DURAPAX™
COAL TAR
COMMERCIAL ROOFING SYSTEMS

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Durapax Coal Tar BUR Application Guide

DESIGN CONSIDERATIONS

The proper specifications of any roof system are extremely important to its long-term performance. To assist designers and applicators in obtaining the desired results, Durapax offers this guide. Although major topics of consideration are discussed in detail, any other elements (e.g. structural framing, climate, interior conditions, etc.,) are important and must be taken into consideration. It is the responsibility of the design professional to take the material presented in this guide and determine that all segments of the overall project design are appropriate.

As an additional reference guide, Durapax *recommends the National Roofing Contractors Association Roofing and Waterproofing Manual*. The information contained in this publication has been developed by industry experts from scientific evaluation and actual field experience. If presented with a situation not covered therein, consult your Durapax representative for clarification. As with any roofing project, good roofing practices should always be followed. Consult Durapax Specification Data Sheets for specific information.

SLOPE LIMITATIONS

Due to coal tar's unique resistance to moisture, Durapax membrane systems can be applied on slopes of 1/8", 1/4" or 1/2" per ft. or less, depending on the specification. Consult Durapax Specification data Sheets for specific slope requirements.

When using Durapax coal tar pitch, envelopes and pitch dams must be used to reduce the potential for bitumen drippage.

VAPOR RETARDERS

The need for a vapor retarder must be determined by the system designer and must be based on climate, building construction, use and occupancy. The type of vapor retarder used must be compatible with other roof system components and be installed to provide a moisture-tight system.

INSULATIONS

When a Durapax complete systems warranty is specified, the insulation products approved by Durapax must be incorporated into the system.

Insulation Application

The following guidelines apply when selecting and installing the desired insulation products:

- Insulation shall be specifically recommended for each particular roof deck/membrane application.
- Insulation shall comply with Durapax specifications, building codes, insurance requirements and other applicable requirements.
- Double layer applications are preferred whenever possible. When the first layer of insulation is mechanically fastened, an overlay board set in asphalt or insulation adhesive is required for 15 and 25 year warranties. When only one layer is used and mechanically fastened, an organic base sheet mopped in asphalt or applied with membrane adhesive is required as the first ply of the membrane system.
- All Durapax membrane systems over isocyanurate insulations require an overlayment board to be set in bitumen or insulation adhesive. Maximum thickness of first layer of Polyisocyanurate is 2.5 inches.
- NOTE: The use of coal tar pitch to install the overlay board is not recommended when the base layer is mechanically fastened.
- When using multiple layers, offset the joints of the upper layer the maximum distance possible from the joints of the layer directly beneath the upper layer.
- Check specific deck requirements, since certain roof decks require insulation to be installed prior to the membrane application.
- No more insulation should be installed than can be covered by a membrane system the same day.
- All board insulation must be kept protected and dry.
- If the insulation is to be installed between a va-

por retarder or a concrete deck and the membrane, fiberglass roof insulation is recommended for use as one of the layers.

- SPECIAL NOTE: 48” x 48” (4’ x 4’) insulation boards may be mechanically fastened or adhered to the substrate. 48” x 96” (4’ x 8’) insulation boards are to be mechanically fastened to the substrate. When using bitumen for attachment of the insulation, boards no larger than 48” x 48” (4’ x 4”) should be used. The use of insulation adhesive for the attachment of boards larger than 48” x 48” (4’ x 4”) is not recommended.
- NOTE: When using Insulation Adhesive to adhere fiberboard insulation, the board should be no larger than 48” x 48” (4’ x 4’), have a minimum thickness of ½” and be asphalt coated on all six sides.

For requirements pertaining to specific insulation products, consult your Durapax representative.

Insulation Adhesive

Insulation adhesive products may be desired in certain situations for use as an adhesive for bonding approved roof insulations to a building’s structural roof deck, base sheets, other insulation boards and smooth (non-graveled) built-up roof surfaces for approved recover applications.
Any insulation adhesive used must be specifically approved for use with the applicable products and system configuration. For additional information, consult your Durapax representative.

Surface Preparation

All substrates should be clean, dry, free of dirt, debris, oils, loose and/or embedded gravel, unadhered coatings, deteriorated membrane and other contaminants that may result in a substrate that is not sound. Use applicable primers when needed.

DECKS

All decks must be installed in accordance with their manufacturer’s specifications, be structurally sound, and be designed to accept live and dead loads including the desired roofing system.

Consideration must be given to movement and the need for expansion joints.

