NAVAL FACILITIES ENGINEERING SERVICE CENTER
Port Hueneme, CA 93043

NFESC
TECHNICAL REPORT
TR-2102-ENV

EVALUATION OF BIO-BASED INDUSTRIAL PRODUCTS FOR NAVY AND DOD USE

PHASE I

PRIMEBOARD™

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1.0 INTRODUCTION

Alternative Agricultural Research and Commercialization (AARC) Corporation is a wholly owned corporation of the U.S. Department of Agriculture (USDA). AARC is a venture capital firm that is authorized to make investments in companies to help commercialize bio-based industrial products (non-food, non-feed) from agricultural, forestry materials, and animal byproducts. As these bio-based products are made from agricultural materials, they tend to be environmentally friendly. In many instances, these products replace petroleum products and are comprised of recovered agricultural waste material.

Since the Federal government has an equity position in these companies, Section 729 of the 1996 Federal Agricultural Improvement and Reform Act (P.L. 104-127, Title VII, Subtitle A, Chapter 2, Section 1657c) prompted an amendment of the AARC Corporation authorization. The authorization now allows other Federal agencies to establish procurement set-asides and encourages preferences for property that has been commercialized with assistance provided under Subtitle G of Title XVI of the Food, Agriculture, Conservation and Trade Act of 1990. To this end, the Federal Acquisition Regulations are in the process of being amended to encourage these preferences. In addition, both the Secretary of Defense and the Secretary of Agriculture have signed letters expressing their support of a partnership between Department of Defense (DOD) and USDA to increase DOD use of these bio-based products.

Under the sponsorship of AARC Corporation, Naval Facilities Engineering Service Center (NFESC) evaluated the potential use of a number of these bio-based products within the Navy and DOD. Representatives from both NFESC and AARC selected eleven bio-based products to undergo a two-phase evaluation process. This document provides the results from the first phase of the evaluation process.

2.0 EVALUATION METHODOLOGY

The evaluation methodology consists of a two-phase approach. Details of the methodology are outlined in the following two subsections.

2.1 Phase I: Preliminary Product Evaluation

Each vendor's manufacturing site was visited to collect product data, discuss product usage, and to obtain information regarding the performance claims, savings, and environmental benefits. Existing third-party certifications and test results were also reviewed and current users of the product were contacted and interviewed. In addition, scientific and engineering literature was researched to establish the physical, chemical, or biological mechanisms employed by the product in achieving its claimed performance. Potential opportunities for using the product within the Navy were identified and a preliminary life cycle cost (LCC) analysis was performed using the Phase I product data. The evaluation process did not proceed to Phase II if the results of the Phase I product investigation clearly indicated that the product could not be cost-effectively employed within the Navy or that the product had no apparent cost-effective potential for Navy use. An implementation plan was developed for those products evaluated as having

cost effective use within the Navy. Proceeding onward to Phase II product testing was recommended when the Phase I analysis suggested that the product had potential for cost-effective Navy use but lacked sufficient data to conclusively validate product performance and/or LCC.

2.2 Phase II: Product Testing

For those products proceeding onto phase II of the evaluation process, a specific step-by-step test protocol is developed for each recommended product with the objective of providing sufficient data to verify product utility within the Navy. The protocol will be designed to evaluate life cycle performance of the product. Upon approval of the protocol by AARC, the product will be tested by a certified testing facility under controlled conditions. In addition, the life cycle performance of the product will be evaluated and the environmental, safety, and health benefits and trade-offs associated with the product will be estimated. A LCC analysis of the product will be performed using the proven costing techniques from the NAVFAC Economic Analysis Handbook P-442.

An implementation plan will be developed for each of the recommended products targeted for the potential user community within the Navy and DOD. During the development of the implementation plan, the requirements and needs of the Navy ship, aviation, and shore facilities will be considered. The resources of the Joint Group on Acquisition Pollution Prevention (JG-APP) will also be utilized to promote Army and Air Force implementation of the product. Product visibility may also be achieved through various publications distributed throughout DoD and other government agencies.

3.0 PRODUCTS EVALUATED

Table 3.1 lists the eleven products evaluated in Phase I for potential application within the DoD. Two of the products were determined unfeasible for use within the DoD. The remaining nine products are each presented in a separate evaluation report.

