Best Practices Guide

For

Post- Consumer Reclaimed Asphalt Shingles in Asphalt Pavement

Prepared by: Carolina Asphalt Pavement Association

September 2011

DISCLAIMER

This Best Practice Guide outlines Carolina Asphalt Pavement Association (CAPA) recommended practices for the use of Post- Consumer Reclaimed Asphalt Shingles (PRAS) in Asphalt Pavement. These recommendations are based upon the best information available and the use of PRAS in ASPHALT PAVEMENT at this time. This guide is not intended to be the authority for all regulations, specifications or policies mentioned. It is the responsibility of the entity using PRAS to ensure they comply with all Local, State and Federal regulations that may be involved in this practice.

TABLE OF CONTENTS

INTRODUCTION

This Best Practices Guide is intended to outline important areas involved in the use of Post-consumer reclaimed asphalt shingles (PRAS) for use in asphalt mix. PRAS are shingles that have been removed from roofs and have been previously used. Asphalt shingles can be a valuable resource to the producers of Asphalt Pavement in reducing the amount of virgin liquid asphalt in a mix. While the use of PRAS may be beneficial to the production of Asphalt Pavement it is very important that asphalt producers and all shingle processers in North Carolina to understand the responsibilities and regulations involved with the use of PRAS in asphalt mix.

North Carolina has been using manufacturer waste-reclaimed asphalt shingle (MRAS) in Asphalt Pavement for approximately 15 years. The use of MRAS has been successful and has reduced the amount of virgin liquid asphalt in Asphalt Pavement. The use of PRAS is somewhat different due to the possibility that some sources of PRAS could contain asbestos. Shingle manufacturing included asbestos until the late 1970's to early 1980's. Currently shingles produced today do not contain asbestos. Therefore the use of MRAS in Asphalt Pavement does not require testing for asbestos. However due the shingle age being unknown for PRAS, the testing for asbestos is required.

In North Carolina, the Asphalt Pavement Industry is constantly seeking new ways to improve the quality of Asphalt Pavement. While striving to improve quality and considering the funding challenges for the transportation system today, the use of PRAS is another way asphalt contractors and shingle recyclers can reduce costs and contribute to the sustainability of our State's transportation infrastructure. These reduced costs can then be passed on to the North Carolina Department of Transportation (NCDOT) and ultimately to the tax payers of North Carolina.

Another major benefit to the incorporation of PRAS in asphalt mix is contributing to the protection of our environment. It is estimated that roofing shingles are the third largest source of landfill material.

By reducing the amount of shingles which may otherwise enter landfills, less landfill space is required which is also very beneficial to our environment.

REGULATIONS

Prior to beginning to use PRAS in Asphalt Pavement, the asphalt producer must be keenly aware of all regulations regarding this practice. The use of PRAS in Asphalt Pavement must comply with all local, state and federal regulations. Regulations related to this practice involve but may not be limited to waste management, public health and air quality. Any questions regarding the state and federal regulations should be directed to the North Carolina Department of Environment and Natural Resources Division of Waste Management and Division of Air Quality and the North Carolina Department of Health and Human Services Health Hazard Control Unit. The lack of following all local, state and federal regulations may impact worker safety, Asphalt Pavement quality and jeopardize an asphalt plant's air quality permit.

One important component of complying with all local, state and federal regulations involves knowing the source of the PRAS. Another important component is ensuring the PRAS supplier is also aware of all local, state and federal regulations. These regulations involve but may not be limited to zoning, permitting, licenses, worker safety, asbestos testing, ground water protection, storm water runoff and dust control. Knowing and complying with all regulations is imperative to retain the ability to use PRAS and produce a quality Asphalt Pavement product.

PERMITS

The shingle recycler/asphalt producer will need to determine what permits are necessary to run their operation. This could be solid waste and recycling facility permits along with applicable air quality permits. They must also determine whether other regulations apply, such as state and federal worker health and safety regulations. State and federal air emissions and water quality protections must also be reviewed.

Each asphalt producer is responsible for modifying the air quality permit issued by the Division of Air Quality of NCDENR to use PRAS in asphalt mix production. This permit modification must be made and approved prior to the use of PRAS. The lack of complying with all regulations and permits or the use of PRAS prior to modifying the air quality permit may result in the air quality permit for the asphalt plant being revoked or suspended and the use of PRAS being eliminated. In ***Appendix III*** *you will find* ***"Draft Operating Permit Condition Language for Asphalt Plants Using PRAS"****. This document contains an example of language that may be contained in the modified air quality permit for the use of PRAS at asphalt plants. If you have any questions regarding this process please contact the Division of Air Quality of NCDENR.*

The following counties have been designated authority by the US Environmental Protection Agency to enforce the NESHAP regulation within their jurisdictions. Any facility in these counties will need to contact the appropriate local air quality program to determine if additional requirements are necessary.

Buncombe County

Western North Carolina Regional Air pollution Control Agency

49 Mt. Carmel Road

Asheville, NC 28806 Telephone: 828-250-6777

Forsyth County

Environmental Affairs Department

537 N. Spruce Street

Winston-Salem, NC 27101-1262 Telephone: 336-703-2440

Mecklenburg County

Mecklenburg County Land Use and Environmental Services Agency

Mecklenburg Air Quality

700 N. Tryon Street

Suite 205

Charlotte, NC 28202 Telephone: 704-336-5430

ASBESTOS OPERATION PLAN

The use of PRAS in Asphalt Pavement will require an Asbestos Operation Plan. This plan will outline how the PRAS will be obtained, tested and/or processed. This plan will also outline how the required documentation will be maintained.

In ***Appendix I*** *you will find the* ***"Guidelines for Grinding Post-Consumer Roofing Shingles in the Manufacture of Asphalt"*** *from the North Carolina Department of Health and Human Services, Health Hazard Control Unit. These guidelines will be a resource to the development of an Asbestos Operation Plan. The asphalt contractor, shingle recycler or processor using PRAS for Asphalt Pavement is required to submit an Asbestos Operation Plan to the N.C. Department of Health and Human Services Division of Public Health, Health Hazards Control Unit for review.*

Source of PRAS

In general there are three ways an asphalt producer will obtain PRAS. PRAS may be obtained in the processed form, ground and ready to be used in Asphalt Pavement. PRAS may be received from a permitted solid waste facility and then processed at the asphalt plant. PRAS may be obtained from roofing contractors and then processed at the asphalt plant. In each case the source of the PRAS must be documented. The source documentation will certify the PRAS originated from a NESHAP regulated facility or a non-NESHAP regulated facility. If the PRAS originated from a NESHAP regulated facility the NESHAP testing information will also be supplied to indicate the material contains less than 1% asbestos.

