appliances; however, the residence may qualify if it has a fireplace or fireplace with doors and heat exchanger with no outside combustion air.

Basis for Air to Air Heat Exchanger

- 4. Unvented kitchen gas stove and/or oven, even if equipped with a mechanically ventilated range hood.
- 5. Kerosene space heater.
- 6. Gas or oil water heater with disconnected vent pipe or showing evidence of leakage of combustion gases from the vent pipe (i.e., soot).
- 7. Combustion appliance which has an outside air intake or supply but not an outside air exhaust.
- 8. Wood stove fireplace insert that uses the fireplace chimney as the exhaust vent.
- 9. Free standing wood stove with either a separate flue or a connection to a chimney used for other purposes.
- 10. A fireplace with glass doors and an outside combustion air source.

Residence's domestic water supply is obtained from either a municipal or water district supply system, a vented storage system, or a surface water source, i.e., spring, pond, cistern.

Basis for Air to Air Heat Exchanger

- 11. Water supply system with unvented storage.
- 12. Domestic well water (vented or unvented).

Basis for Air to Air Heat Exchanger

- 13. Residence contains any type of urea-formaldehyde foam insulation.
- 14. Residence is a mobile home.

This house requires the addition of an Air to Air Heat Exchanger.

This house does not require the addition of an Air to Air Heat Exchanger.

I hereby certify the above information is correct.

Homeowner _____ Date _____

Prepared by _____ Date _____



HRCP #121
8/83

Name:
Acct #:

Preliminary Weatherization Recommendations

Dear _____,

Based on results from the energy audit recently completed on your home, the items checked below are recommended weatherization measures. The actual installation of these items may be affected by cost-effective limits or special conditions brought to our attention during the bidding process.

- _____ Ceiling insulation with adequate attic ventilation.
- _____ Floor insulation with ground cover and crawl space pipe wrap.
- _____ Wall insulation.
- _____ Duct insulation.
- _____ Storm windows and/or replacement glazing to achieve up to triple glazing.
- _____ Sliding glass door treatment to achieve up to triple glazing.
- _____ Insulated door(s) to replace ineffective standard door(s).
- _____ Window and door frame caulking.
- _____ Window weatherstripping.
- _____ Door weatherstripping.
- _____ Clock thermostat.
- _____ Air to air heat exchanger.

You will be contacted by a weatherization contractor regarding bids on the items checked above.

Auditor

Date

CONSERVATION MEASURES PRELIMINARY REPORT

CUSTOMER NAME: _____ RESIDENCE PHONE: _____
ADDRESS: _____ BUSINESS PHONE: _____
CITY: _____ DATE: _____ 1984

1. NUMBER OF WATER HEATERS PRESENT: _____
WATER HEATER: 2. FUEL SOURCE ELECTRIC? YES NO
3. PRESSURE RELIEF VALVE PRESENT? YES NO
4. ARE THERE LEAKS OR OBVIOUS DEFECTS
ON THE WATER HEATER? YES NO
5. CAN THE WATER HEATER BE WRAPPED? YES NO
IF NO, EXPLAIN WHY.

WATER HEATER 1. CAN PIPE WRAP BE INSTALLED? YES NO
PIPE WRAP. IF NO, EXPLAIN WHY.

2. APPROX. LIN. FT. OF WRAP REQUIRED: _____

GASKETS: 1. CAN OUTLET / SWITCHPLATE GASKETS
BE INSTALLED? YES NO
IF NO, EXPLAIN WHY:

2. APPROX. NUMBER TO BE INSTALLED.
OUTLETS. SWITCHPLATES:

SHOWER HEADS: 1. NUMBER OF SHOWERS IN THE HOME: _____
2. NUMBER THAT CAN BE INSTALLED: _____

PORTLAND AUDITORS. RETURN THIS REPORT TO ECI-BEAVERTON.

HOOD RIVER CONSERVATION PROJECT
WEATHERIZATION PROGRAM
AUTHORIZATION TO OBTAIN BIDS

RE: _____

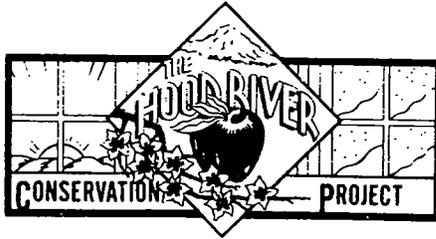
Phone: _____

The above Homeowner or Customer hereby authorizes the Hood River Conservation Project (HRCP) to obtain weatherization bids on the above listed premises. It is understood that HRCP will request weatherization program contractors (bidders) to inspect the premises and submit bids so as to accomplish the weatherization required as determined by the energy analysis.

The bidders are authorized to inspect my premises. The best times for these inspections are:

Homeowner or Customer Date

Homeowner initial here
to signify receipt of
completed copy of this
form.



PROPOSAL ACCEPTANCE

Date _____

Company Name — PLEASE PRINT

Weatherization improvements as checked below are proposed to be installed according to the HRCP specifications.

- Ceiling insulation with appropriate ventilation: Install insulation from an average estimated existing R-_____ to an average estimated R-_____. Approximately _____ sq. ft.
- Floor insulation with appropriate ventilation, ground cover and crawl space pipe wrap: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Wall insulation: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Knee Walls: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Duct insulation: Install attic duct insulation to an estimated R-_____. Approximately _____ lin. ft. Install crawl space duct insulation to an estimated R-_____. Approximately _____ lin. ft.
- Multiple Glazing: total approximately _____ sq. ft. Color _____ . Type _____ .
- Insulated Doors: Install _____ doors.
- Threshold replacement _____ doors.
- Sliding Doors: totaling approximately _____ sq. ft. No. of Doors: _____ .
- Caulking.
- Window weatherstripping.
- Door weatherstripping/Door bottoms.
- Air to Air Heat Exchanger.
- Clock Thermostat.
- Placement of Attic/Crawlspace Venting. _____
- Other _____

The above-named Homeowner hereby acknowledges that the proposed work as checked above will be performed, subject to cost-effective limitations, on the premises listed above under an Agreement with Hood River Conservation Project, which meets with Homeowner's approval. The Homeowner's signature on this form indicates only that this proposal has been reviewed with them.

This proposal will be reviewed with the Homeowner by the Project office prior to the Homeowner's signing of the Hood River Conservation Project Insulation Agreement.

Homeowner

By: _____
Contractor

Homeowner initial here to signify receipt of a completed copy of this form.

