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Built-up Roofing

Manual for
Architects
Engineers
Contractors
1970

KOPPERS
Architectural and
Construction Materials

preface

This manual contains recommended roofing specifications and procedures which are based on the many years of Koppers experience and generally accepted good roofing practice. They are intended to provide the architect, engineer, general contractor and roofer with the proper information to plan and construct the best built-up roof with the most time-proven materials available today.

The availability of a Koppers surety bond for roofing and flashing constructed according to the information contained in this manual under Koppers bond procedure, which customarily includes inspection by Koppers during application, and the publishing of these specifications and information shall not be construed as creating any warranty, expressed or implied, with regard to any roofing or flashing for which a bond has not been issued.

This roofing manual supersedes all previous roofing manuals and literature published by Koppers.

Coal Tar Roofing Pitch

Tar is a very familiar word, however it has different meanings for different people. To many it is any black liquid adhesive or plastic substance; however, it is much more than this. It is a hydrocarbon, meaning it is composed primarily of carbon and hydrogen and is therefore an organic compound.

Tar is obtained from the "destructive distillation" of coal, primarily bituminous coal. This means when coal is heated to very high temperatures without contact with air (thus not allowing the combustion of coal and its derivatives) the coal molecules in effect are "cracked" into little molecules (gas), medium molecules (tar) and coke. We see, therefore, that the more proper term is Coal Tar.

Coal tar, through further distillation processes, is refined and separated

into products of great commercial usefulness and value:

PITCHES—of various consistencies such as roofing material, waterproofing products, protective coatings for metals, masonry, etc.

CREOSOTE—for wood-preserving
CHEMICAL OILS—for use in the manufacture of drugs, dyes, paints, varnishes, cosmetics, plastics, synthetic rubber, etc.

Coal tar is indeed a vital and valuable product that produces materials for many industries in our world of today.

In the ever-growing construction industry a very valuable tar derivative is Coal-Tar Roofing Pitch. Its value is found in the fact that it has superb water and corrosive resistance qualities as well as being an excellent adhesive especially applicable in adhering the tarred roofing felts together in

built-up-roofing. These qualities are due to the unique property that was endowed to it by nature. Without going into a highly technical chemical analysis it can be most simply stated that Coal Tar Roofing Pitch is a balanced organic compound. The atoms in Roofing Pitch—carbon (C) and hydrogen (H)—have a very strong molecular attraction or bond one to another and hence attacking atoms of oxygen (O) cannot attach themselves to the hydrogen atoms of Roofing Pitch and form a water molecule (H₂O) that will be absorbed into the pitch.

Coal Tar Roofing Pitch is therefore inherently resistant to molecular penetration by water. Coal Tar Roofing Pitch is nature's own balanced answer to waterproofing (roofs and elsewhere), adhesive bonding, and chemical resistance, especially to water-borne chemicals.

Coal Tar Pitch built-up roofing

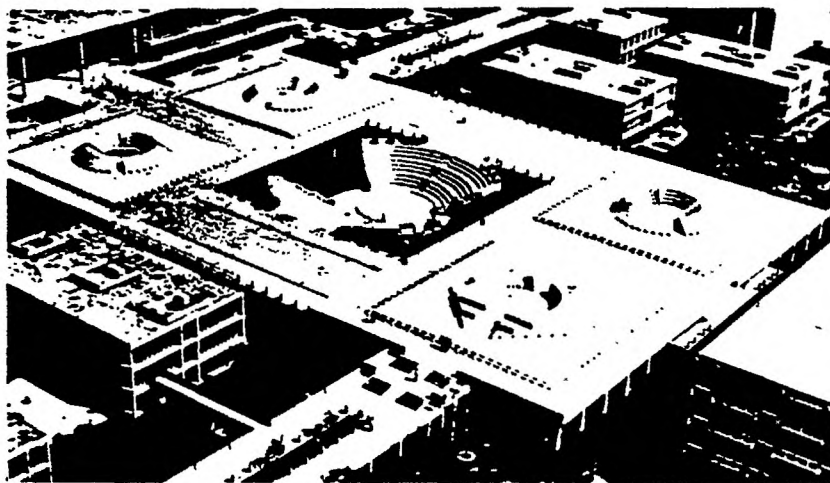
Koppers coal tar pitch built-up roofing systems consist of layers of Koppers Old Style Pitch and Koppers approved tarred felt, surfaced with a heavy top pouring of Koppers Old Style Pitch into which is embedded an aggregate.