The asphalt producer will visually inspect each load of PRAS received to check for materials other than PRAS. This is important to obtain quality material and is also important for compliance with state regulations. If mixed roofing waste loads are received and additional sorting of the shingles from the waste material is required at the asphalt producer's facility, a Solid Waste Permit from the Solid Waste Section of NCDENR will be required. This process will be time consuming, labor intensive and will add cost to the operation. Therefore it is very important to educate the supplier of the PRAS to only deliver clean PRAS to the asphalt plant or other facility that will be performing the processing. If the PRAS contains material other than clean shingles it is recommended that the loads be rejected and returned to the original supplier for proper handling. To minimize debates regarding the various loads of PRAS that may be received from different sources, it is also very important to make sure loads are separated by source and visually inspected for debris other than PRAS immediately upon receipt.

In ***Appendix II*** *you will find a document titled* ***"RECYCLING OF TEAR-OFF ASPHALT SHINGLES"*** *by the North Carolina Department of Environment and Natural Resources, Division of Waste Management – Solid Waste Section.*

This document contains general information regarding asphalt shingles, terminology and references, collection and sorting guidance for permitted facilities, collection and grinding guidance for non-permitted facilities, a general

*"Operation Plan for Sorting at a Solid Waste Facility", a sample "**Shingle Supplier Certification**" form to be used by the shingle suppliers, and a sample "Notification of Asphalt Shingle Recycling at a Non-Permitted Facility". This document provides additional information regarding recycling shingles as it relates to solid waste regulations and practices. Also the "**Shingle Supplier Certification**" is the required document to be used by shingle suppliers when delivering shingles to be recycled. The asphalt producer and the shingle recycler or processor should train the shingle supplier on the proper procedures to supply shingles to their facility and use this document. This document should be maintained by the asphalt producer and the shingle recycler or processor for a minimum of 3 years.*

Asbestos Testing

Due to the potential of asbestos in tear-off shingle scrap, an asbestos testing plan must be included. Asbestos testing shall be based on the state and local agency requirements. A thorough quality control plan is essential for the asbestos testing process. A contingency plan is also necessary in the event that unacceptable levels of asbestos are detected. Asbestos testing should be done using standard methods prescribed in U.S. EPA and NESHAP rules. PRAS must be tested for asbestos prior to processing the material.

*Sampling and testing of PRAS can be done only by an **North Carolina Accredited Asbestos Inspector or an Accredited Roofing Supervisor** as defined by the North Carolina Department of Health and Human Services Health Hazards Unit under section 10A NCAC 41C .0602 Accreditation. Asbestos testing involves sampling each layer of PRAS using standard methods prescribed in NESHAP rules. Samples will then be analyzed for asbestos content. It is required that every load of shingles be visually inspected for cleanliness (lack of miscellaneous debris) as well as any material which could possibly contain asbestos. It is further required that asbestos sampling and testing by **North Carolina Accredited Asbestos Inspector or an Accredited Roofing Supervisor occur at minimum intervals of 100 tons of material received.** However, if suspect material is observed in the load it is required that the load be rejected or tested for asbestos and disposed of properly*

regardless of the frequency(Note: multi-layer or oxidized shingles are possible examples of suspect material).

It is best to separate loads of PRAS that have not been tested from tested loads of PRAS. Once the material passes the test requirements it may be moved to the main stockpile. Material that does not pass the required tests will need to be transported to an approved disposal site.

It is the responsibility of the asphalt producer to inspect the material for any hazardous or harmful materials that could result in regulatory actions against the asphalt plant. It is of utmost importance that the health and safety of employees and the protection of the environment be the highest priority when PRAS is used.

Each load of PRAS shall be inspected by personnel trained to visually detect possible ACM. This process must be detailed in the Asbestos Operation Plan. If you have any questions regarding the proper procedures for asbestos testing you should contact the Department of Health and Human Services, Health Hazard Control Unit.

INDEPENDENT RECYCLERS OR PROCESSERS

In addition to the guidelines mentioned above, any independent recycler or processor that will process tear-off shingle scrap delivered to their facility for processing is required to obtain a Solid Waste Permit from the Solid Waste Section of NCDENR. The recycler or processor will also be required to process PRAS to the most current NCDOT Specifications.

All recyclers and processers must have PRAS source and testing documentation. The source documentation will indicate the origin of the material and if the material is NESHAP regulated or non-NESHAP regulated. Any NESHAP regulated material will also contain official testing documentation indicating the material contains less than 1% asbestos. The recycler and processors must also have documentation for all non-NESHAP material which indicates the material contains

less than 1% asbestos and has been tested and sampled in accordance with all State, Local EPA and NESHAP regulations. This documentation must be supplied to the asphalt producer. This documentation is required for each load of PRAS material delivered to the asphalt plant. The asphalt producer and the recycler shall maintain this documentation for a minimum of 3 years.

PRAS PROCESSING

One of the most important aspects of recycling PRAS is the processing. Processing or grinding is a critical factor when using PRAS in asphalt mix. Research has shown that grinding the PRAS to a size smaller than 3/8" provides the best blending of the shingles with the virgin aggregates and virgin binder. It is currently required in the NCDOT specifications that PRAS be processed to 100% passing the 3/8" sieve.

Proper blending is important in order to insure that the binder from the PRAS is activated. Due to the different types of shingle grinding machines being used today, it is very important to understand how these machines operate and process shingles. Processing PRAS is a little different than processing MRAS because of differences in the types of materials.