Account Number _____

Name _____

HOOD RIVER CONSERVATION PROGRAM
COST EFFECTIVE CALCULATION SHEET

<u>Weatherization Measure</u>	Annual KWH Saved	Est. Cost	Cost Effective Amount	Contractor's Bid
Ceiling Insulation/Attic Vent.				
Floor Insulation/Ground Cover/ Pipe Wrap				
Wall Insulation (including kneewalls)				
Duct Insulation				
Windows				
Sliding Glass Doors				
Insulated Doors				
Window & Door Frame Caulking				
Window Weatherstripping				
Door Weatherstripping				
Clock Thermostat				
Totals				

Notes: _____

Completed By Auditor _____ Date _____

Project Center Review _____ Date _____

BARRIERS

Measures	Barrier #	Other Barriers
Ceiling Insulation/Attic Vent	1.	
Floor Insulation/Gr. Cover/Pipe Wrap	2.	
Wall Insulation/Kneewalls	3.	
Duct Insulation	4.	
Windows	5.	
Sliding Glass Doors	6.	
Insulated Doors	7.	
Window & Door Frame Caulking	8.	
Weatherstrip Windows/Sliding Doors.	9.	
Weatherstrip Doors.	10.	
Clock Thermostat.	11.	
Air to Air Heat Exchanger	12.	
Water Heater Wrap	13.	
Water Heater Pipe Wrap.	14.	
Low Flow Shower Heads	15.	
Infiltration Gaskets	16.	
Dehumidifier.	17.	
Heat Pump Conversion	18.	

Point of Barrier Occurrence (check one)

- Prior to EA
- During EA
- Between EA and Bid
- While Contractor Bidding Job
- After Customer Agreement
- During Installation
- During Inspection

- Refused
Audit _____
Barrier # _____
- or
- Weatherization
Barrier # _____

Prepared by _____ Date _____

Auditor _____ ID# _____

BARRIER NUMBERS

Customer Barriers

- 1 - Degrade Appearance
- 2 - Make House Too Tight
- 3 - Refuses Contact with Utility
- 4 - Non-Electric Space Heat
- 5 - House Already Weatherized
- 6 - Measure Already Installed
- 7 - Customer Will Pay In Long Run
- 8 - Refuses Handouts
- 9 - Dislikes Grade of Materials
- 10 - Violates Privacy
- 11 - Contractors Not Acceptable
- 12 - House Vacant
- 13 - Owner Unavailable
- 14 - No Reason Given
- 15 - Interfere With Use Of Area/Appliance
- 16 - Not Cost Effective

Reason For Supplemental Payment

- 40 - Exceeds Product or Installation Standards
- 41 - Exceeds Cost Effective Limit
- 42 - Exceeds Program Level

Physical Barriers

- 60 - Limited Physical Access
- 61 - Unable to Vent
- 62 - Ceiling will not Support Load
- 63 - Existing Insulation/Installation
- 64 - Ground Water Problem
- 65 - Rodent/Animal Problem
- 66 - Non Compatible Structure (e.g. Slab)
- 67 - Existing Dry Rot/Termite
- 68 - Structural Limitation
- 69 - Non Compatible With Heating Equipment
- 70 - Water Heater not Electric
- 71 - Audit Contract Restriction

Other Barriers

99 - Other (provide detail)

Hood River Conservation Project Insulation Agreement (Limited Warranty)

This agreement is made this _____ day of _____, 19____, between Hood River Conservation Project ("HRCP") and _____ ("Homeowners"). Homeowners are the owners or contract vendees of real property at _____, hereinafter referred to as "the property." Account Number _____

1. HRCP shall cause insulation and weatherization materials checked below (subject to notations) to be installed in Homeowners' home pursuant to current HRCP specifications.

- Ceiling Insulation with appropriate ventilation: Install insulation from an average estimated existing R-_____ to an average estimated R-_____. Approximately _____ sq. ft.
- Floor Insulation with appropriate ventilation, ground cover and crawl space pipe wrap: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Wall Insulation: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Knee Walls: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Duct Insulation: Install attic duct insulation to an estimated R-_____. Approximately _____ lin. ft.
Install crawl space duct insulation to an estimated R-_____. Approximately _____ lin. ft.
- Multiple Glazing: total approximately _____ sq. ft.
- Insulated Doors: Install _____ doors.
- Threshold replacement _____ doors.
- Sliding Doors: totaling approximately _____ sq. ft.
- Window and door frame caulking.
- Window weatherstripping.
- Door weatherstripping.
- Clock thermostat.
- Air to Air Heat Exchanger.
- Other _____

2. LIMITED WARRANTY PROVISION

HRCP shall contract with an independent contractor. The materials will be installed consistent with prevailing industry standards. If insulation is not so installed, HRCP will cause any deficiencies to be corrected if within 90 days of installation Homeowners contact the Project Coordinator of the Hood River Conservation Project, 216 Cascade Street, Hood River, Oregon 97031 (503) 386-5030.

HRCP IS NOT SELLING AND HOMEOWNERS ARE NOT BUYING THE MATERIALS, BUT HOMEOWNERS SHALL OWN THE MATERIALS AFTER INSTALLATION. THEREFORE, HRCP MAKES NO WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OF FITNESS OR MERCHANTABILITY. THE MATERIALS ARE PROVIDED BY HRCP AS IS.

The entire risk as to the quality and performance of the materials is with the Homeowners. If the materials prove defective, except as provided above, the Homeowners and not the manufacturer, distributor, or HRCP assumes the entire cost of all necessary servicing or repair.

Homeowners' remedies for any claim, including but not limited to, expressed or implied warranties, negligence, strict liability or contract are limited to replacement of defective materials as described herein, and in no event shall HRCF be responsible for any incidental or consequential damages.

NOTE: Some states do not allow limitations on how long an implied warranty lasts, the above limitation may not apply to you.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusion may not apply to you.

The warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

HRCF conducts Energy Analyses at the request of the homeowner to determine the cost-effectiveness of insulation and weatherization based upon average consumption patterns and typical local weather conditions. Because of the variability of individual energy use, it is not possible to predict the savings that will accrue to any particular individual. Therefore, HRCF does not warrant that the installation of the materials will result in savings of money or electricity.

3. HOMEOWNERS' OBLIGATION TO NOTIFY

Through 1985, Homeowners shall notify HRCF in writing of the sale or transfer of any interest in the property, whether it is voluntary or involuntary. Such notice shall be sent as soon as Homeowners know that there will be a sale or transfer. The notice must include the name of the Homeowners, the address of the property, and the name of the person to whom the property is being sold or transferred.

4. THIS DOCUMENT CONTAINS THE ENTIRE AGREEMENT BETWEEN THE PARTIES and shall not be modified except by a written instrument signed by the parties.