(Table 3.1 Omitted Due To Restricted Vendor Information)

4.0 AFFIRMATIVE PROCUREMENT

Section 6002 of Resource Conservation Recovery Act (RCRA) directs government agencies to promote recycling by increasing their purchases of products containing recovered materials. RCRA section 6002(e) requires the Environmental Protection Agency (EPA) to designate items that are or can be produced with recovered materials and prepare guidelines to assist procuring agencies in complying with their affirmative procurement responsibilities set forth in paragraphs (c), (d), and (i) of section 6002. Once EPA has designated items, section 6002 requires that any procuring agency spending more than $10,000 a year of Federal funds on an item must purchase the highest percentage of recovered materials practicable. Procuring agencies are Federal, state, and local agencies, and their contractors, which use appropriated Federal funds.

Executive Order 12873 reinforced RCRA's Federal buy recycled program by directing EPA to adopt modified procedures for designating items and providing procurement recommendations.
Under the order, EPA issued a regulation known as Comprehensive Procurement Guideline (CPG) which contains the item designations, and also prepared a guidance document known as a Recovered

Materials Advisory Notice (RMAN). The RMAN contains EPA's recommendations to procuring agencies to assist them in purchasing the designated items and meeting their statutory obligations. The RMAN also provides general guidance for developing an affirmative procurement program. An affirmative procurement program is an procuring agency's strategy for maximizing its purchases of EPA-designated items, and must consist of the following:

- Recovered materials preference program
- An agency promotion program
- A program for requiring vendors to reasonably estimate, certify, and verify the recovered materials content of their products; and
- A program to monitor and annually review the effectiveness of the affirmative procurement program

On September 16, 1998 Executive Order 12873 was replaced by Executive Order 13101 which expanded the affirmative procurement program to include bio-based products on the EPA designated item list. A bio-based product list will be developed and published by USDA in the Federal Register no later than March 23, 1999. The list shall also be updated biannually after publication to include additional items. It is assumed that the bio-based product evaluated in this report will be included in the list.

In the spirit of section 6002 of the Resource Conservation and Recovery Act (RCRA) and Executive Order 13101, Federal procuring agencies and personnel should strongly consider implementing sustainable bio-based products when selecting items to meet the goals of the affirmative procurement program.

5.0 PRIMEBOARD™

5.1 Product Description

PrimeBoard™ is an industrial-grade particleboard made entirely from pressed wheat straw, and polymeric diphenylmethane diisocyanate (MDI), a formaldehyde-free binding agent. The traditional particleboard product purchased in North America is comprised of wood particles and formaldehyde resins that are bonded together under heat and pressure.

PrimeBoard™ can be used for many of the same applications as conventional particleboard. Particleboard is widely utilized in the manufacture of furniture, cabinets, countertops, floor underlayment, laminate flooring, and many other products.

PrimeBoard, a privately owned corporation, manufactures PrimeBoard™ at a plant in Wahpeton, North Dakota. PrimeBoard™ production first began in 1995. The current manufacturing facility is highly automated, employs 70 people, and operates 7 days per week. The plant has an annual production capacity of 30 million square feet (¾" basis) and manufactures panels in sizes of 5'x 8', 5'x 9', and 5'x 10' and in thicknesses ranging from 3/8" to 1 1/8". The manufacturing process is fairly simple. Wheat straw is chopped into fine pieces, mixed with MDI, and then pressed into panels under heat and pressure. Their current 5' wide panel size is optimal for the furniture industry. The production plant can accommodate another product line for expanded future capability.

Contact information:

Address: PrimeBoard Incorporated
Sales and Marketing Representative
2111 North 3M Drive
Wahpeton, ND 58075
Phone: (701) 642-9700
Fax: (701) 642-1154
Internet: www.wheatboard.com

5.2 Vendor Claims and Specifications

The emission-free board designation has been established by Primeboard to assure their customers, and the market, that the product they are purchasing is free from all harmful emissions. PrimeBoard™ utilizes MDI as an alternative adhesive to urea formaldehyde used in conventional particleboard. Primeboard claims that MDI becomes inert once the PrimeBoard™ has cured. PrimeBoard also claims that using PrimeBoard™ offers the following benefits:

- Non-measurable formaldehyde off-gassing
- Physical properties of the highest industrial grade standard
- 10% lighter weight than conventional particle board
- Greater moisture resistance than conventional particle board
- Produced from an annually renewable resource
- Excellent machining qualities
- Superior laminating surface

American National Standard (ANSI) A208.1 is the current standard for particleboard. The voluntary standard classifies particleboard by grade, and covers the physical, mechanical, and dimensional characteristics required of particleboard. The standard also covers formaldehyde emission limits.