MRAS are much softer and will react differently during the grinding process. PRAS are much more brittle from oxidation of the asphalt binder due to aging. This brittleness makes it easier to grind PRAS. Make sure that the shingle processor understands the basics of the grinding operation. This includes making sure the shingles are being sprayed with water as they enter the grinder to control fugitive dust and provides cooling for the grinder. The granules and fillers contained in shingles are very abrasive and will accelerate normal wear on recycling equipment.

Recycling equipment being used to grind shingles should have some type of magnet at the end of the exit conveyor located on the head pulley for removing nails and other metals. Shingles must be processed to meet the NCDOT Specifications that only allow 0.5% by total cumulative weight of deleterious waste material.

Note: *To conduct deleterious material testing, prepare and weigh a 500 to 700 gram sample of material retained on the 4.75-mm (No. 4) sieve. Separate and weigh any deleterious materials. Divide the weight of the deleterious materials by the total sample weight and multiply by 100. This is the percent of deleterious material and must be 0.5% or less.*

Note: *The success of processing or grinding a good quality product will depend on the company's Quality Control (QC) program. What goes in the grinder comes out of the grinder. It is essential that your PRAS are clean before they enter a grinding machine.*

Safety is important with all procedures necessary to use PRAS in Asphalt Pavement and especially during the processing of PRAS. Continuously wearing safety equipment including but not limited to gloves, approved safety glasses and hardhat are recommended. Shingles can be abrasive and should be handled with care so not to cause harm to all employees involved in the process. Shingle handling and processing should be done in compliance with all OSHA safety regulations and any other safety regulations that may apply. If you have any questions regarding appropriate safety practices please contact OSHA immediately.

STOCKPILE MANAGEMENT

The processed and unprocessed stockpiles are an important part of the recycling operation. An unprocessed stockpile must be handled differently than the processed stockpile. Once PRAS are processed, the material needs to be carefully handled by the loader operator.

It is strongly recommended that no equipment ever climb the stockpile while feeding or loading from the pile. This will keep the pile from becoming compacted which makes it hard to feed from when in production.

Blending fine aggregate or RAP with processed shingles is allowed to keep the material workable. Between 10% and 20% sand, screenings, or fine RAP is the amount recommended to prevent the shingles from sticking together. This 10-20% of material must be accounted for in the mix design process.

The stockpile should always be tossed and turned as much as possible (define frequency) to help keep the shingles dry and loose while feeding from the pile. This practice is equally important when not feeding from the pile to keep shingle stockpiles free from agglomerations.

DOCUMENTATION

Requiring and maintaining proper documentation is essential to a successful practice of using PRAS in Asphalt Pavement. As mentioned above, the source of the shingles are very important to ensure compliance with state and federal regulations. It is also important to document the source to determine if the material is from a NESHAP regulated facility or a NON-NESHAP regulated facility. Documenting the source is important in the event that asbestos greater than 1% is found to be in the material so all impacts of the material can be traced.

Testing for asbestos is paramount to the safe use of PRAS in Asphalt Pavement. For this reason all documentation indicating test results are important. This documentation is the proof that the use of PRAS in Asphalt Pavement has been done in a safe manner.

Due to the importance of the documentation is necessary to maintain both the shingle source document and all asbestos testing documentation for NESHAP and Non-NESHAP regulated material for at least 3 years. Failing to comply with regulations and failing to maintain the source and testing documents may result in the air quality permit for the asphalt plant being revoked or suspended.

AUDITING THE PROCESS

To ensure proper compliance with all procedures involved with the use of PRAS in Asphalt Pavement and the associated regulations, audits are necessary. Internal audits performed by individuals not associated with the day to day processes are recommended. After the internal audits are completed the findings should be documented and corrections made to the processes immediately.

Annual training is also recommended for all individuals involved in the process of the use of PRAS in Asphalt Pavement. The training should review correct procedures for all processes including proper documentation and documentation maintenance.

Audits of the process and compliance with the regulations will also be performed by NCDENR Solid Waste and Air Quality Divisions as well as the Department of Health and Human Services Health Hazard Control Unit. The NCDOT will also audit the use of PRAS in Asphalt Pavement. In order to have successful audits, all source and asbestos testing documentation should be kept in an organized fashion and a safe location, such that the information can be easily shared and compliance with all regulations and the Asbestos Operation Plan be demonstrated.

CONCLUSION

As mentioned earlier the use of PRAS in Asphalt Pavement has many benefits. All aspects related to the use of PRAS should be done in such a manner to ensure the utmost quality of the end product, Asphalt Pavement. Shortcutting the process should not be considered as this will only deter from quality and could eliminate the allowance of practice. Following the proper processes and regulations should be held in the highest regard in order to provide long term benefits to the economy and environment.

Mix design policy and procedures can be found in the North Carolina Department of Transportation Standard Specifications for Roads and Structures, and in the specific contract Special Provisions.

CONTACT INFORMATION

If you have any questions or comments related to this document, or information in the appendix, you may contact the responsible entity using the directories at the following web address:

Carolina Asphalt Pavement Association in Raleigh, North Carolina – http://carolinaasphalt.org

North Carolina Department of Health and Human Services, Health Hazard Control Unit – http://www.epi.state.nc.us/epi/asbestos/healthaz.html

North Carolina Department of Environment and Natural Resources, Division of Waste Management - http://portal.ncdenr.org/web/wm/

North Carolina Department of Environment and Natural Resources, Division of Air Quality - http://daq.state.nc.us/

North Carolina Department of Transportation, Construction Unit - http://www.ncdot.org/doh/operations/dp_chief_eng/constructionunit/

North Carolina Department of Transportation, Materials and Test Unit - http://www.ncdot.org/doh/operations/materials/

APPENDIX

APPENDIX I
Guidelines for Grinding Post-Consumer Asphalt Roofing Shingles in the Manufacture of Asphalt

Asbestos is the name given to a naturally occurring group of minerals composed of tiny, easily inhaled fibers. In the past, asbestos was added to a variety of building materials to provide strength, heat insulation, and fire resistance. Breathing airborne asbestos fibers can lead to an increased risk of serious diseases, including asbestosis, lung cancer and mesothelioma.