Excessive deck deflection can cause a roof system problem. Durapax recommends following the guidelines for maximum allowable deck deflection published by the National Roofing Contractors Association.

All deck surfaces must be reasonably smooth, clean and dry before starting the insulation or membrane application. Any loose decking should be appropriately attached using the techniques designed for the construction.

Care must be taken to design a deck system, which reduces the potential for bitumen drippage.

Durapax will not accept responsibility for improperly designed deck systems, bitumen drippage, migration or membrane slippage.

The following are additional design requirements applicable to individual deck types. These comments, however, should not be the only considerations when specifying a membrane over the designated deck.

The designer/specifier should consult all available information before committing to a final specification.

Steel Decks

Design and install deck to comply with deck manufacturer’s specification.

- Comply with Steel Deck Institute procedures.
- Shall be 22 gauge or heavier.
- Shall be permanently attached to the structural framing.
- Metal decks must be covered by at least one layer of insulation board with a thickness suitable to span the flute as recommended by the insulation manufacturer. Consult Factory Mutual (FM) Data Sheet 1-28 on recommendation for maximum spans.
- Metal decks must be covered by at least one layer of insulation board mechanically attached to meet a minimum FM 1-60 requirement.

- ***Durapax will not be responsible for bitumen drippage, damage to the membrane caused by fasteners or lack thereof or improper attachment.***
- When acoustical metal decks are used, to reduce the potential for bitumen drippage, the roofing system must include a dry sheet on the deck and the first ply of the membrane system must be a base sheet set in steep asphalt.
- **NOTE:** The base sheet and the CTP plies must all be installed the same day. Phase construction is not permitted. At no time shall the base sheet be used as a temporary roof.
- Install membrane system in accordance with applicable specification.

Wood Decks (Plywood/Plank)

- Comply with Department of Commerce Standards PS 1-74.
- Design and install in accordance with the American Plywood Association. Grade C-D or better.
- Secure to structure with annular threaded, ring shank nails or screws.
- All joints shall be supported.
- Cover installed deck with rosin-sized sheathing paper (scatter nail).
- A double layer of approved insulation is required when not using base sheet.
- When installing the Durapax membrane system without insulation, properly nail a base sheet over rosin paper and install membrane in accordance with the applicable specification.
- Install membrane system in accordance with appropriate specification.

Gypsum/Lightweight Insulating Concrete Decks

- Design and install deck in accordance with the deck manufacturer's recommendations.
- Steel deck should be 28 gauge corrugated or heavier.
- An approved base sheet should be mechanically fastened, with an approved fastener, to the deck according to manufacturer's recommendations.
- On new decks provision must be made for venting to the outside.
- The membrane or insulation should never be installed directly to these type decks with bitumen or adhesive.
- If board type insulation is required, install it in steep asphalt over the mechanically fastened asphalt base sheet.
- Board insulation should not be installed over newly installed gypsum or lightweight concrete substrates.
- Metal reinforcing mesh of existing gypsum decks should not be rusted.
- Gypsum decks shall have a minimum thickness of 2" (50 mm).
- Install membrane system in accordance with appropriate specification.

Structural/Precast Concrete Decks

- All joints or cracks must be even, filled with grout and stripped with organic felt set in asphalt flashing cement to prevent bitumen drippage.
- Follow the recommendations of the Precast Concrete Institute (for panel applications).
- Install deck in accordance with the manufacturer's specifications.
- At least one layer of roof insulation is required over precast panel applications.
- Prime deck with appropiate primer.
- When using insulation, prime deck with asphalt primer and set boards in full moppings of hot steep asphalt.
- Mechanical fastening of insulation is optional.

Structural Wood Fiber Decks

- Install deck in accordance with deck manufacturer's specifications.
- All deck joints should be even, grouted and sealed with organic felt stripping set in asphalt flashing cement.
- Cover deck with 1 ply organic base sheet mechanically attached with approved fasteners.

With structural wood fiber decks, a minimum layer of approved insulation is required. A base sheet

should be mechanically attached to the deck with approved fasteners and the insulation installed in a full mopping of steep asphalt. As an option, the insulation may be mechanically attached to the deck over a loose laid rosin paper with approved fasteners. A base sheet mopped in steep asphalt is required as the first ply of the membrane system installed over structural wood fiber decks.