5. HOMEOWNERS' RIGHT TO CANCEL.

You may cancel this agreement without any penalty, cancellation fee or other financial obligation by mailing a notice to HRCF. The notice must say that you do not want the materials and must be mailed before 12:00 midnight of the third business day after you sign this agreement. The notice must be mailed to Hood River Conservation Project, 216 Cascade Street, Hood River, Oregon 97031.

However: You may not cancel if you have requested HRCF to provide goods or services without delay because of an emergency and

- (1) HRCF in good faith makes a substantial beginning of performance of the contract before you give notice of cancellation, and
- (2) In the case of goods, the goods cannot be returned to HRCF in substantially as good condition as when received by Homeowners.

6. Homeowners acknowledge that they have received a copy of this agreement, and the Notice of Cancellation Form.

HOOD RIVER CONSERVATION PROJECT

HOMEOWNERS

By: _____

_____, 19____

HOOD RIVER CONSERVATION PROJECT
WEATHERIZATION PROGRAM

SUPPLEMENTAL WEATHERIZATION AGREEMENT

Agreement made this _____ day of _____, 198__ between Hood River Conservation Project (HRCP) and _____ ("Homeowner").

HRCP and Homeowner have entered into an Agreement entitled, "Homeowner Agreement" hereinafter called "The Agreement." The Agreement provides that HRCP, at its own cost, will have installed certain weatherization materials in Homeowner's home. HRCP has obtained bids from certain contractors to furnish and install the weatherization materials and the Homeowner has requested HRCP to have

*(a) installed in his home certain additional weatherization materials as shown in the Supplemental Work Proposal, briefly described as _____

_____, and has agreed to pay the difference between the cost of those materials recommended by HRCP and the cost of those contained in the Supplemental Work Proposal.

*(b) weatherization improvements installed where the costs of such installation exceed the amount deemed cost effective by HRCP. Homeowner acknowledges that any and all bids obtained by HRCP for Homeowner were not cost-effective.

NOW, THEREFORE, the parties do mutually agree as follows:

1) Homeowner shall pay to HRCP, upon the execution hereof, the sum of \$ _____, the receipt of which is hereby acknowledged, and which said sum represents

*(a) the additional amount contained in the Supplemental Work Proposal. By signing this Supplemental Agreement, Homeowner authorizes HRCP to have Contractor perform the work described in the Supplemental Work Proposal and described in (a) above.

*(b) the difference between the cost effective amount as determined by HRCP and the Homeowner's selected bid amount.

2) All terms and conditions of the Agreement, including but not limited to the Limited Warranty Provision, are incorporated into this Supplemental Agreement, unless they are inconsistent with the terms herein.

3) HOMEOWNER' RIGHT TO CANCEL. YOU, THE HOMEOWNER, MAY CANCEL THIS TRANSACTION AT ANY TIME PRIOR TO MIDNIGHT OF THE THIRD BUSINESS DAY AFTER THE DATE OF THIS TRANSACTION. SEE THE ATTACHED NOTICE OF CANCELLATION FORM FOR AN EXPLANATION OF THIS RIGHT. Homeowners acknowledge that they have received a copy of this Agreement, and the Notice of Cancellation form.

IN WITNESS WHEREOF the parties hereto have executed this Supplemental Agreement as of the day and year first above written.

HOMEOWNER

HOOD RIVER CONSERVATION PROJECT

By _____

*Cross out and initial inapplicable sections.

Form 9 C

DATE _____

NOTICE OF CANCELLATION

YOU MAY CANCEL THIS TRANSACTION, WITHOUT ANY PENALTY OR OBLIGATION, WITHIN THREE (3) BUSINESS DAYS FROM THE ABOVE DATE.

IF YOU CANCEL, ANY PROPERTY TRADED IN, ANY PAYMENTS MADE BY YOU UNDER THE CONTRACT OR SALE, AND ANY NEGOTIABLE INSTRUMENT EXECUTED BY YOU WILL BE RETURNED WITHIN 10 BUSINESS DAYS FOLLOWING RECEIPT BY THE SELLER OF YOUR CANCELLATION NOTICE, AND ANY SECURITY INTEREST ARISING OUT OF THE TRANSACTION WILL BE CANCELLED.

IF YOU CANCEL, YOU MUST MAKE AVAILABLE TO THE SELLER AT YOUR RESIDENCE, IN SUBSTANTIALLY AS GOOD CONDITION AS WHEN RECEIVED, ANY GOODS DELIVERED TO YOU UNDER THIS CONTRACT OR SALE; OR YOU MAY IF YOU WISH, COMPLY WITH THE INSTRUCTIONS OF THE SELLER REGARDING THE RETURN SHIPMENT OF THE GOODS AT THE SELLER'S EXPENSE AND RISK.

IF YOU DO MAKE THE GOODS AVAILABLE TO THE SELLER AND THE SELLER DOES NOT PICK THEM UP WITHIN 20 DAYS OF THE DATE OF YOUR NOTICE OF CANCELLATION, YOU MAY RETAIN OR DISPOSE OF THE GOODS WITHOUT ANY FURTHER OBLIGATION. IF YOU FAIL TO MAKE THE GOODS AVAILABLE TO THE SELLER, OR IF YOU AGREE TO RETURN THE GOODS TO THE SELLER AND FAIL TO DO SO, THEN YOU REMAIN LIABLE FOR PERFORMANCE OF ALL OBLIGATIONS UNDER THE CONTRACT.

TO CANCEL THIS TRANSACTION, MAIL OR DELIVER A SIGNED AND DATED COPY OF THIS CANCELLATION NOTICE OR ANY OTHER WRITTEN NOTICE, OR SEND A TELEGRAM TO HOOD RIVER CONSERVATION PROJECT AT 216 CASCADE STREET, HOOD RIVER, OR 97031 NOT LATER THAN MIDNIGHT OF _____.

CONTRACT CANCELLATION

I HEREBY CANCEL THIS TRANSACTION.

Date

Homeowner's Signature

Distribution: 2 copies to Homeowner

HOOD RIVER CONSERVATION PROJECT
WEATHERIZATION PROGRAM

TO: _____

RE: _____

NOTICE TO PROCEED

Your Proposal, submitted for the premises listed above, Bid No. _____, has been reviewed. Item(s) of your Proposal have been accepted as checked below.