Koppers coal tar pitch built-up roofing systems are used whenever a roof is exposed to water and/or corrosion and on all level or low sloped roofs where long, maintenance-free service is required. Particularly recommended for:

- All 'dead' level roofs
- All water cooled roofs
- Low sloped roofs with retarded drainage
- Low sloped roofs with occasional water ponding

(Note: coal tar pitch roofs are especially suitable to withstand the water attack around drainage areas on roofs that are pitched to the drains.)

All buildings with level or low sloped roofs that are built for long service life



An open-air amphitheater and four multi-level patios serve as a common roof for the Lecture Center at Chicago's Circle Campus. The architect, Skidmore, Owings and Merrill, specified a Koppers 5-ply membrane system for protection of the complex.

Coal tar pitch built-up roofing provides one of the most durable roofing membranes known. The advantages are found in the inherent superior characteristics of coal tar pitch for this

purpose. This is the time-proven roofing system for level and low sloped roofs.

Coal tar pitch has a natural resistance to water, air and water vapor

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Construction Materials

The specifications and details contained in this manual have been determined to cover the proper procedures for long lasting built-up-roofing for most areas of our country. In certain locations minor variations in details and specifications may be appropriate due to unusual local conditions, such as wind, temperature, humidity, etc. To assure the best application of the proper specifications and details for your area, we recommend consulting our roof structure system specialist... your local Koppers sales representative.

penetration. A tight molecular structure enables coal tar pitch to permanently withstand water penetration and resist oxidation of the roof surface. Koppers water-cooled roof specifications take advantage of the unique water-resistant characteristics of coal tar pitch to give you long-term roofing performance.

Another unique feature of coal tar roofing is its self-healing ability. Alligatoring and hairline cracks common to most materials, eventually cause damage to the roofing membrane. Coal tar pitch has a property known as "cold-flow" which automatically corrects these conditions before serious damage takes place. This "cold-flow" feature heals small mechanical fractures at normal temperatures.

Time and statistics have proven that coal tar roofing pitch when applied in accordance with the specifications in this manual results in the highest acceptable quality level of any built-up roofing system. Coal tar pitch is a nature-formed polynuclear large molecule compound. Coal tar roofing pitch is a selectively manufactured fraction which satisfies the basic requirements for long-term roofing ser-

vice on level and low-sloped roofs.

In recent years some people in the construction industry have been placing strong emphasis on the use of a minimum $\frac{1}{4}$ " slope on all roof structures. This is certainly an ideal to be desired, and Koppers does concur with this thought; however, it is not a prerequisite of our specification. We are well aware that not all buildings can be practically designed with a minimum $\frac{1}{4}$ " per foot slope, due to special architectural design criteria or specifications that may outweigh this roofing requirement. In some areas of the country local codes require roof drains to be retarded during heavy rain storms to reduce the peak periods of water drainage in storm sewers. There are also existing buildings that require re-roofing that have flat roofs, and, or due to natural building settlement have inherent water-ponding conditions.

This emphasis on the $\frac{1}{4}$ " per foot slope has caused some concern to designers and specification writers. It has created a design gap over what suitable bitumen to use in those special conditions where the roofs are not, or cannot be designed incorporating this

minimum slope, or where there is an inherent water-ponding situation.

Koppers has the answer. Coal tar roofing pitch, due to its chemical composition has a natural resistance to water as well as most corrosive atmospheres, in fact, greater than any other normally used roof coating. It does then indeed provide the answer to this bitumen design gap that has been created by the virtual requirement by some of the minimum $\frac{1}{4}$ " per foot slope.

Koppers is not suggesting the elimination of a slope in the roof, for excess water is not good for any roof when the design requirements are not built-in. Proper drainage assists in elimination of excess water and the extra weight resulting from it. Koppers, however, does state that building design should not be restricted where restriction is not necessary. When a roof cannot be sloped, for various reasons, always use KOPPERS COAL TAR ROOFING SYSTEMS for long lasting and time proven results.