EXPANSION JOINTS

Roof areas that extend further than 200 feet in any direction normally require the use of expansion joints, which extend across the entire width of the roof. The expansion joint must not terminate short of the roof edge or perimeter. The expansion joint should be constructed to a minimum raised height of eight (8) inches above the roof line. Water drainage should never be obstructed by the expansion joint. Drainage should never be attempted through or over an expansion joint.

Expansion joints should be provided:

- Wherever expansion or contraction joints are provided in the structural systems.
- Where steel framing, structural steel or decking change direction.
- Where separate wings of “L,” “U,” “T” or similar configurations exist.
- Whenever additions are connected to existing buildings.
- Whenever the type of decking changes.
- Where movement between vertical walls and the roof deck may occur.
- At junctions where interior heating conditions change.

CANT STRIPS

At all intersections of vertical and horizontal surfaces, such as walls, equipment curbs, expansion joints, etc., install a 45° cant strip, providing a four (4) inch rise above the roof’s surface. Consult Flashing Specifications for specific details. Although a treated solid wood cant is preferred when a cant strip is needed, wood fiber or perlite cant strips are acceptable in warranted applications.
It is recommended that the wood fiber or perlite cant be installed in asphalt cement to avoid bitumen drippage. The solid wood cant is to be mechanically attached with approved fasteners. Care must also be taken to avoid bitumen from entering the building at such edge details.

MATERIAL PROTECTION

All materials must be kept clean and dry prior to their installation. When stored outside or on a job site, materials must be kept off the ground and adequately covered with canvas (breathable, not polyethylene) tarpaulins. NOTE: X-cut the sides of all plastic covers prior to covering with a tarp. For long periods of storage, the materials should be properly warehoused.

All rolls should be stored on end and not double stacked. If rolls become deformed, the material may be laid out on the roof in the sun and allowed to relax. Any damaged or wet material shall not be used. Any damaged or wet material shall be conspicuously marked and removed from the job site.

MEMBRANE SYSTEM APPLICATION-GENERAL

All substrate materials (e.g. decks, insulation, vapor retarders, etc.) must be solid, clean, dry and properly installed. If a base sheet is required as the first ply of the roof membrane system, it must be installed in accordance with the applicable Durapax membrane system specification.

When mechanical fastening of the base sheet is required, the minimum fastening pattern is as follows: Install approved fasteners nine inches (230 mm) on center along the side laps and stagger fasten 18” (455 mm) on the center in two rows equally spaced between the side laps. An asphalt base sheet adhered in hot asphalt may be used as the first ply when hot applying Durapax membranes in coal tar pitch.

Depending on the particular application, an increased number or special fasteners and/or plates may be required per Factory Mutual installation guidelines. *At no time, when installing a Durapax System, shall a base sheet used as the first ply of the primary roofing membrane system, be left exposed overnight or used as a temporary roof.*

COLD WEATHER APPLICATIONS-GENERAL

Warm and dry weather conditions are ideal for installing any commercial roofing system. In any weather conditions, the substrate must be free of moisture (e.g. dew, rains, frost, snow, ice, condensate, etc.).

When applying hot bitumen in cold weather, precautions must be taken to be certain the temperature of the bitumen, at the actual point of application, complies with the specified requirements without over-heating the material. Insulated equipment may be necessary to achieve the desired results. Special care must also be taken to assure that the roofing felts are totally embedded into the bitumen at the specified point of application temperature. All roof felts/membranes shall be immediately broomed or pressed into place to assure total adhesion.

NOTE: Installing the roofing bitumen at less than the EVT temperatures can cause the use of greater amounts of material, that can lead to roof slippage. Care must be taken to avoid applying more than the specified amount of bitumen.

If point of application temperatures cannot be maintained, the application should be stopped until conditions improve.

GENERAL MEMBRANE APPLICATION

When installing a Durapax System, all plies must be fully embedded in the hot bitumen. At no place shall one ply or felt touch another. All plies shall be laid shingle fashion in accordance with the specification. Avoid walking on membrane until bitumen has cooled and set.

The total membrane system shall be completed at one time. Phased construction is not acceptable. All felts shall be immediately broomed into the bitumen at its EVT to ensure total adhesion.

At the intersection of all vertical and horizontal surfaces, such as walls, curbs expansion joints, etc., all plies shall extend to the top of the cant strip no further than two (2) inches above its top edge. Care must be taken to assure that all plies conform as tightly as possible to this configuration.

Application of Coal Tar Pitch

Whether applied by mop or mechanical spreader, the coal tar pitch must be sufficiently hot to adhere the system. It must not, however, be heated to temperatures greater than recommended (see below).