Recycling of asbestos-containing building materials may result in asbestos fibers becoming airborne. For this reason, building materials that may contain asbestos may not be recycled and must be disposed of in a landfill permitted to accept asbestos-containing materials. By prohibiting asbestos-containing materials from entering the asphalt manufacturing industry, environmental contamination and the exposure of facility employees, downstream recipients and the general public can be prevented.

In an effort to ensure that asbestos-containing materials are not ground and used in the manufacture of asphalt products in North Carolina, the Health Hazards Control Unit (HHCU) is providing the following guidelines to assist you with writing an asbestos operations plan for your facility:

1. An asbestos operations plan will be submitted to the HHCU for review before grinding operations can begin at each facility. If your facility is located in Buncombe, Forsyth, or Mecklenburg County, contact the local air quality program for information regarding local requirements.

2. Provide the complete name of the company, as well as the mailing address, telephone number, point of contact and the county where each facility is located. Additionally, provide the days and hours of operation, and, where applicable, list the North Carolina Division of Air Quality and/or Division of Waste Management, Solid Waste Section permit number for each facility location.

3. If the facility is owned by someone other than the company submitting the asbestos operations plan, provide the name of the property owner, as well as their mailing address and telephone number.

4. The only roofing shingles addressed in this guidance are post-consumer roofing shingles.

5. Provide information as to the original source(s) of any post-consumer roofing shingles entering each facility. Include the supplier(s) name, mailing address and telephone number for each landfill, recycling center, individual, etc.

6. Regardless of the source(s) of roofing shingles, all post-consumer roofing shingles which will be ground must contain less than 1% asbestos.

7. No facility will grind flat built-up roofing, roof flashing, roofing felts, roofing shingles that have been coated with asbestos-containing paint or mastic, or asbestos cement shingles. These materials must be sent to a permitted solid waste facility approved to receive such materials.

8. Each facility will use a North Carolina accredited asbestos inspector or a NC accredited asbestos roofing supervisor to inspect suspect post-consumer roofing shingles for the presence of asbestos before grinding. The NC accredited asbestos inspector or accredited roofing supervisor will determine the sufficient number of samples to collect based upon their experience and the color and texture of materials.

9. Each facility must sort and identify loads received and track each load from its original source to the facility and match the documentation for post-consumer roofing shingles from the appropriate supplier, transporter, and waste ticket used in exchange for the shingles. Attach a copy of an asbestos survey if one was conducted prior to transporting the post-consumer roofing shingles to the facility.

10. Provide a legible diagram of each facility property, documenting the physical layout of the operation.

11. Explain how each facility will provide water for dust suppression during grinding activities.

12. Any load of post-consumer roofing shingles identified as containing > 1 % asbestos must be rejected and disposed of in a permitted landfill. Provide the name of the landfill, point of contact, physical address and telephone number of the landfill to be used for this purpose.

13. Add the words "asbestos and/or asbestos-containing material" as <u>unacceptable material</u> to the sign at the entrance to each facility and/or place this information on other media used to educate suppliers.

14. If the facility operation accidentally grinds asbestos-containing shingles, all work must stop, the ground material must be isolated, and the Health Hazards Control Unit (HHCU) notified at (919) 707-5950.

15. If it becomes necessary for the facility to modify the asbestos operations plan, submit a revision to the HHCU for review.

16. At least one individual, who is an employee of the facility and who is on site during normal operations, will need to be asbestos trained in order to meet the OSHA requirements for competent person. This person will have the authority to address potential asbestos issues and stop work if necessary. Currently, the recommended training is the two-day asbestos roofing supervisor course.

17. Keep a current copy of the asbestos operations plan, asbestos sampling results, training records, revisions and other supporting documentation at each facility location. Each facility must also be able to maintain records for any post-consumer asphalt roofing shingles, ground or not, which were sold to an individual/company. All records must be kept on site where the grinding operation will take place.

18. Any deficiencies identified during an inspection by the North Carolina Division of Air Quality or the Division of Solid Waste Management will be addressed by the appropriate agency and a copy of the correspondence sent to the HHCU.

19. Describe the type of asbestos training and/or educational material that will be used to educate suppliers of post-consumer roofing shingles. Provide a copy of any asbestos educational materials for employees and contractors as part of the asbestos operations plan.

20. The HHCU recommends using the EPA Method 600/93/116 for determining the presence of asbestos in post-consumer roofing shingles instead of the polarized light microscopy method. The EPA Method 600/93/116 addresses the use of "Gravimetry" for preparing samples by reducing the bound matrix down to a smaller volume of material to analyze and provide more accurate results when determining the presence or absence of asbestos.

For additional information, please contact the Health Hazards Control Unit at 919-707-5950. You can also access information about our Program including listings of accredited asbestos professionals by visiting our web site at: www.epi.state.nc.us/epi/asbestos/ahmp.html

APPENDIX II

RECYCLING OF TEAR-OFF ASPHALT SHINGLES

North Carolina Department of Environment and Natural Resources
Division of Waste Management – Solid Waste Section

I. Introduction

Asphalt roofing shingles contain asphalt cement, mineral aggregate, and mineral filler which are raw materials used in asphalt production. The North Carolina Department of Transportation (NCDOT) and the North Carolina Department of Environment and Natural Resources (NCDENR)– Division of Air Quality (NCDENR - DAQ) allow the use of both ground manufacturers' asphalt shingle scrap and tear-off asphalt shingles in asphalt production. The use of tear-off asphalt shingles, which would otherwise be disposed as construction and demolition debris waste, reduces raw materials costs for asphalt plants and saves valuable landfill space.

However, not every tear-off shingle is recyclable. Asbestos was used for many years in the manufacture of tear-off asphalt shingles and other roofing products. Although not specifically banned from use, asbestos has generally not been used in U.S. shingle manufacture since the mid-1970s. Therefore, asbestos is not a concern when recycling manufacturer's asphalt shingle scrap. However, it may be present in shingles from roofs with several layers or in other roofing materials. If asbestos is present, the grinding of the shingles could release asbestos fibers into the air and expose workers to asbestos.

The NCDENR Division of Waste Management – Solid Waste Section (Section) has developed this document to suggest procedures to provide a "clean" tear-off shingle stream that can be used in asphalt production while also being protective of public health and the environment.