- | | | |
|----------------------------------|---|--|
| <input type="checkbox"/> Ceiling | <input type="checkbox"/> Thermal Doors | <input type="checkbox"/> Heat Pump |
| <input type="checkbox"/> Floors | <input type="checkbox"/> Sliding Doors | <input type="checkbox"/> Dehumidifier |
| <input type="checkbox"/> Walls | <input type="checkbox"/> Weatherstrip Windows | <input type="checkbox"/> Clock Thermostat |
| <input type="checkbox"/> Ducts | <input type="checkbox"/> Weatherstrip Doors | <input type="checkbox"/> Air to Air Heat Exchanger |
| <input type="checkbox"/> Windows | <input type="checkbox"/> Caulking | |

Total Accepted Bid Amount \$ _____

Your Proposal for Supplemental Work at the above listed premises has/has not been accepted as indicated below:

_____	\$ _____
_____	\$ _____
_____	\$ _____

Such work, as specified above, may commence on the _____ day of _____, 19____ and shall be completed on or before the _____ day of _____, 19____. At Least 24 hours prior to commencing work you are to call _____ at _____ and notify them of your intention to commence work.

The Project Representative for this job is _____ who may be reached at (503) 386-5030 and to whom all invoices should be directed. All invoices shall carry the bid number and the name of the Project Representative.

HOOD RIVER CONSERVATION PROJECT

By _____

INVOICE

HOOD RIVER CONSERVATION PROJECT

BID # _____

CONTRACTOR

CONTRACTOR INVOICE # _____

NAME _____

DATE _____
MONTH DAY YEAR

ADDRESS _____

CUSTOMER ACCOUNT # _____

NAME _____

VENDOR # _____ GLASS CON. # _____

ADDRESS _____

INSULATION CON. # _____ OTHER # _____

PHONE _____

SUMMARY

- | | |
|---------------------------------------|---|
| 1. Ceiling \$ _____ | 8. Caulking \$ _____ |
| 2. Floor \$ _____ | 9. Window and Sliding Glass Door Weatherstrip ... \$ _____ |
| 3. Wall Insulation \$ _____ | 10. Door Treatment \$ _____ |
| 4. Duct Insulation \$ _____ | 11. Other |
| 5. Windows \$ _____ | <input type="checkbox"/> Clock Thermostat \$ _____ |
| 6. Sliding Glass Doors \$ _____ | <input type="checkbox"/> Air to Air Heat Exchanger \$ _____ |
| 7. Insulated Doors \$ _____ | <input type="checkbox"/> _____ \$ _____ |

INVOICE TOTAL \$ _____

1. CEILING

Insulation

- | | | Bid Amount | Existing Insulation R-Value | Insulate to R-Value of: | Manufacturer Type and Form of Material Used |
|--|----------|------------|-----------------------------|-------------------------|---|
| <input type="checkbox"/> Open attic sq. ft. | \$ _____ | R-_____ | R-_____ | _____ | |
| sq. ft. | \$ _____ | R-_____ | R-_____ | _____ | |
| sq. ft. | \$ _____ | R-_____ | R-_____ | _____ | |
| <input type="checkbox"/> Roof-Ceiling Cavity sq. ft. | \$ _____ | R-_____ | R-_____ | _____ | |

Other

- Attic Ventilation sq. ft. \$ _____
- Soffit, Chimney and Fixture Baffling \$ _____
- Connect Existing Bath Vent to Outside \$ _____
- Connect Existing Kitchen Vent to Outside \$ _____
- Provide for Attic Access \$ _____

Total Ceiling \$ _____

2. FLOOR

Insulation

- | | | | | |
|--|----------|---------|---------|-------|
| <input type="checkbox"/> Crawl Space or Unheated Basement sq. ft. | \$ _____ | R-_____ | R-_____ | _____ |
| sq. ft. | \$ _____ | R-_____ | R-_____ | _____ |
| sq. ft. | \$ _____ | R-_____ | R-_____ | _____ |
| <input type="checkbox"/> Exterior Perimeter (slab on grade) lin. ft. | \$ _____ | R-_____ | R-_____ | _____ |

Other

- Ground Cover sq. ft. \$ _____
- Limited Clearance \$ _____
- Crawl Space Venting sq. ft. \$ _____
- Pest Control \$ _____
- Post and Beam Support System \$ _____
- Crawl Space Pipe Wrap lin. ft. \$ _____

Total Floor \$ _____

216 CASCADE STREET
HOOD RIVER, OREGON 97031
(503) 386-5030

3. WALL INSULATION (Uninsulated Walls Only)

<input type="checkbox"/> Drill, blow and plug (include restoration of existing siding/finish)	_____ sq. ft.	\$ _____	R-_____
<input type="checkbox"/> Remove siding, install batt/vapor barrier and install new siding*	_____ sq. ft.	\$ _____	R-_____
<input type="checkbox"/> Remove siding, install batt/vapor barrier, sheathing or insulated sub-siding and new exterior siding*	_____ sq. ft.	\$ _____	R-_____
<input type="checkbox"/> Attic kneewalls	_____ sq. ft.	\$ _____	R-_____
<input type="checkbox"/> Basement walls	_____ sq. ft.	\$ _____	R-_____
*Aluminum or Vinyl siding only.		Total Wall	
		\$ _____	

4. DUCT INSULATION

<input type="checkbox"/> Attic	_____ lin. ft.	\$ _____	R-_____
<input type="checkbox"/> Underfloor	_____ lin. ft.	\$ _____	R-_____
		Total Ducts	
		\$ _____	

5. WINDOWS (Type Added)

EXISTING WINDOW TYPE (enter sq. ft. and number)

	Aluminum or Wood Surround	Steel Frame or Masonry Surround	Bid Amount	Finish/Color	Material	Mfg. and Model #
<input type="checkbox"/> 1. Single inside or outside storm window ..	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 2. Double inside or outside storm window ..	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 3. Change out single lites to double (conversion kit)	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 4. Total replacement of single glazed system with new dual glazed units	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 5. Total replacement of single glazed system with new triple glazed units	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 6. Combination of (1) and (3) above	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 7. Combination of (1) and (4) above	_____	_____	\$ _____	_____	_____	_____
			Total Windows			
			\$ _____			

6. SLIDING GLASS DOORS

		Number of Doors		
	Location	5'	6'	8'
<input type="checkbox"/> Changeout Kits to Double	\$ _____	_____	_____	_____
<input type="checkbox"/> Changeout Kits to Triple	\$ _____	_____	_____	_____
<input type="checkbox"/> Total Replacement to Double	\$ _____	_____	_____	_____
<input type="checkbox"/> Total Replacement to Triple	\$ _____	_____	_____	_____
<input type="checkbox"/> Add Sliding Glass Door: Single Glass	\$ _____	_____	_____	_____
Double Glass	\$ _____	_____	_____	_____
Total Sliding Glass Doors		\$ _____		