Table 5.1 compares the physical properties of PrimeBoard™ to the Grade M-3 requirements in ANSI A208.1. Kitchen cabinets, office and residential furniture, stair treads, moulding, and shelving are examples of industrial-grade interior products that are typically classified as Grade M-3.

Table 5.1: Physical Properties of PrimeBoard™

Physical Properties	ANSI Standard A208.1 (M-3)	PrimeBoard™ 3/4 Inch Thickness
Density (lb/ft^3)	40-50	40
Modulus of Rupture (psi)	2,393	2,393+
Modulus of Elasticity (psi)	399,000	399,000+
Internal Bond (psi)	80	80+
Screw-Holding Face (lbs)	247	247+
Screw-Holding Edge (lbs)	225	225+
Hardness (lbs)	500	500+
Formaldehyde Emissions (ppm)*	0.3	0

Test results obtained at and published by PrimeBoard.
* Based on product loading of 0.13 ft^2/ft^3 of room volume.

Table 5.1 shows that PrimeBoard™ (3/4" thickness) is a lightweight product with zero formaldehyde emissions that meets or exceeds the Grade M-3 requirements of ANSI A208.1.

PrimeBoard™ also appears to consistently conform to ANSI A208.1 requirements for Grade M-3 particleboard. Appendix A contains physical property data collected over three months for random PrimeBoard™ specimens pulled from the production line. Appendix A also contains additional physical property data for PrimeBoard™ on the product's material safety data sheet.

5.3 Verification of Product Claims

5.3.1 Third Party Testing and Results

5.3.1.1 TECO Test Laboratory

The TECO test laboratory in Eugene, Oregon conducted tests on PrimeBoard™ from December 14, 1995 to January 30, 1996. The tests were performed to determine compliance with the ANSI 208.1 requirements for Grade M-3 particleboard using American Society of Testing Materials (ASTM) test method D-1037-93 as requested by PrimeBoard.

The National Voluntary Laboratory Accreditation Program (NVLAP) accredits TECO laboratory for wood based products. NVLAP provides an unbiased third party evaluation and recognition of performance, as well as expert technical guidance to upgrade laboratory performance. The National Institute of Standards and Technology (NIST) administers NVLAP.

The individual tests conducted by TECO included modulus of rupture, modulus of elasticity, moisture content, internal bond, water absorption, hardness, screw withdraw, and linear expansion. Table 5.2 shows a summary of results for 7/16" and 11/16" board thickness. Appendix A contains an abbreviated copy of the TECO report #95-73 results. The abbreviated copy was provided by PrimeBoard.

Table 5.2: TECO Test Results

Physical Properties	ANSI Standard A208.1 (M-3)	PrimeBoard™ 7/16 Inch Thickness	PrimeBoard™ 11/16 Inch Thickness
Density (lb/ft^3)	40-50	43	46
Modulus of Rupture (psi)	2,393	2,624	2,929
Modulus of Elasticity (psi)	399,000	409,000	456,000
Internal Bond (psi)	80	121	101
Screw-Holding Face (lbs)	247	335	306
Screw-Holding Edge (lbs)	225	NA	272
Hardness (lbs)	500	1,154	1,019

NA Information not available.

The third party test results of 7/16" and 11/16" thickness PrimeBoard™ meets or exceeds ANSI A208.1 requirements.

5.3.1.2 Environmental Protection Agency (EPA) Test Results

In the paper, "Identification and Evaluation of Pollution Prevention Techniques to Reduce Indoor Emissions from Engineered Wood Products", EPA and Research Triangle Institute conducted research to investigate pollution prevention options to reduce indoor emissions from different types of finished engineered wood. As part of the investigation, a fiber study was conducted to evaluate emissions from a variety of potentially low-emitting, engineered fiber panels. A panel constructed of agricultural residue fiber (wheat straw) and MDI resin was included in the study, however, the study did not specify the manufacturer's name.

The wheatboard panels from the study were shown to have very low emissions factors of total volatile organic compounds (TVOC) and formaldehyde relative to urea-formaldehyde bonded particleboard. Report data showed the wheatboard estimated emission factor to be approximately 70 micrograms per square meter hour (µg /m^2 hr) of TVOC and 10 µg /m^2 hr of formaldehyde. The EPA test results essentially concur with the zero formaldehyde emissions claimed by PrimeBoard.