II. Terminology and References

There is not one universally accepted terminology in the recycling of shingles. The following terms apply to this document and are, in general, consistent with terminology used by NCDOT, NCDENR-DAQ, the Health Hazards Control Unit in the Department of Health and Human Service (HHCU), the Carolina Asphalt Pavement Association (CAPA), and the Construction Materials Recycling Association (CMRA).

"Manufacturers' Asphalt Shingle Scrap" (also referred to as "pre-consumer" asphalt shingle scrap) is excess recyclable material not usable directly by the shingle manufacturing plant. It includes rejected asphalt shingles and shingle tabs that are discarded in the manufacture of new asphalt shingles. This material does not contain asbestos.

"Manufacturer-waste Reclaimed Asphalt Shingles" (MRAS) is the name used by NCDOT for manufacturers' asphalt shingle scrap when used in NCDOT projects. The specification includes the size of the material and the amount that can be used in the asphalt mix.

"Tear-off shingles" are asphalt shingles from re-roofing projects whereby the old shingle layers are removed to prepare the roof surface for new shingles and/or other roofing materials. This material may contain asbestos.

"Post-consumer Reclaimed Asphalt Shingles" (PRAS) is the name used in NCDENR-DAQ asphalt plant permits and in NCDOT material specification for material derived from tear-off shingles. The NCDENR-DAQ raw material specification for PRAS addresses the source of the shingles and the asbestos content. The NCDOT material specification adds requirements for the removal of non-shingle roofing debris, size of the ground shingles, and the amount that can be used in the asphalt mix.

"Reclaimed Asphalt Shingles" (RAS) is a term used in NCDOT material specification to mean either MRAS or PRAS.

"Built-up roofing" is a roof system that is built by adding layers of roofing felts or fabric and saturating the layer with bitumen such as coal tar or asphalt. It is used on buildings with low-slope or flat roof structures. Asbestos was more prevalent in the roofing mats and it is not acceptable for recycling.

"Mixed Roofing Material" is roofing waste that has not been source separated. It contains non-shingle debris (e.g., plastic, wood, metal flashing and gutters, paper, garbage) which cannot be used in asphalt production. Picking tear-off shingles or other recyclables from mixed roofing material requires a solid waste permit that includes the picking process in the approved facility operation plan. This material may contain asbestos and review of the plan by HHCU or other responsible agency may be required.

"Source-separated shingles" are tear-off asphalt shingles that have been set aside for recycling at the roofing job site by the roofer. "Source separation" is defined in 40 CFR 246.101. Source separation requires the roofer to set up a separate container for the shingles or to load the shingles in a single layer that can be easily separated from other roofing waste when unloaded. Source separation is not dumping roofing waste and picking out the shingles or contaminants.

"Sorted shingles" are tear-off asphalt shingles that have been separated from non-roofing debris at a solid waste facility that is permitted to sort, store, and manage tear-off shingles.

"NESHAP" means the National Emission Standards for Hazardous Air Pollutants. The National Emission Standard for Asbestos is found in 40 CFR 61, Subpart M.

"Non-regulated Facility" and "Regulated Facility" is used to differentiate whether a facility is subject to the Asbestos NESHAP Standard for Demolition and Renovation, 40 CFR 61.145. Owners or operators of a demolition or renovation activity for a regulated facility must submit a "Notification of Demolition and Renovation" which includes an inspection for the presence of asbestos prior to beginning work. Tear-off shingles from a regulated facility should be accompanied by documentation of their asbestos content. The NESHAP does not generally cover roofing projects on single family homes or on residential building containing four or fewer dwelling units, 40 CFR 61 Subpart M, Appendix A.

III. Collection at a Permitted Solid Waste Facility

A permitted solid waste facility may add the collection and sorting of tear-off asphalt shingles to their facility operation plan by submitting a request to the Section that addresses the acceptance, sorting, storage, and management of shingles at their facility.

An example that may be used as a starting point for a request is provided in Appendix A. It is based on practices recommended by the CMRA, CAPA, HHCU, and the experience of solid waste facilities and asphalt plants.

The waste acceptance criteria are very important in providing material that can be recycled. It is recommended that the solid waste facilities "train" roofers about what is and isn't recyclable for PRAS and to separate the recyclable tear-off shingles from other roofing waste when cleaning up at the job site. Only tear-off asphalt shingles can be recycled into asphalt pavement. Built-up roofing material is not acceptable for recycling. An example of a shingle supplier specification list is provided in Appendix B. A facility may modify the example to fit their specific operation.

A landfill or transfer station will only be authorized to perform minimal sorting of waste. Therefore, these facilities may only accept source-separated tear-off asphalt shingles for recycling. Sorting of demolition waste and mixed roofing materials requires a solid waste processor permit and an asbestos screening plan.

The source of the tear-off shingles must also be documented. If the shingles were removed from a facility not regulated under the Asbestos NESHAP, generally a single family home or residentially building with less than four dwelling units, only the source of the shingles must be documented. If shingles were removed from an Asbestos NESHAP-regulated facility, both the source of the shingles and the asbestos content must be documented. The documentation of the asbestos content is a letter from the North Carolina accredited asbestos inspector or roofing supervisor that performed the sampling and the analytical results showing the asbestos content of the shingles. If the shingles contain greater than one (1) percent asbestos or if the documentation of the asbestos content is not provided, the shingles may not be recycled and must be disposed. A solid waste facility may choose to only accept tear-off shingles from non-regulated facilities or may choose to accept shingles from both regulated and non-regulated facilities. An example of a shingle supplier certification form is provided in Appendix B. The form was developed as an example that could be used by solid waste permitted facilities and non-permitted facilities. A facility may modify the example to fit their specific operation.

Supplier certification and documentation is a requirement for a solid waste permitted facility and is also required by the asphalt plants permitted by NCDENR-DAQ. The facility should consult with the customer of their sorted shingles to determine if there are additional requirements.

IV. Processing and Grinding at Permitted Solid Waste Facility

A facility that accepts mixed roofing waste from either a solid waste facility or a roofer in order to remove tear-off asphalt shingles and other recyclables from the waste must have a solid waste processor permit.