7. INSULATED DOORS

	Bid Amount	Location	Number of Doors		
			30"	32"	36"
<input type="checkbox"/> Insulated Door Replacement	\$ _____	_____	_____	_____	_____
Total Insulated Doors		\$ _____			

8. CAULKING

9. WINDOW AND SLIDING GLASS DOOR WEATHERSTRIPPING

10. DOOR TREATMENT

<input type="checkbox"/> Threshold	Number of Doors _____	\$ _____
<input type="checkbox"/> Door Weatherstripping	Number of Doors _____	\$ _____

11. OTHER

<input type="checkbox"/> Clock Thermostat		\$ _____
<input type="checkbox"/> Air to Air Heat Exchanger	Number Required _____	\$ _____
<input type="checkbox"/> Other		\$ _____

CONTRACTOR SIGNATURE _____

DATE _____

WEATHERIZATION INSPECTION CHECKLIST

Account No. _____
Name _____

BID # _____ CONTRACTOR _____

INSPECTED BY _____ DATE PASSED _____

CEILING

INSPECTION CHECKLIST

Insulation

Material meets specifications	DATES	
Minimum R-49 (or per bid)		
Knee walls minimum R-11		
Knob and tube wiring		
Entry access framed for containment		
Access door insulated & weatherstripped		
Certificate posted		

Dam Protection

Insulation 3" away from sides & 24" above recessed light fixtures		
Miscellaneous electrical devices protected		
Clearance around flues, stovepipes & chimneys		

Ventilation

Soffit/leave baffles		
Net free ventilating area		
Vapor barrier		
Exhaust fan ducts extended to outside		
Special ventilation attained		

FLOORS

Material meets specifications

Pipe insulation for freeze protection R-3		
Water pipe heaters		
Ventilation		
Ground cover		
Water drainage		
Access door insulated		
Access door weatherstripped		

B Underfloors

Total R-38 (or per bid)		
Floor insulation support installed		
Vapor barrier		
Exposed insulation protected		

Internal Perimeters

Minimum R-19 (or per bid)		
Insulation coverage		

FLOORS (Cont.)

External Perimeters

Minimum R-10 (or per bid)	DATES	
Depth of insulation into ground		
Weather proofed		
Metal "Z" flashing		

WALLS

Material meets specifications		
Minimum R-11 (or per bid)		
Vapor barrier		
Finish rated covering		
Outlets clear of insulation		
Plugs painted to match exterior		

WINDOWS

Product certification/est on file		
Safety glass installed		
Windows correct size, shape, & type		
Mounted correctly		
Bare wood finished		
Prime & storm windows clean		
Units operate smoothly & properly		
Screens installed		
Thermal barrier between metal to metal		
Windows free of distortions, bows or glass-to-glass contact		
Sliding panes/openings weatherstripped		
Rattle free		
Frames free of holes & other damage		
No free fall hazards		
Provision for relieving moisture accumulation		
Caulking		

Multi-Glazing: (In Addition to Above)

Frame or sash material not deteriorated		
Sealed units fog free		
No hairline cracks at glazing periphery		
Certification label attached to window		

X = Pass O = Not Pass NA = Not Applicable

SLIDING DOORS

	DATES			
Product certification/test on file				
2 Certification label attached to window				
a) Metal rollers installed with insert keys				
b) Safety glass used where needed				
Screen provided				
Bare wood painted to match				
Gaps and cracks caulked				
Worn weatherstripping replaced				
9" Landing surface from sliding prime door				
Door clean				
Fits & works properly				

INSULATED ENTRANCE DOORS

	DATES			
Product certification/test on file				
R-7 minimum				
Hardware/locks installed & operating properly				
Glazing is glass				
Doors operate freely with no binding, gaps or openings				

HVAC DUCTS

	DATES			
Minimum R-11 or R-30				
Ducts taped and supported				
Plenums and boots insulated				
Insulation facing				

WEATHERSTRIPPING & CAULKING

	DATES			
Material of approved type				
Weatherstripping securely attached				
Weatherstripped windows & doors operate properly				
Caulking installation per bid				

CLOCK THERMOSTAT

	DATES			
Meets NEMA requirements				
24 Hour type with two setback periods per day				
Temperature "set-up" and "set-back" adjustment				
Thermostats for heat pumps inhibit electric resistance elements				
Instructions provided				

AIR-TO-AIR HEAT EXCHANGERS

	DATES			
Sized correctly				
Cross or counter air flow paths				
Exchanger of water impermeable material				
Outside portion protected from weather				
Particulate filters present				
Blowers sized, lubricated & UL listed				
Moisture condensation control possible				
Frost control provided				
Product specs & instructions provided				
Periodic maintenance possible with hand tools				
Intakes and discharges separated				
Air ducts insulated				
Operates properly				

ELECTRIC WATER HEATER & PIPE WRAP

	DATES			
R-11 wrap meets material specs				
Temperature set at 140°F or lower				
Clearance for heat producing appliances				
P/T valve free of obstruction				
Cutouts around electric service wire & drain valve				
Cutouts around thermostat access panels <u>if over 140°F</u>				
Thermostat access panels indicated on wrap surface				
Safety label				
Minimum R-3 pipe wrap				
First 5-feet of pipe insulated				
Insulation secured to pipe				
Protective coverings installed where needed				

DEHUMIDIFIER

	DATES			
Meets AHAM specs				
Sizing correct				
Instructions provided				

X = Pass O = Not Pass NA = Not Applicable

Account No. _____

Date _____

Hood River Conservation Project Weatherization Completion Acknowledgment

Re: _____
NAME

STREET _____ CITY _____ STATE _____ ZIP _____

Weatherization Improvements as checked below have been installed according to the HRCP specifications.

- Ceiling Insulation with appropriate ventilation: Install insulation from an average estimated existing R-_____ to an average estimated R-_____. Approximately _____ sq. ft.
- Floor Insulation with appropriate ventilation, ground cover and crawl space pipe wrap: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Wall Insulation: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Knee Walls: Install insulation from an estimated existing R-_____ to an estimated R-_____. Approximately _____ sq. ft.
- Duct Insulation: Install attic duct insulation to an estimated R-_____. Approximately _____ lin. ft.
Install crawl space duct insulation to an estimated R-_____. Approximately _____ lin. ft.
- Multiple Glazing: total approximately _____ sq. ft.
- Insulated Doors: Install _____ doors.
- Threshold replacement _____ doors.
- Sliding Doors: totaling approximately _____ sq. ft.
- Window and door frame caulking.
- Window weatherstripping.
- Door weatherstripping.
- Clock thermostat.
- Air to Air Heat Exchanger.
- Other _____

The above named Homeowner hereby acknowledges that work, as checked above, performed on the premises listed above under the Agreement with Hood River Conservation Project meets with Homeowner's approval, and to the best of Homeowner's knowledge, the work was performed in a workmanlike manner.