When you specify Koppers Coal Tar Roofing Systems, you are assuring your building owner-client of long-term roofing performance.

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For decks or insulations not covered in these specifications, consult your Koppers Representative.

NOTE: All elements in the roof structure affect roofing performance. Koppers built-up roofing specifications are based on the general type of deck to be used so that precautionary statements are readily available for reference. Specifications are designated by general deck type. If insulation board is used, the suffix wi is added to the base specification. If vapor barrier is used the suffix v is added. If the base sheet alternate is used, the suffix bs is used. For example, a 4 ply roof over poured concrete with insulation and vapor barrier is designated Koppers 5 wiv.

In any building the performance of the Built-up-Roofing will be affected to some degree by all of the parts of the Roof Structure System as well as the inside and outside atmospheric environment. Each component should be investigated for its compatibility with each of the others. The Roof Structure System may include any or all of the following:

- Outside Air Conditions
- Roofing System
- Peripheral Details (Flashings)
- Insulation (if present)

- Vapor Barrier (if present)
- Structural Deck including sub purlins (supports)
- Structural Framing
- Air Space (if present)
- Ceiling (if present)
- Interior Air Conditions

You will find information in this manual, pertaining to materials and application methods other than for built-up-roofing. They are offered to assist the designer in establishing their normal position in the Roof Structure

System. They should not be construed as part of the built-up-roofing system, an endorsement, nor as part of the designated specifications other than to establish a suitable roofing base in the roof structure system.

The proper design, specification and positioning of the various components of the Roof Structure System is the responsibility of the building owner or his designer. Any subsequent failures, due to either the installation or lack of installation will not be Koppers responsibility.

1. GENERAL REQUIREMENTS

1.1 BUILT-UP ROOFING

1.1.1 Decks

The deck is the base over which the built-up roofing, or insulation and built-up roofing is applied. Where the term deck is used in this manual without reference to insulation, it shall designate the surface over which roofing is to be applied. All decks shall be clean, smooth, dry, rigid and free of debris. Any deck defect shall be corrected before application of roofing. All decks shall be installed in accordance with the deck manufacturer's specifications and shall be in compliance with Koppers General Requirements.

In approving any deck as satisfactory to receive a Koppers roof, only the deck surface is accepted. It is the responsibility of the building designer and the deck manufacturer to provide for expansion and contraction in a manner that will provide a stable base for the roofing; for support of maximum anticipated loads; secure attachments vertically and laterally, and the selection of the deck material and construction details including their ability to contain bitumens. Koppers will not assume responsibility for deck defects, the effect of deck defects on Koppers roofs, or bitumen seepage.

The placing of conduits, bolt heads, etc., above the roof deck and below the roofing membrane is not recommended.

All projections or openings in the deck should be completed prior to the application of the roofing.

Optimum adhesion to the deck is necessary for good roof performance. Where Koppers Old Style Pitch or steep asphalt is used for adhesion, questionable decks may be tested for dryness and adhesion by pouring one pint of the bitumen, heated to application temperature, over a representative area or areas of the deck. The deck is not satisfactory if the bitumen foams or bubbles, or upon cooling to ambient temperature may be stripped clean of the deck.

1.1.2 Conditions of Surface to Receive Roofing

All surfaces must be dry, reasonably smooth, clean, rigid and free from debris, loose materials, projections and holes which might cause rupture of the membrane.

Metal Decks: Decks of this type must also be free from loose rust and oily substances.

Poured Portland Cement Concrete, Precast Structural Concrete Sections, Poured Gypsum, Lightweight Insulating Concrete: Decks of these types with inclines of one (1) inch per foot or more shall permit nailing, or treated nailing strips must be set in the deck and installed prior to roofing. Where insulation is specified, nailing strips may be secured to the deck surface and shall be level with the surface of the insulation. These strips should be spaced not more than three (3) feet apart and placed up and down and not across the slope of the roof. Roof deck shall be properly graded to outlets.

Precast Decks: (concrete, gypsum, wood fiber) Decks of these types, whether grouted or not, shall be caulked with Koppers

Flashing Cement which shall be applied so that the top surface is level and smooth. Felt stripping four (4) to six (6) inches wide set in a troweling of the cement is recommended to assist in leveling uneven joints and bridge the joint openings thus providing a better surface for the roofing materials.