The facility must submit a request to the Section with a facility operation plan that includes the acceptance, storage, and management of shingles as described in Section III, along with other requirements for a solid waste processor permit. A screening plan that has been reviewed by the HHCU or regional agency responsible for the Asbestos NESHAP must also be provided.

If the facility also wishes to grind the shingles, the application must include an asbestos operation plan for the grinding process. The Section can provide guidelines developed by the HHCU to assist facilities in developing a grinding operation plan. The Section may require review of the sorting and grinding operations by HHCU or regional agency responsible for the Asbestos NESHAP. The facility should

consult with the customer of their sorted shingles or ground PRAS to determine if there are additional requirements.

V. Collection, Grinding, and Use at Non-Permitted Facilities

Facilities that fall under this category are primarily asphalt plants that plan to accept, grind, and use the tear-off shingles at their plant and facilities that plan to produce PRAS for sale to asphalt plants.

A non-permitted facility may only accept source-separated tear-off shingles from the roofer, sorted tear-off shingles from a solid waste facility, or ground PRAS. They may not accept mixed loads and may only perform limited removal of deleterious materials such as paper, plastic, bottles and cans, etc. The facility may not accept or remove other recyclable materials that are not part of asphalt production, e.g., wood, plastic, metals flashing and gutters, unless they obtain a solid waste permit. It is recommended that the unpermitted facilities "train" roofers about what is and isn't recyclable and to separate the recyclable tear-off shingles from other roofing waste when cleaning up at the job site. An example of a supplier specification list is provided in Appendix B. A facility may modify the example to fit their specific operation.

The source of the tear-off shingles must also be documented. If the shingles were removed from a facility not regulated under the Asbestos NESHAP, generally a single family home or residentially building with less than four dwelling units, only the source of the shingles must be documented. If shingles were removed from an Asbestos NESHAP-regulated facility, both the source of the shingles and the asbestos content must be documented. The documentation of the asbestos content is a letter from the North Carolina accredited asbestos inspector or roofing supervisor that performed the sampling and the analytical results showing the asbestos content of the shingles. If the shingles contain greater than one (1) percent asbestos or if the documentation of the asbestos content is not provided, the shingles may not be recycled and must be sent to a transfer station or landfill for disposal. A non-permitted facility may choose to only accept tear-off shingles from non-regulated facilities or may choose to accept shingles from both regulated and non-regulated facilities. An example of a shingle supplier certification form is provided in Appendix B. The form was developed as an example that could be used by solid waste permitted facilities and non-permitted facilities. A facility may modify the example to fit their specific operation.

It is recommended that the facility also review *Recycling Tear-off Asphalt Shingles: Best Practices Guide* available from the CMRA at www.shinglerecycling.org and the *Best Practices for Recycling Post-Consumer Reclaimed Asphalt Shingles in Hot Mix Asphalt* available from CAPA.

The CAPA document reflects the best practice recommended for asphalt plants in North Carolina. It references the testing frequency and protocols set by NCDENR-DAQ and NCDOT. In addition, non-permitted facilities should review the NCDOT provision for the use of PRAS, consult NCDENR- DAQ concerning the use of PRAS if they have an asphalt plant air emissions permit, and determine the proper testing frequency, as appropriate. The current minimum testing frequency is to sample each 100 tons of shingles (September 2011).

A non-permitted facility should maintain records of the tear-off shingles coming into the facility and the amount of material that is used, reused, or sold. The tear-off shingles and RAS should be managed in a manner to prevent it from entering the environment and posing a threat to public health and safety. The Section can provide guidelines developed by the HHCU to assist facilities in developing a grinding

operation plan. However, it is the facility's responsibility to ensure that appropriate permits and/or approvals are obtained.

The facility may be asked by the Section to demonstrate that 75% of the tear-off shingles received have been used, reused, or sold within a year and to document that they have the appropriate environmental permits and are in compliance with the permits. If the facility cannot provide the documentation and are not in compliance with other permits, the Section may determine the tear-off shingles must be managed as a solid waste and the facility will have to obtain a solid waste facility permit. These requirements are based on NCGS 130A-309.05(c) which is the basis for not requiring shingles to be managed as a solid waste.

Appendix C contains a voluntary notification form for non-permitted facilities that are recycling tear-off shingles. The form serves as a tool for facility to document understanding of the criteria to avoid management as a solid waste and provides the Section with a list of facilities participating in shingle recycling that can be shared with interested parties.

APPENDIX A

General Operation Plan

For Tear-off Asphalt Shingle Sorting

at a Solid Waste Permitted Facility

NAME OF THE FACILITY

Permit No.

Address of the Facility
City, NC Zip

Operation Plan for Sorting

Tear-off Asphalt Shingles for Recycling

Name of the applicant

Mailing address

Prepared by:

Name of the preparer

Address

Date

I. Introduction

This operation plan describes how tear-off asphalt shingles will be collected, sorted, stored, and managed at this facility in order to provide a material that can be used into asphalt production. Our facility uses best practices for acceptance and sorting to remove the tear-off shingles from the waste stream and divert the "clean" shingles to other facilities.

II. Waste Acceptance

Asphalt roofing shingles contain asphalt cement, mineral aggregate, and mineral filler which are raw materials used in asphalt production. Asbestos was used in shingle manufacture until the mid-1970's and in other roofing materials such as roof felt, roof putty, surface coating, and mastic until the mid 1980s.

Our facility provides roofers with a list of acceptable and unacceptable items for tear-off shingle recycling and requires source separation at the job site by the roofer. Materials from flat and built-up roofing system are disposed rather accepted for recycling due the higher use of asbestos roofing materials in those systems. Roofers are instructed to separate tear-off shingles into either a dedicated trailer or to layer their waste when loading so that the shingles can be easily separated from the unacceptable debris. Our list of acceptable and unacceptable material is shown in Attachment ___.