5.3.2 Current Users

PrimeBoard declined to provide a list of customers currently purchasing PrimeBoard™. However, they did state that approximately 99% of their product is sold to furniture and countertop manufacturers, and panel laminators. Less than 10% of their product is sold to lumber companies.

Closer investigation of the PrimeBoard™ web-site (www.wheatboard.com) revealed a PrimeBoard distributor list. Discussions with several PrimeBoard™ distributors indicated that product demand fluctuates, and the product appears to be primarily sold to customers with indoor air quality concerns related to formaldehyde off-gassing.

5.4 Product Comparisons

(Section 5.4 Omitted Due To Restricted Vendor Information)

5.5 Preliminary Life Cycle Costs

Although the cost of PrimeBoard™ is presently up to two cents greater per square foot than conventional particleboard, the benefit of improving Federal work environments by utilizing non-formaldehyde containing products and building materials should be considered.

The *qualitative* relationship between workplace environment and employee productivity is generally accepted among indoor air quality (IAQ) professionals. However, *quantitative* proof that workplace environment and employee productivity is related is limited and controversial. This is especially true when attempting to show directly that improvements to the workplace environment increase employee productivity.

Despite the lack of quantitative proof that maximum comfort leads to maximum productivity, it is not unreasonable to postulate that an improved environment decreases worker complaints and absenteeism, thus indirectly increasing productivity.

Several studies have shown that "employee" costs greatly exceed "building" costs in the operation of a facility. Therefore, spending additional money on renewable, non-formaldehyde containing building materials and products that improve building IAQ may be a cost-effective way to improve worker productivity. This is a significant point considering that the National Institute for Occupational Safety and Health (NIOSH) found that up to 20% of all "sick" buildings are attributed to the building fabric and contamination from inside the building.

Applying a preliminary life cycle cost analysis for Navy facilities based on the assumptions below yields the following:

- 10% of all Navy facilities suffer from IAQ problems
- 20% of the Navy facilities with IAQ problems are due to building fabric and contamination inside the building
- 50% of all acute health conditions are caused by upper respiratory irritation (URI)
- 5% of URI cases occur in facilities with formaldehyde off-gassing
- NAVFAC message 2014202 of November 1990 estimates the Navy owns 60,610 buildings
- The National Center for Health Statistics estimates that the absenteeism rate for white collar workers 18 years of age or older is 2.6% (9.5 days per year)
- $30,000 average employee salary
- 100 occupants average per building

Savings from reduced employee absenteeism is estimated as:

Total salary = (100 occupants per building)($30,000 per occupant)
= $3,000,000 per building

Absentee cost = (2.6% absenteeism rate)(Total salary)
= $78,000 per building

Savings due to decreased absenteeism = (Absentee cost)(50% conditions due to URI)
(5% of URI are associated with formaldehyde)
= $1,950 per building

Total number Navy buildings = 60,610

Navy buildings with IAQ problems = (10%)(60,610)
= 6,061

Navy buildings with IAQ problems due to formaldehyde containing materials
= (20%)(6061)
= 1,212 buildings

Savings due to decreased absenteeism = (1,212 buildings)($1,950 per building)
= $2,363,400 yearly

Therefore the estimated benefit of improving Navy work environments by utilizing non-formaldehyde containing products and building materials may be 2.4 million dollars annually. Benefits for the Army, Air Force, Marines, and other departments in the Federal Government are expected to be similar.

Table 5.4 displays the different quantities of PrimeBoard™ that could be purchased with the entire annual savings. The first column shows various proposed percentages of Navy buildings utilizing only non-formaldehyde containing products and materials. The second column shows the quantity of PrimeBoard™ that the annual savings will offset, based on an additional ten cents per square foot purchase price over conventional particleboard. For example if 25% of all Navy buildings used only non-formaldehyde containing products and materials, then approximately 6 million square feet (148,000 5'x 8' sheets) of PrimeBoard™ could be purchased with the resulting savings. If only 1% of all Navy buildings used only non-formaldehyde containing products and materials, then approximately 237 thousand square feet (5,900 5'x 8' sheets) of PrimeBoard™ could be purchased with the resulting savings.

Table 5.4: Required PrimeBoard™ Production and Estimated Annual Savings For Various Percentages of PrimeBoard™ Use Within Navy Buildings

Percentage of Non-Formaldehyde Containing Products and Materials In Navy Buildings (%)	PrimeBoard™ Required (ft^2)	Annual Savings ($)
100%	23,737,900	2,363,790
50%	11,818,950	1,181,895
25%	5,908,500	590,850
10%	2,363,400	236,340
5%	1,181,700	118,170
1%	236,340	23,634

The current capacity of the PrimeBoard™ plant is 30 million square feet on a ¾" basis. As the quantity of PrimeBoard™ purchased increases, the cost per square foot can be expected to decrease.