Application and Heating Temperature Guidelines

	Heating Maximum	Point of Application
Product	°F	°F
Coal Tar Pitch ASTM Type I	400º	360º ±25

Note: Kettle temperature should not exceed 325 °F if material is not being used and replenished. This is for jobsite use, and should material not be used in 4 hours the kettle should be shut down.

It is extremely important that all interply moppings be as thin as practical, but continuous without interruptions or voids and of sufficient amount to adhere the felt plies. Heavy moppings can contribute to membrane slippage.

Pitch weight can vary significantly between plies of a system. Experience has demonstrated that an interply mopping averaging not less than 20 lbs. per 100 square feet is adequate for constructing a membrane assembly.

BITUMEN CONTROL/ENVELOPES

Envelopes can be installed using two plies of non-perforated organic felt or polyester reinforced smooth membrane suitable for use as an envelope. The envelope should be a minimum 18” wide, or can be wider if needed to cover the juncture between the nailer and insulation. It should be in-

At all horizontal edge details such as gravel stops, raised edge perimeters, vent pipes, pitch pockets etc. a 2 ply felt envelope or some other type of pitch dam must be provided to avoid bitumen drippage or bitumen migration from between plies. Durapax will not be responsible for bitumen drippage or migration.

stalled in a solid trowelling of approved asphalt mastic or a solid mopping of steep asphalt. Half of the envelope should extend beyond the edge of the roof. After membrane installation the extended portion should be folded back over the completed membrane and embedded in approved asphalt mastic prior to setting of the gravel stop in a bed of asphalt mastic. After metal is secured, remove excess envelope extending past metal prior to stripping.

AGGREGATE SURFACING

Before top pouring the membrane with pitch and embedding the aggregate, the roof membrane must be inspected to determine that all plies are lying smooth and foreign materials have been removed.

Over the entire membrane surface, apply a uniform coating of hot coal tar pitch at an average rate of not less than 70 lbs. per 100 sq. ft. While the coal tar is still hot, embed 400 lbs. of gravel or 300 lbs. of slag per 100 square feet. These figures are offered only as a guide and can vary depending upon many factors. Actual experience by the contractor must be considered when estimating project requirements.

To obtain the desired top coating of pitch, it should be applied either by pouring or through a mechanical applicator designed and regulated for this purpose. The aggregate used shall be reasonably clean, dry, and meet ASTM D-1863 standards. The aggregate must be spread into the top pour while it is still hot enough to achieve the required bonding.

FLASHING INSTALLATION-GENERAL

1. All substrates must be inspected and repaired, if necessary, prior to installation of flashing materials.
2. Masonry walls should be checked for softness, cracks, deteriorated mortar or insufficient joints and should be repaired.
3. Walls, including frame type, must provide adequate backing for support & fastening of flashing materials.
4. All masonry shall be primed with the appropriate primer for the flashing system being installed.
5. All base and counter flashing materials must be securely attached to the substrate or wood nailer.
6. Basic wood blocking anchorage recommendations are found in Factory Mutual Data Sheet I-49.
7. Install flashing at all intersections of vertical and horizontal surfaces. Install flashing materials in accordance with the particular flashing specification.
8. Flashing membrane height shall be no less than 8” or more than 24” above the roof surface.
9. Flashing membrane must be cut to manageable application length. The back up plies can be installed in lengths of up to 6’. The top ply should be cut to a length no longer than the width of the roll. Flashing laps shall be 4 inches and when installing a granulated sheet, the selvage shall be used as the flashing lap. When installing an asphalt flashing system, and a flashing lap occurs on the granule surface, unless the lap is torched or heat welded, it must be three coursed with a four inch strip of fabric set into and top coated with asphalt mastic and coated with Durapax Aluminum Coating. See applicable flashing specifications for additional information.
10. On masonry substrates install 1”x 1/8” flat anchor bar approximately ½ inch from the top edge of the flashing, fastening into the masonry on 8 inch centers, with fasteners specifically designed for the intended use.
11. On a wood substrate, fasten the top edge of the completed flashing system using nails with a ring shank and a 1 inch diameter metal head. Install fasteners 8 inches on center for flashing up to 12 inches high and 4 inches on center for flashing up to 24 inches high.
12. Strip the top edge of the completed flashing system, including the anchor bar or fasteners, with a 4 inch wide strip of reinforcing fabric set into and top coated with Durapax asphalt flashing cement.
13. The top of all flashing is to be covered a minimum of 4 inches with metal counterflashing. If the flashing is run up and over the top of a parapet, nailing and stripping can be completed at the outer edge over the top of a parapet’s

wood nailer and a metal coping installed. Note: If the flashing sheet is ran over the top of the wall and turned down (approximately 2 inches) and fastened on the outside of the nailer, stripping is not required. Follow SMACNA guidelines for all formed sheet metal.