Wood Plank/Plywood: Wood shall be well seasoned, dry and preferably treated. End joints shall have adequate bearing. Loose or void knot holes, large cracks, etc., shall be covered with sheet metal.

Lumber shall be a minimum of 1" nominal thickness.

Plywood shall be a minimum of 1/2" thickness.

1.1.3 Lightweight Aggregate Insulating Decks

Koppers will only accept lightweight aggregate insulating decks which are designed to permit the fill to vent water vapor or to dry from the underside. Koppers will not accept lightweight aggregate decks over poured concrete substrates, vapor barriers, unvented metals, or any type of base which will not permit the fill to vent or dry. It is necessary to prevent a water vapor pressure build-up under the built-up roof. Occasional, or spot vents through the roofing as the only venting method are not satisfactory substitutes for underside or continuous vented systems.

1.1.4 Old Style* Pitch

Koppers Old Style* coal tar roofing pitch is carefully manufactured to standards which have been regularly improved over many years. Koppers Old Style Pitch is manufactured to exceed the minimum requirements of the following specifications:

- Federal Specification RP381 Type I
- ASTM D-450 Type A
- Underwriters' Laboratories, Inc.

1.1.5 Koppers No. 15 Tarred Felt

Koppers approved tarred felt is manufactured to meet the following specifications:

- Federal Specification HH-R-595 Type I Class 1
- ASTM D-227
- Underwriters' Laboratories, Inc.

1.1.6 Underwriters' Laboratories

Underwriters' Laboratories, Inc. Building Materials List, Guide No. (360 018)—Built-up-Roof Covering Materials, has listed Koppers Coal Tar Pitch and tarred felts for use in construction of Classes A and B built-up-roof coverings.

Reference:

Roof Deck Constructions are listed under U.L. Guide No. (360 RO)

Roof Deck Construction Materials, such as vapor barriers, insulations and adhesives are listed under U.L. Guide No. (360 R 13).

1.1.7 Application of Roofing

All roofing is to be built-up in place with alternate moppings of bitumen and layers of felt over the proper substrate and preliminary work as described or specified in this book under the several sub-heads for various types of deck construction and slope. Application is to be made by experienced workmen in the manner described. The finished roof is to consist of the number of plies of felt and moppings of bitumen plus top pouring as specified herein. Applicable portions of Koppers precautions for "Food Establishments" apply.

1.1.8 Application of Bitumen

Recommended Weights per 100 square feet.
(for estimating purposes only)

	Average Interply	Top Coating
Old Style Pitch	25 lbs.	75 lbs.
Steep Asphalt	23 lbs.	60 lbs.

Average interply weights are based on long years of experience in good roofing practice, and take into account a reasonable variation in distribution as well as a variation in the amount absorbed in different substrates, and the type of specification. Moppings of bitumen between felts shall be continuous. Felt shall not touch felt. The top pouring of Old Style Pitch is most important, and must be thorough; and must be uniformly covered with specification aggregate embedded in the pitch while hot.

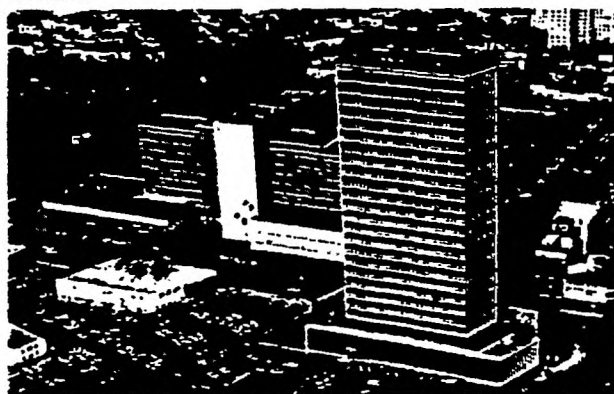
When solid mopping is not part of the specification and is substituted by strip & spot moppings (sprinkle mopping may be substituted for spot mopping) for installation of vapor barriers, insulation and/or the first ply of the built up roofing, the quantity of bitumen required shall be not less than 10 lbs. per 100 square feet. Strip mopping shall be on 8" centers unless otherwise specified and in one direction.