5.6 Potential Navy / DoD Users

The Federal Supply System is the method by which the Federal Government buys, stocks, and distributes over six million items. Federal Supply Class (FSC) Codes are assigned to each item which classify them into major groupings. Five FSC groups identified in the Federal Supply System that could potentially include PrimeBoard™ as a finished product or a lumber related material that substitutes for conventional Grade M-3 particleboard are:

(1) FSC: 5510 – Lumber and Related Basic Wood Materials
(2) FSC: 5520 – Millwork
(3) FSC: 7105 – Household Furniture
(4) FSC: 7110 – Office Furniture
(5) FSC: 7125 – Cabinets, Lockers, Bins, and Shelving

The major military buying offices or agencies procuring lumber and millwork include:

- Defense Construction Supply Center
- U.S. Army Corps of Engineers
- Navy Construction (each of the Engineering Field Divisions)

The major military buying offices or agencies procuring household furniture, office furniture, and cabinets, lockers, bins, and shelving include:

- Supply centers (each of the Fleet and Industrial Supply Centers)
- Defense General Supply Center
- Department of the Army Defense Supply Center Washington
- Aerospace Guidance and Metrology Center
- Defense Personnel Support Center

Note: The major buying offices or procuring agencies listed above mainly purchase particleboard through construction contractors, or alternatively, by purchasing goods and products that utilize particleboard as a construction material.

5.7 Conclusions

PrimeBoard™ is an environmentally responsible product made from pressed wheat straw and MDI adhesive that meets or exceeds the physical, Grade M-3, requirements for particleboard in ANSI A208.1. When it is compared to conventional particleboard made of wood particles and formaldehyde adhesives, two major advantages become apparent:

1) PrimeBoard™ is made from an annually renewable material.
2) PrimeBoard™ emits extremely low levels of formaldehyde (almost zero).

Third party test results from TECO test laboratories and the EPA appear to confirm several claims made by PrimeBoard about their PrimeBoard™ product.

Five FSC groups identified by the Federal Supply System that could potentially include PrimeBoard™ as a finished product or building material that substitutes for conventional Grade M-3 particleboard are:

(1) FSC: 5510 – Lumber and Related Basic Wood Materials
(2) FSC: 5520 – Millwork
(3) FSC: 7105 – Household Furniture
(4) FSC: 7110 – Office Furniture
(5) FSC: 7125 – Cabinets, Lockers, Bins, and Shelving

Price quotes from the particleboard industry indicate that PrimeBoard™ can cost up to ten cents more per square foot (depending on geographical location) than conventional wood based particleboard. However, the product may be considered cost-effective when the benefits of improving Federal work environments by utilizing non-formaldehyde containing products and building materials are considered.

5.8 Recommendations

Procuring agencies serving the Federal government should implement purchase preference for PrimeBoard™ where feasible. This action is in the spirit of Executive Order 13101 and RCRA section 6002, although PrimeBoard™ is presently not an EPA designated item.

5.9 Implementation

Table 5.5 lists the major buying offices or procuring agencies within the military that have a history of purchasing items identified by the FSC Codes 5510, 5520, 7105, 7110, and 7125.

Table 5.5: Purchasing Offices For Items Identified By FSC Codes

MILITARY AND GOVERNMENT PURCHASING OFFICES	FSC
Defense Construction Supply Center 3990 East Broad St Columbus , Ohio 43216-5000 (614) 692-3541	5510 5520
U.S. Army Corps of Engineers Office, Chief of Engineers Room 4117, Pulaski Building 20 Massachusetts Ave., NW Washington, DC 20314-1000 (202)272-0725	5510 5520
North Division Naval Facilities Engineering Command 10 Industrial Highway, Code 09J Lester, PA 19113-2090 (215) 595-0641	5510 5520
Chesapeake Division Naval Facilities Engineering Command Code 09J, Building 212 Washington Navy Yard Washington, DC 20374-2121 (202) 433-4666	5510 5520
Atlantic Division Naval Facilities Engineering Command Code 09J, Building N26, Room 275 1510 Gilbert Street Norfolk, VA 23511-2699 (804) 444-9011	5510 5520
Southern Division Naval Facilities Engineering Command Code 90J, P.O. Box 190010 2155 Eagle Drive Charleston, SC 2941909010 (803) 743-0935	5510 5520
Southwest Division Naval Facilities Engineering Command Code 09J, Building 208 900 Commodore Drive San Bruno, CA 94066-0720	5510 5520