The shingle suppliers are also required to complete a supplier certification form. The handling and disposal of asbestos during demolition and renovation is regulated under the National Emissions Standards for Hazardous Air Pollution (NESHAP). NESHAP-regulated facilities are required to submit a notification of demolition and renovation prior to starting work. The notification includes an inspection by a North Carolina accredited asbestos inspector or roofing supervisor and analysis for asbestos. The supplier of shingles from a NESHAP-regulated facility must present documentation that the shingles do not contain greater than 1% asbestos. The documentation is a letter from the accredited asbestos inspector or roofing supervisor that sampled the shingles and the analytical test results. A copy is of the documentation is kept with the supplier certification form. Shingles from a NESHAP-regulated facility that do not have the required documentation or that are documented to contain greater than 1% asbestos are disposed.

Shingles from single family homes or residential buildings containing four or fewer dwelling units are generally not regulated under NESHAP. Only the source of shingles it required for these shingles.

Our supplier certification form is shown in Attachment ___. These practices help ensure that only recyclable tear-off shingles are sent for asphalt production while reducing sorting at our facility.

III. Flow and Management of Tear-off Shingles

Loads are visually inspected when entering the facility to determine whether the shingles have been separated or if it is a mixed load. The roofer is asked to complete a supplier certification form. Mixed loads, shingles from a NESHAP-regulated facility that contain greater than 1 percent asbestos, and shingles from a NESHAP-regulated facility without the proper documentation are directed to the

[landfill or transfer station tipping floor] for disposal. Loads that were source-separated into dedicated containers are sent directly to the sorting area and unloaded. Loads that were separated into layers usually have the asphalt shingle on the bottom and other material on the top. These loads are first directed to the *[landfill or transfer station tipping floor]* to remove the non-shingle roofing waste and then to the sorting area for unloading the shingles. Figure __ shows the location of the sorting area on the site plan and Figure __ shows the unloading, sorting, and storage areas. Shingles are not unloaded into an area with standing water and sorted and unsorted materials are kept separate.

Source-separation by the roofer eliminates most of the unacceptable materials that cannot be used in tear-off shingle recycling. The unloaded tear-off shingles are examined for unacceptable materials and any unacceptable materials are removed. The remaining sorted shingles are accumulated *[in the designated area or in a roll off box or in a container]* until there is a sufficient amount to transport to a facility that will grind and use or sell the ground shingles for asphalt production. *[A copy of the supplier certification form accompanies each sorted load to the receiving facility.]* At least 75% of the tear-off shingles that are sorted leave the facility during the same year.

IV. Recording Keeping

Records are kept of shingle waste entering the facility, sorted shingles leaving the facility for recycling, and waste that is disposed or sent for disposal. These records are kept for use in the facility's monthly and annual reports. Supplier certification forms and any supporting documents are also kept.

V. [Additional Operations/Requirements]

[Please check with the facility that will receive the sorted shingles to determine if there are additional requirements. Those requirements and any other site specific operations may be included here. Asbestos sampling and testing is required prior to grinding shingles. The testing frequency and protocols are set by NCDENR-DAQ and NCDOT. The current frequency current testing requirement is to sample each 100 tons of shingles (September 2011).

Appendix B

TEAR-OFF ASPHALT SHINGLE RECYCLING

List of Acceptable and Unacceptable Materials

"YES"

Include these items:

- Shingles
- Felt attached to shingles

"NO"

Do NOT include these items:

- Wood
- Metal flashings, gutters, etc.
- Nails (best effort)
- Rolls of sheets of felt paper
- Plastic wrap, buckets
- Paper waste
- No garbage, trash, or other waste materials
- Built-up asphalt roofing
- Asbestos-containing materials
- Shingles containing mastics

[*Company or Facility Name*]

SHINGLE SUPPLIER CERTIFICATION FORM

Supplier of Whole Tear-off Asphalt Shingles

Supplier Name: _____

Address: _____

Contact Name: _____

Phone: _____

We the undersigned certify that (check appropriate boxes):

☐ The tear-off shingles are from a NESHAP regulated facility and documentation stating that the shingles do not contain >1% asbestos is attached. (Documentation is a letter from the North Carolina accredited asbestos inspector or roofing supervisor that collected the samples with the analytical results attached.)

☐ The tear-off shingles are from a single family home or residential building having four or fewer dwelling units that is not regulated under NESHAP.

Tear-off shingles were removed from the following addresses:

_____

_____

_____

(Please attach additional sheets as needed to record each building address.)

_____ _____

Shingle Supplier (signature) Date

APPENDIX C

Notification of Asphalt Shingle Recycling

at a Non-Permitted Facility

Print Form

ASPHALT SHINGLES

State of North Carolina
Department of Environment and Natural Resources
Division of Waste Management

NOTIFICATION
TEAR-OFF SHINGLE RECYCLING

Facility Name: _____

Physical Address	Mailing Address
Street 1: _____	Street 1: _____
Street 2: _____	Street 2: _____
City: _____ County: _____	City: _____
State: North Carolina Zip: _____	State: North Carolina Zip: _____

Primary Facility Contact Person

Name: _____

Phone: _____ Fax: _____

Email: _____

(for office use)

1. Material Accepted (Check all that apply)

- ☐ Source-separated tear-off shingles from roofer
- ☐ Sorted tear-off shingles from permitted solid waste facility
- ☐ Sorted tear-off shingles from another asphalt plant
- ☐ Ground asphalt shingle material (NCDOT PRAS)

2. Shingle Certification (Check all that apply)

- ☐ Facility requires roofers to complete a shingle supplier certification form that includes the address of the source of shingles.
- ☐ Facility accepts shingles from NESHAP-regulated facilites and requires asbestos testing documentation.

3. Operations at facility (Check all that apply)

- ☐ Storage of Shingles
- ☐ Sampling for Asbestos
- ☐ Grinding
- ☐ Asphalt production
- ☐ Storage of Ground Shingles for use at facility
- ☐ Storage of Ground Shingles for sale

4. Permits or Approvals (Enter permit numbers)

NPDES Stormwater: _____

NCDENR-DAQ Emission: _____

Other: _____

CERTIFICATION: I certify that I read the instructions for completing this form and that the information provided is an accurate representation of the activity at this facility.