(HOMEOWNER)

An inspection has been made to assure, to the best of our knowledge, workmanlike installation of the indicated weatherization services and that installations meet all program specifications.

HOOD RIVER CONSERVATION PROJECT

By: _____
(INSPECTOR)

Homeowner initial here to signify receipt of a completed copy of this form.

HOOD RIVER CONSERVATION PROJECT
216 Cascade Street
Hood River, OR 97031

INSPECTION OF CONTRACTED WORK

Contractor: _____ ID # _____

Customer: _____

Customer Phone No. _____

HRCP Bid No. _____

Contracted work at the above location DID NOT pass inspection in the following area or areas:

- | | | |
|--------------------------------------|--|--|
| <input type="checkbox"/> Ceiling | <input type="checkbox"/> Insulated Doors | <input type="checkbox"/> Dehumidifier |
| <input type="checkbox"/> Floor | <input type="checkbox"/> Sliding Doors | <input type="checkbox"/> Air to Air Heat Exchanger |
| <input type="checkbox"/> Vents | <input type="checkbox"/> Weatherstripping Windows | <input type="checkbox"/> Wall Insulation |
| <input type="checkbox"/> Ducts | <input type="checkbox"/> Weatherstripping Doors | <input type="checkbox"/> Low Flow Shower Heads |
| <input type="checkbox"/> Water Pipes | <input type="checkbox"/> Thresholds | <input type="checkbox"/> Water Heater Wrap |
| <input type="checkbox"/> Windows | <input type="checkbox"/> Caulking Window & Door Frames | <input type="checkbox"/> Gaskets |

Remarks: _____

THIS DISCREPANCY IS TO BE CORRECTED WITHIN TEN DAYS. PLEASE SEND WRITTEN CONFIRMATION THAT IT HAS BEEN CORRECTED AND INSPECTED BY YOU!

Prepared by _____ Date _____

Inspector _____ ID # _____

**HOOD RIVER CONSERVATION PROJECT
 WEATHERIZATION PROPOSAL**

Account No. _____
 Name: _____

Date: _____

INSULATION

Notice is hereby given that Hood River Conservation Project ("HRCF") will accept a proposal until the close of business _____, 19_____, for the work as indicated below, and pursuant to the specifications as contained in HRCF specifications.

All proposals shall be subject to acceptance for a period of thirty (30) days from the due date. Proposals are to be submitted to 216 Cascade Ave., Hood River, OR 97031.

This proposal can be identified using the following number: _____. HRCF reserves the right to reject any or all proposals. HRCF also reserves the right to award all or any part of a job.

The work is to be performed on the premises listed above. These premises shall be available for your inspection on _____. Any questions regarding this work should be directed to _____ at 386-5030.

CEILING

Insulation

	Amount	Existing Insulation R-Value	Insulate to R-Value of:	Manufacturer Type and Form of Material Used
<input type="checkbox"/> Open attic	_____ sq. ft.	\$ _____	R-_____	_____
.....	_____ sq. ft.	\$ _____	R-_____	_____
<input type="checkbox"/> Roof-Ceiling Cavity.....	_____ sq. ft.	\$ _____	R-_____	_____
Other				
<input type="checkbox"/> Attic Ventilation.....	_____ sq. ft.	\$ _____	Location and size _____	
<input type="checkbox"/> Soffit, Chimney and Fixture Baffling.....	_____	\$ _____	_____	
<input type="checkbox"/> Connect Existing Bath Vent to Outside	_____	\$ _____	_____	
<input type="checkbox"/> Connect Existing Kitchen Vent to Outside	_____	\$ _____	_____	
<input type="checkbox"/> Provide for Attic Access	_____	\$ _____	_____	
Total Ceiling		\$ _____		

FLOOR

Insulation

<input type="checkbox"/> Crawl Space or Unheated Basement.....	_____ sq. ft.	\$ _____	R-_____	R-_____	_____
.....	_____ sq. ft.	\$ _____	R-_____	R-_____	_____
<input type="checkbox"/> Exterior Perimeter (slab on grade).....	_____ lin. ft.	\$ _____	R-_____	R-_____	_____
Other					
<input type="checkbox"/> Ground Cover.....	_____ sq. ft.	\$ _____	Location and size _____		
<input type="checkbox"/> Limited Clearance.....	_____	\$ _____	_____		
<input type="checkbox"/> Crawl Space Venting.....	_____ sq. ft.	\$ _____	_____		
<input type="checkbox"/> Pest Control.....	_____	\$ _____	_____		
<input type="checkbox"/> Post and Beam Support System.....	_____	\$ _____	_____		
<input type="checkbox"/> Crawl Space Pipe Wrap.....	_____ lin. ft.	\$ _____	_____		
Total Floor		\$ _____			

WALL INSULATION (Uninsulated Walls Only)

<input type="checkbox"/> Drill, blow and plug (include restoration of existing siding/finish).....	_____ sq. ft.	\$ _____	R-_____	_____
<input type="checkbox"/> Remove siding, install batt/vapor barrier and install new siding*	_____ sq. ft.	\$ _____	R-_____	_____
<input type="checkbox"/> Remove siding, install batt/vapor barrier, sheathing or insulated sub-siding and new exterior siding*	_____ sq. ft.	\$ _____	R-_____	_____
<input type="checkbox"/> Attic kneewalls.....	_____ sq. ft.	\$ _____	R-_____	_____
*Aluminum or Vinyl siding only				
Total Wall		\$ _____		

DUCT INSULATION

<input type="checkbox"/> Attic	_____ lin. ft.	\$ _____	R-_____	_____
<input type="checkbox"/> Underfloor	_____ lin. ft.	\$ _____	R-_____	_____
Total Ducts		\$ _____		

JOB TOTAL \$ _____

Comments: _____

NOTE: ANY DATA OR INFORMATION SUPPLIED IS APPROXIMATE ONLY AND IS NOT INTENDED TO PRECLUDE PHYSICAL INSPECTIONS

SUPPLEMENTAL WORK PROPOSAL

The undersigned and the Homeowner have discussed and agreed to the following supplemental work:

Description of Work

The undersigned Contractor proposes to perform this supplemental work for the additional amount of \$ _____. Any supplemental work shall be performed pursuant to the terms of Contractor's Weatherization Program Agreement with HRCF.