Table 5.5: Purchasing Offices For Items Identified By FSC Codes (Continued)

MILITARY AND GOVERNMENT PURCHASING OFFICES	FSC
Pacific Division Naval Facilities Engineering Command, Code 09J Pearl Harbor, HI 96860-7300 (808) 471-4577	5510 5520
Dept. of the Army Defense Supply Service Washington 5200 Army Pentagon Washington, DC 20310-5200 (703) 697-6024	7110
Headquarters U. S. Marine Corp Code L-2 2 Navy Annex Washington, DC 20380-1775 (703) 696-1022	7105
Naval Regional Contracting Center Code 09B Naval Shipyard, Building 600 Philadelphia, PA 19112-5082 (215) 897-5405	7125
Fleet and Industrial Supply Center Code 04, Building W-143 1968 Gilbert Street, Suite 600 Norfolk, VA 23511-3392 (804) 445-2525	7105 7110 7125
Fleet and Industrial Supply Center Code 6 115 Cunningham Street, Suite A Pensacola, FL 32508-6200 (904) 452-8758	7105 7110 7125
Fleet and Industrial Supply Center 937 Harbor Drive, Code PKB San Diego, CA 92408-5044 (619) 532-3187	7105 7110 7125
Fleet and Industrial Supply Center Code 07, P.O. Box 97 Jacksonville, FL 32212-0097 (904) 779-3077	7105 7110 7125
Fleet and Industrial Supply Center Code 04 Charleston, SC 29408-6301 (803)743-2972	7105 7110 7125

Table 5.5: Purchasing Offices For Items Identified By FSC Codes (Continued)

MILITARY AND GOVERNMENT PURCHASING OFFICES	FSC
Fleet and Industrial Supply Center Puget Sound 467 W. Street, Code 04 Bremerton, WA 98314-5104 (206) 476-2812	7105 7110 7125
Fleet and Industrial Supply Center Regional Contracting Directorate (Ext. 206) Code 200M, P.O. Box 300 Pearl Harbor, HI 96860-5300	7105 7110 7125
Fleet and Industrial Supply Center Contracting Department Code 200 FPO AP 96540 011-671-334111	7105 7110 7125
Ogden Air Logistics Center 6038 Aspen Ave. SE Hill AFB, UT 84056-5802 (801) 777-4145	7110
Aerospace Guidance and Metrology Center Directorate of Contracting (PK-2) 813 Irving-Wick Dr, West Newark AFB, OH 43057-0027 (614) 522-7289	5510 5520 7710
Defense General Supply Center Bellwood, Petersburg Pike Richmond, VA 23297-5000 (804) 279-3617	7105 7125
Defense Personnel Support Center 2800 South 20th St. Philadelphia, PA 19101-8419 (215) 737-2321 1 (800) 523-0705	7110
General Services Administration Business Service Center Rocky Mountain Region Building 41, Room 145 Denver, CO 80225 (303) 236-7408	7105 7110 7125

One obstacle to the implementation of PrimeBoard™ is that procuring agencies do not stockpile any kind of particleboard. Even the most general government procuring agencies, GSA and DLA, have no listing of particleboard in their inventories. Instead, particleboard is purchased indirectly through contractors, or alternatively by purchasing goods and products utilizing particleboard as a construction material. Therefore, procuring agencies must actively advertise their desire to buy recycled products or sustainable products from recovered materials, both within their organizations and to product vendors. This goal can be attained through internal promotion. The process is a broad-based employee education program that will affirm the procurement policy of an agency through advertising, workshops, agency newsletters, and technical and staff manuals.

The vendor may increase the demand of their product indirectly through government procurement of products made from PrimeBoard™, specifically office furniture, household furniture, and cabinetry, bins, and shelves. To this end, the vendor or the manufacturer of office and household furniture made from PrimeBoard™, may submit a Standard Form 129 to each procurement agency listed in Table 5.5. More detailed information on this particular implementation process is provided in Section 6.0.

It is also strongly recommended that the vendor learn of construction material procurement opportunities through the Commerce Business Daily (CBD). The vendor may also greatly increase procurement opportunities by becoming fully capable of conducting electronic commerce with the government. More detailed information on these subjects is provided in Section 6.0.