Signature: _____ Date: _____

Name: _____ Title: _____

Phone Number: _____ Email: _____

INSTRUCTIONS FOR TEAR-OFF SHINGLE RECYCLING NOTIFICATION

Tear-off asphalt shingles are not regulated as a solid waste if they meet certain criteria. The purpose of this notification is to document that a facility wanting to be excluded from solid waste regulation understands these criteria. An additional benefit of this notification is to provide the Division of Waste Management, Solid Waste Section with a list of facilities participating in shingle recycling that can be shared with interested parties.

Facility Name – This is the name of your facility.

Physical Address – This is the E911 address for your facility.

Mailing Address – This is the mailing address the Section can send an acknowledgement of receipt of the notification.

Primary Facility Contact Person – This is the person that an interested party may contact for more information about supplying or getting material from your facility.

Material Accepted – The shingles must be removed from the solid waste stream prior to acceptance. Only shingles that have been source-separated at the job site or sorted at a permitted solid waste facility may be received by a non-permitted facility. Sorting of mixed loads containing other roofing waste such as wood, flashing, gutters, plastics, trash and other non-asphalt-shingle materials requires a solid waste permit.

Shingle Certification – Documentation of the source of the shingles is required for use in NCDENR-DAQ permitted asphalt plant and for use in NC DOT paving projects. Non-residential buildings and residential buildings having four or more dwelling units are "regulated facilities" under the asbestos National Emissions Standards for Hazardous Air Pollutants (NESHAPs)(40 CFR 61 Subpart M, Appendix A). Tear-off shingles from regulated facilities require the certification of the source and documentation that the shingles do not contain >1% asbestos. Documentation is a letter from the North Carolina accredited asbestos inspector or roofing supervisor that collected samples and the analytical results. Single-family homes and residential buildings having four or fewer dwelling units are generally not regulated facilities and only the source of shingles is required. Materials that cannot be accepted cannot be recycled and are subject to regulation as a solid waste. The facility operator should check with the facility reusing the reclaimed asphalt shingles to determine specific requirements.

Operations at facility – For asphalt tear-off shingles to avoid regulation as a solid waste, neither the shingles nor the products or the by-products of the operations that process the tear-off shingles, can enter the environment or pose a threat to public health and safety. In addition, at least 75% of the tear-off shingles must be sold, used, or reused within a year. (Records of the listed operations could be used to document that this material is not subject to solid waste regulations.)

Permits or Approval – Information on permits or other approvals indicating oversight of operations that could pose a threat to public health and safety.

Certification – This is to document that the information is accurate and that these instructions have been read.

Send completed form to NCDENR-Division of Waste Management, Solid Waste Section-Permitting Branch, MSC 1646, Raleigh, NC 27699-1646

APPENDIX III
Draft Operating Permit Condition Language for Asphalt Plants Using PRAS

RECYCLED ASPHALT SHINGLE REQUIREMENTS - In accordance with Rule 2Q .0317, the Permittee is avoiding the applicability of Rule 2Q .0700 for asbestos and 40 CFR 61, Subpart M, *National Emission Standard for Asbestos* by using post-consumer reclaimed asphalt roofing shingles (also known as PRAS and herin denoted as recycled shingles) which are equivalent to their virgin or unadulterated counterparts. The Permittee is allowed to use the recycled shingles and associated asphalt roofing materials provided the following conditions are met:

a. Specifications - The recycled shingles shall be considered equivalent to unadulterated asphalt and aggregate for use in manufacturing of asphalt concrete by meeting the following criteria:

   The recycled shingles and roofing materials are certified to be free of asbestos containing material (ACM). ACM is defined as materials containing more than one percent (1 %) by weight of asbestos. This certification shall be provided by demonstration that the materials sampled and representative of the recycled asphalt roofing materials contain less than 1 percent asbestos or is certified to be asbestos free as measured by the method specified in appendix E. 40 CFR 763, Section 1, polarized light microscopy (PLM).

b. The Permittee is responsible for ensuring that the recycled shingles and roofing materials, as used at the site, meet the approved criteria for unadulterated materials including meeting minimum sampling criteria as specified by best practices. These practices shall include visual inspection of each load for suspect ACM and a sampling of at least one sample event per 100 tons of recycled shingles received for processing. Recycled asphalt roofing materials purchased or provided by an outside vendor shall include a certification that the material does not contain ACM with each load or batch purchased and delivered to the facility and that it was tested in accordance with the best practices specified above.

c. If certification of the incoming recycled shingle material is not provided by an outside vendor, the Permittee shall arrange for testing and certification of the material as not being ACM, meeting the specifications outlined above, prior to use in the process. The Permittee shall arrange for the results of such sampling and testing to be provided in a manner and form consistent with meeting the recordkeeping requirements cited below.

d. The Permittee is held responsible for any discrepancies discovered by DAQ as a result of any sampling and analysis of the recycled shingles and asphalt roofing materials.

e. Recordkeeping Requirements - The Permittee shall maintain certifications that the materials received and used are not ACM. These certifications shall be maintained at the facility for a minimum of three years, and shall be made available to representatives of the DAQ upon request. In addition, accurate records of the following:

   i. The actual amount of recycled shingles delivered to and used at the facility in the production of asphalt concrete pavement.

   ii. Each load or batch of recycled shingles received from an outside vendor shall include the following:

      1. A delivery manifest document clearly showing the shipment content and amount, its place and date of loading, and place and date of destination.

      2. A batch specific analytical report that contains an analysis for all constituents / properties listed above in the specification. Analytical results of the samples representative of the recycled shingles/ roofing materials shipment from the vendor shall be no more than one year old when received.

      3. Batch signature information consisting of the following: a batch number, batch weight or volume of recycled shingles/ roofing materials delivered.

      4. A certification statement indicating that the recycled shingles were sampled in accordance with best practices and tested according to appendix E, 40 CFR 763, Section 1 and do not contain ACM or are otherwise asbestos-free as determined by PLM prior to grinding.

f. The Permittee shall be obligated to comply with any additional regulations or obtain any additional permits associated with the receipt and/or storage of the recycled asphalt roofing materials. This permit condition to use these materials in the asphalt concrete manufacturing process creates no waiver from other applicable laws and regulations.

g. The DAQ reserves the right to require additional testing and/or monitoring of the recycled shingles/roofing materials in accordance with Rule 2Q. 0317.