14. Do not flash above a through-wall counterflashing.
15. Do not flash over existing weep holes.

Reroof/Recover Applications

If reroofing requires complete removal of all existing roofing materials, treat the application as you would a new building. If conditions dictate that complete removal of all existing materials is not possible (e.g. roof membrane, insulation, etc.), consult your Durapax representative for specific recommendations.

Recover (without tear-off)

The existing roofing system is subject to inspection prior to start of roofing by Durapax.

1. All existing substrate materials (e.g. deck, insulation, membrane, etc.) must be solid, dry and well attached. A moisture survey is recommended and in some cases may be required.
2. Wet or damaged materials must be replaced prior to proceeding with the recover operation.
3. All recover applications require the use of a recover board. Roof system warranties on recover operations are limited.

Protected Roof Membrane Assemblies (PRMA)

New construction or tear-off to an existing sound deck is required. The condition and structural integrity of the underlying deck is most important. In addition to the general requirements that the deck be smooth, dry, without any cracks over ¼ inch wide, or holes larger than 1 inch in diameter, the deck and underlying structure must be able to support ballast loads grater than 20 pounds per square foot or more depending on the specifics of the PRMA to be employed. It is the sole responsibility of the building owner to establish the ability of its building to hold the ballasted roofing system plus snow loads, live loads, etc.

On some decks, such as steel decks, a minimum layer of insulation is required to be installed prior to the application of the Durapax Specification. The possibility of moisture condensation occurring in this layer of insulation should not be overlooked, particularly in colder climates. Each PRMA job should be evaluated by the architect, design engineer, or owner to determine that the dew point is not in this layer of insulation and that a condensation problem will not develop.

Only extruded polystyrene insulation (XPS) with a minimum compressive strength of 40 psi is acceptable as the insulating board on top of the membrane. The slip sheet, insulation and ballast can be installed only after the pour coat of coal tar pitch has cooled.

NOTE: The roof membrane and flashing system must be inspected prior to installing insulation, pavers or gravel ballast.

The insulation boards must be a minimum of 2" thick and must have channels on the bottom to provide for the flow of water beneath the panels toward drainage. The XPS boards can be plain or come with a factory applied cementitious top layer. This cementitious top layer must be weather resistant and soundly bonded to the XPS. The installation of the XPS boards should strictly follow the recommendations of the insulation manufacturer. In general, the boards should be snugly butted, tongue and grooves engaged where they exist. When no factory applied ballast exists on the XPS boards, provisions must be made for ballasting the insulation. Where pavers are to be used, they must be a minimum of 2 feet by 2 feet. For a 4 foot perimeter of the roof, pavers must weight a minimum of 20 lbs. per square foot as determined by the building owner or its consultants. Pavers must be weather resistant with a minimum compressive strength of 3000 psi. Pavers must not rest directly on the XPS. A ½" space should exist between the paver and the top of the XPS board.

For gravel ballasted systems, a fabric such as Confil 689 H[1] (3 ounces per yard) black polyester from International Paper Co. or Rufon®[2] P38

(3ounces per yard) black polypropylene from Phillips Fiber Corp. must be installed over the XPS boards with side laps of 1 foot and end laps of 2 feet. The ballast must be clean and dry, free of excess fines. The gravel ballast must meet ASTM D-448-80 graduation No. 5. The ballast loading must be calculated for each PRMA installation based upon each job's specific circumstances. However, in no case should the ballast be applied below a minimum rate of 10 pounds per square foot in the field of the roof.

Insulation, fabric, and ballasts should be installed as the Durapax Membrane and Flashing is completed. However, when using Durapax specifications utilizing Tar Coated (TC) glass fiber felts, the application of the top pour can be delayed for up to 14 days after the membrane has been installed. When using Durapax specifications utilizing tarred organic felt, the top pour of coal tar, polyethelene, insulation, filter fabric and ballast must be applied the same day the membrane is installed.
For PRMA's, all parapet and roof top penetration must be designed to provide for flashing a minimum of 8 inches above the top of the ballast.

[1] Made by the International Paper Company.

[2] Rufon® is the registered trademark of Phillips Fibers Corporation.