TOTAL WORK PROPOSAL

The undersigned hereby proposes to perform the work as described above on the premises listed above in strict accordance with the specifications, and subject to all the terms and conditions contained in HRCF contract # _____, dated _____, of which this proposal shall become part.

COMPANY _____ BY _____ CUSTOMER X _____
 ADDRESS _____ TITLE _____ Sign here to verify contact with contractor

**HOOD RIVER CONSERVATION PROJECT
WEATHERIZATION PROPOSAL**

Account No. _____
Name: _____

Date: _____

GLASS

Notice is hereby given that Hood River Conservation Project ("HRCF") will accept a proposal until the close of business _____, 19_____, for the work as indicated below, and pursuant to the specifications as contained in HRCF specifications.

All proposals shall be subject to acceptance for a period of thirty (30) days from the due date. Proposals are to be submitted to 216 Cascade Ave., Hood River, OR 97031.

This proposal can be identified using the following number: _____. HRCF reserves the right to reject any or all proposals. HRCF also reserves the right to award all or any part of a job.

The work is to be performed on the premises listed above. These premises shall be available for your inspection on _____. Any questions regarding this work should be directed to _____ at 386-5030.

WINDOWS (Type Added)

	EXISTING WINDOW TYPE (enter number & sq. ft.)		Amount	Finish/ Color	Material	Mfg. and Model #
	Aluminum or Wood Surround	Steel Frame or Masonry Surround				
<input type="checkbox"/> 1. Single inside or outside storm window.....	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 2. Double inside or outside storm window.....	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 3. Change out single lites to double (conversion kit)	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 4. Total replacement of single glazed system with new dual glazed units	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 5. Total replacement of single glazed system with new triple glazed units.....	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 6. Combination of (1) and (3) above	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 7. Combination of (1) and (4) above	_____	_____	\$ _____	_____	_____	_____
<input type="checkbox"/> 8. Tempered Glass.....	_____	_____	\$ _____	_____	_____	_____
Total Windows			\$ _____			

SLIDING GLASS DOORS

	Amount	Number of Doors		
		5'	6'	8'
<input type="checkbox"/> Changeout Kits to Double.....	\$ _____	_____	_____	_____
<input type="checkbox"/> Changeout Kits to Triple.....	\$ _____	_____	_____	_____
<input type="checkbox"/> Total Replacement to Double.....	\$ _____	_____	_____	_____
<input type="checkbox"/> Total Replacement to Triple	\$ _____	_____	_____	_____
<input type="checkbox"/> Add Sliding Glass Door: Single Glass.....	\$ _____	_____	_____	_____
Double Glass.....	\$ _____	_____	_____	_____
Total Sliding Glass Doors		\$ _____	_____	_____

INSULATED DOORS

	Amount	Location	Number of Doors		
			30"	32"	36"
<input type="checkbox"/> Insulated Door Replacement.....	\$ _____	_____	_____	_____	_____
Total Insulated Doors		\$ _____	_____	_____	_____

CAULKING

WINDOW AND SLIDING GLASS DOOR WEATHERSTRIPPING

DOOR TREATMENT

Threshold Number of Doors _____ \$ _____

Door Weatherstripping Number of Doors _____ \$ _____

Comments: _____ **JOB TOTAL \$** _____

NOTE: ANY DATA OR INFORMATION SUPPLIED IS APPROXIMATE ONLY AND IS NOT INTENDED TO PRECLUDE PHYSICAL INSPECTIONS

SUPPLEMENTAL WORK PROPOSAL

The undersigned and the Homeowner have discussed and agreed to the following supplemental work:

Description of Work

The undersigned Contractor proposes to perform this supplemental work for the additional amount of \$ _____. Any supplemental work shall be performed pursuant to the terms of Contractor's Weatherization Program Agreement with HRCF.

TOTAL WORK PROPOSAL

The undersigned hereby proposes to perform the work as described above on the premises listed above in strict accordance with the specifications, and subject to all the terms and conditions contained in HRCF contract # _____, dated _____, of which this proposal shall become part.

COMPANY _____ BY _____ CUSTOMER X _____

ADDRESS _____ TITLE _____ Sign here to verify contact with contractor

Received _____
HOOD RIVER CONSERVATION PROJECT
Extension Request

Customer Acct. No. _____ Bid No. _____
Customer Name _____

Contractor No. _____ Contractor Name _____

Type of Measure: Insulation _____ Glass _____ Air-to-Air Heat Exchanger _____
Extension of Due Date for: (circle one)

- 1) Proposal 2) Weatherization Completion 3) Callback 4) Speed Memo

Due Date: _____

Reason for Extension _____

Extension Not Approved [] Extension Approved [] Extension Date _____
Authorized by _____

Note: If the extension is not received by the due date, an extension will not be granted.

Revised: 3/1/85

HRCP - 129

HOOD RIVER CONSERVATION PROJECT
216 Cascade St.
Hood River, OR 97031

INVOICE

Date ___/___/___

For: Fine

Other

Jobs Where Fines Were Imposed:

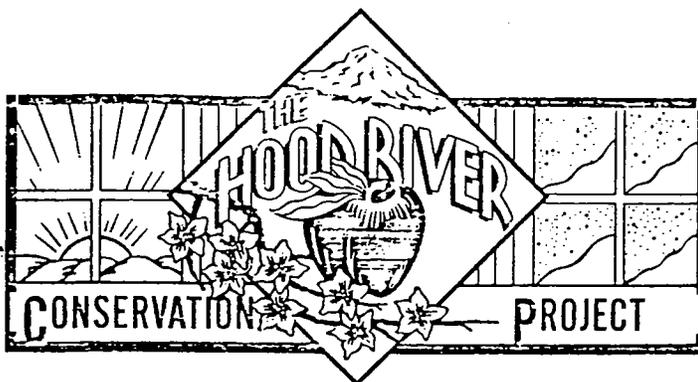
<u>Type of Fine and \$ Charged</u>					
Job #	Account #	Contractor #	Invoiced For Work Not Done	Additional Reinspects	Overdue Cont. Response
_____	_____	_____	\$ _____	\$ _____	\$ _____

Total Amount Due \$ _____

Payment Is Due Within 30 Days of Invoice Date

White - Contractor Submit with Payment
Yellow - Contractor's Copy

Pink - HRCP
Gold - Treasury



M E M O R A N D U M

TO:

FROM: Hood River Conservation Project

SUBJECT: Withheld Payment on Invoice Due to Contractor Fines

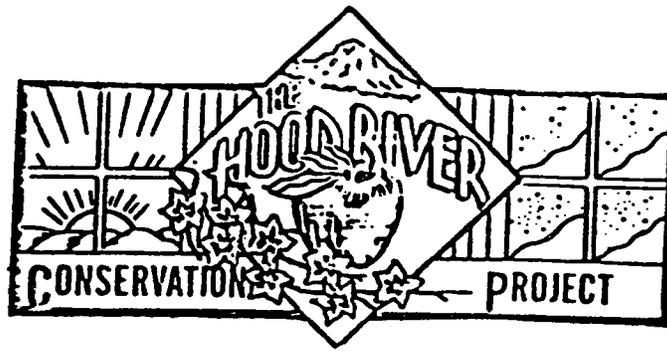
Jobs where fines were imposed: (Completed by inspector and forwarded to Administrative Assistant)

<u>Job #</u>	<u>Account No.</u>	<u>Contractor No.</u>	<u>\$ Charged for Type of Fine</u>	<u>Total \$ Fined</u>
			<u>Invoiced for Work Not Done</u>	<u>Additional Reinspects</u>
1.				

Invoice where fines are being deducted: (Completed by Admin. Asst.)

<u>Job #</u>	<u>Account No.</u>	<u>Contractor No.</u>	<u>Invoice Amount</u>	<u>Amount of Check</u>	<u>Total \$ Deducted</u>

jd



**Customer Approval of Air-to-Air Heat Exchanger Model
and Installation Procedure**

Manufacturer _____

Model # _____ **No. of Units** _____

Location of Unit(s) _____

Contractor has reviewed with me exactly where the air-to-air heat exchanger units will be installed (including any wall-mounted systems), where the duct work will be run, and where the supply and return-air registers will be located. I have reviewed the sketch of the installation, and agree with the proposal.

Contractor Signature

Customer Signature

NOTE: Sketch must be attached to this form.



November 26, 1985

Dear Customer:

Now that the Hood River Conservation Project is well underway, another aspect of the Project we would like to discuss at this time is indoor air quality.

When the Project began, the Bonneville Power Administration (BPA) planned to include as part of the weatherization package an air-to-air heat exchanger for each home participating in the Project. This was done because of the lack of good information available concerning the extent of any increased air quality problem resulting from tightening homes.

Recently, the Bonneville Power Administration completed an extensive study on weatherization's effect on indoor air quality and found that if the indoor air quality is poor in a weatherized home, the occupants are generally in the best position to notice it. This is because most of the pollutants found in a home can cause some discomfort (i.e. stuffiness, irritated eyes, headaches).

Unlike the pollutants mentioned above, there is one pollutant which is difficult to detect and control. This pollutant is radon, a naturally occurring gas given off by soil and rock. Radon is found in all homes, though the level varies. In a recent study of radon levels, BPA measured radon concentrations in over 250 homes in Oregon, Washington, Idaho and Montana. Only about four percent of the homes had radon levels high enough to warrant the installation of an air-to-air heat exchanger. So far, it's concentrations have been found to be scarce in the Hood River area.

The presence of radon is measured with a small lightweight plastic device about the size of a wristwatch. This monitor is placed in the home for at least three months and then sent to a laboratory for analysis.

A representative from the Project will be contacting you in the near future offering to install one of these small devices in your home at no cost to you. Since we will be weatherizing your home, we want to give you the opportunity to take advantage of this service. We will have someone stop by in the spring to pick up the monitor for analysis and will let you know if the results indicate an air-to-air heat exchanger installation would be appropriate for you.

Aside from this monitoring service, since the other pollutants can be detected by the occupants, the Project office is relying on you to give us feedback. If you are not experiencing any discomfort after your weatherization is completed, then an air-to-air heat exchanger is probably not needed in your home. If you believe one is necessary, then contact our office. We will provide you with facts about air-to-air heat exchangers and will assist in arranging for the installation of an air-to-air heat exchanger in your home at no cost to you. You don't have to make a decision now. As you close up your home this winter you may find this to be the best time to determine whether your home is too tight. You have the option of having an air-to-air heat exchanger installed if you feel one is needed, up through March, 1986.

Sincerely,



Dennis J. Quinn
Project Administrator
Hood River Conservation Project

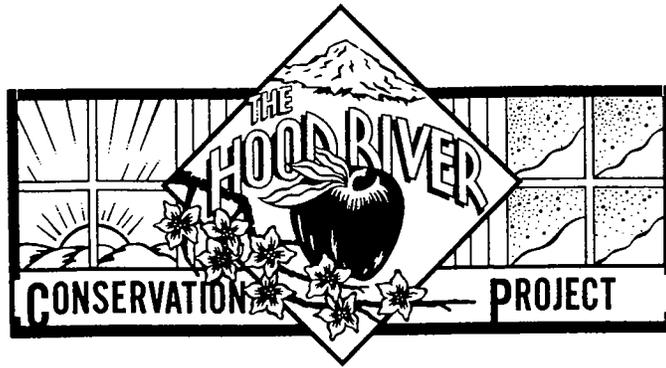
DJQ:ap

I the undersigned have decided to pursue the installation of an air-to-air heat exchanger based on the following reason(s):

- CONCERN OVER COMBUSTION BY-PRODUCTS
- CONCERN OVER FORMALDEHYDE LEVELS
- CONCERN OVER MOISTURE LEVELS
- CONCERN OVER HOUSE TIGHTNESS RELATED TO TOBACCO SMOKE
- CONCERN OVER HOUSE TIGHTNESS RELATED TO OXYGEN AVAILABILITY
- CONCERN OVER CHRONIC ODORS
- OTHER

HOMEOWNER'S SIGNATURE

DATE



Dear Customer:

We are asking you to verify that you have been contacted, in person, by a representative of the Hood River Conservation Project for the purpose of installing a radon monitor. Please indicate your acceptance or refusal of the radon monitor offering and sign at the bottom. Thank you for your cooperation.

_____ I have accepted the offer for the installation of a radon monitor and have been provided with the Bonneville Power Administration publication on indoor air quality. This service was provided to me at no charge. I understand that a representative of the Project will stop by in approximately eight months to pick up the monitor for analysis. I further understand that the Project office will inform me of the results if they indicate an air-to-air heat exchanger installation would be warranted.

_____ I was provided with the Bonneville Power Administration publication on indoor air quality and I refused the offer to have a radon monitor installed in my home at no cost to me.

Customer Signature

Date

Customer Signature

Date