Recommended Temperature Limitations:

	Heated Temperature Maximum	Application Temperature Minimum
Old Style Pitch	400°F	300°F (Recommended 375°F)
Steep Asphalt	475°F	350°F

If heat is desired during a holding period at the jobsite while material is not being drawn off and replenished as under normal usage, kettle temperature should be reduced and not permitted to exceed 350°F for Old Style Pitch or 425°F for steep asphalt. The kettle should be full. These temperatures are applicable to job conditions and do not apply to holding or storage in kettles in excess of 4 hours. If bitumen is not to be used for periods over 4 hours kettle should be shut off.

Prolonged storage in small containers, such as roofing kettles, at temperatures exceeding those detailed above may result in changes in softening point, ductility, and other characteristics which can adversely affect the performance and life of the bitumen.



The California Federal Plaza building, designed by Charles Luckman Associates, is protected from basement to rooftop helistop with Koppers coal tar membrane systems.

Old Style Pitch may be contained in 1000 gallon or greater capacity heated and automatically controlled closed vessel tankers at 375°F for periods, not exceeding 96 hours.

1.1.9 Cold Weather Application

When roofing is applied at temperatures below 45°F special precautions must be taken to insure the satisfactory performance of the finished roof. Before applying roofing the effects of moisture, that is all traces of ice, snow, surface water, etc., must be removed from the deck. Any moisture present at the time the roofing is applied may result in poor adhesion of the materials to the deck and blistering of the roofing felt. Moisture content of materials under the roofing must be as close to dry equilibrium water content as possible.

Hot applied bitumens tend to congeal rapidly in cold weather, even when the deck is dry, so extra care must be taken to set insulation or roofing in as quickly as possible.

Do not heat bitumens above the maximum temperature limit listed above to compensate for rapid chilling. Insulated containers, along with carefully timed material handling methods, must be employed. Whether hand mopping or mechanical distribution equipment is used, lapsed time before contact of felts or aggregate with hot bitumen must be kept to a minimum. In the case of hand mopping, mop no farther than 5 feet in front of felt roll and immediately roll in. Felts should be broomed or pressed in immediately.

After the membrane is completed, the top pouring and aggregate surfacing should be accomplished while there is still latent heat in the membrane.

1.1.10 Application of Felt

Plies of felt must be laid shingle fashion, not only because this method produces a stronger membrane, but because it also makes it possible to construct a roof of any desired number of plies in a single progressive operation. Where a water flow direction exists, felts should be applied so that the direction of flow is not against the laps. Broom or press all plies of felt into the hot pitch and lay without wrinkles, buckles or kinks, so that finished the roof is free of pockets or blisters. Each felt ply shall be completely covered with a uniform mopping of bitumen.

The number of plies are controlled by varying the widths of the edge laps. Three-ply roofing, for example, is achieved by lapping each ply approximately two thirds over the preceeding ply; for 4-ply, a lap of approximately three fourths the width is required. Koppers' No. 15 tarred felt is marked at the factory with lap lines for this purpose. Except as specifically provided for in Koppers specifications, application of felts in a method where two plies are laid over two plies, three plies over one ply, or any combination, other than all plies in shingle fashion, will not be permitted at anytime.

When beginning a membrane roofing installation, appropriate width starting strips of felt shall be used at the starting point to achieve the specification ply build-up at that point so that successive plies laid shingle fashion will produce the ply requirements. Overlap ends of all connecting plies of felt end laps not less than 10 inches. End stripping or taping of these laps is not permitted.

It is advisable on applications of felts on slopes from 1/2 inch to 1 inch per foot, felts be run with the slope, up and over the ridge of the roof parallel to the slope line and each sheet back or blind nailed along the end lap closest to the deck at the high point end of each roll.

Koppers requires that all felts be backnailed when the slope of the deck is one (1) inch per foot or more.

1.1.11 Application of the Old Style Pitch and Aggregate Surface

The final application of all Koppers Coal Tar Pitch Built-up roofs is the triple weight, extra heavy top pouring of Koppers Old Style* Pitch which provides the outstanding waterproofing and service life of the roof. Into the extra heavy top pouring of Old Style* Pitch, slag or gravel is imbedded. The slag or gravel acts as an armor coat against mechanical forces, such as hail and to deflect the intense radiation of the sun.

For best results, the top pouring of pitch with slag or gravel should be applied at the time of the application of the felts. A delay, particularly during inclement weather, can result in a considerably reduced service life of the roofing. If a delay is unavoidable due to construction scheduling, a glaze coating of Old Style® Pitch will provide temporary protection until the pouring of pitch and slag or gravel is applied. If weather or atmospheric conditions are such that precipitation will not occur, slagging or gravelling may be delayed through dry weather periods. If such is not the case, the felts must be protected or work completed daily.

The aggregate surfacing must be applied into the top pouring while hot so that a uniform layer will be embedded and adhered. The completed Koppers Old Style® Pitch and aggregate roof will have a uniform aggregate surface. Occasionally, on well applied roofs, small black globes known as "rasberries" or "blackberries" will temporarily form in the pitch and aggregate surface. These are not detrimental to the roof.

1.1.12 The Aggregate

The aggregate to be used should meet ASTM Specification D1863-64. The basic requirements for this aggregate are as follows:

Sieve Size	Total Passing, Percent
¾"	100
½"	90-100
¼"	4-70
No. 4	0-15
No. 8	0-5
Dust, maximum, percent	0.5
Moisture, maximum, percent:	
crushed stone and gravel	0.5
crushed roofing slag	5.0
Unit Weight (loose), minimum	
lb. per cu. ft.	60

ASTM D1863-64 covers other properties, such as hardness and includes proper methods for sampling. If any doubt exists, the aggregate supplier should furnish a certified analysis and a certification that the product is produced to conform to ASTM D1863-64.

1.1.13 Koppers Steep Roofs

For detailed specifications regarding steep, smooth surfaced asbestos roofs, consult your local Koppers representative or contact Koppers Co. in Pittsburgh.

1.1.14 Temporary Roofing

Temporary roofing applied for various reasons shall not be considered a part of the permanent built-up roofing. Consult your Koppers representative for recommended specifications over various type decks for temporary roof construction.

1.2 INSULATION

1.2.1 Board Type Insulations

These insulations come in varying thicknesses and sizes. The provisions or manner of attachment which follows in the various specifications are suggestions only. Should the manner of attachment as suggested, conflict with that specified by the individual insulation manufacture, the insulation manufacturers specifications shall be followed, and in addition, shall be in compliance with Koppers General Requirements.

The roofing insulation must be kept dry at all times. It must be of a type approved by Koppers for use with a Koppers built-up roof. It should only be applied over a deck complying with all of the General Requirements. Work must be scheduled to prevent damage from other trades and equipment. Roofing equipment must be of a type which will not damage the insulation used. Broken or damaged insulation sheets can only be used when the undamaged portion is cut out for application areas where fill-in pieces are required.

If the deck slope is one 1: inch per foot or more the insulation must be able to retain nails, or wood nailers must be installed perpendicular to the slope at each course of insulation. Provision for wood nailers in this fashion will provide both a surface for anchoring of roofing felts which shall be laid perpendicular to the wood nailers as well as an insulation stop. Spacing of nailers must be such that the insulation fits snugly with the nailers but must not be force fitted.

No more insulation shall be laid at any one time than can be protected by pitch and felt in case of sudden weather changes. Edges of insulation shall be brought closely together and shall not be forced into place. Where insulation joins vertical surfaces the insulation shall be cut in a neat manner allowing at least one-half (½) inch clearance.

When more than one (1) layer of insulation is used, joints in each layer shall not coincide. All layers shall be parallel to preceding layers.

1.2.2 Vapor Barrier

Vapor barriers are normally used where the heat flow direction and/or humidity within the building, during any climate or occupancy cycle, might cause the dew point or condensation to occur under the built-up roofing within the insulation chamber. It is important that the vapor barrier, when installed, provide a continuous seal, including ventilators, skylights, peripheral walls, and other terminations from the source of the water vapor. Ventilation provisions of the insulation chamber, when a vapor barrier is used, are dictated by the heat flow cycle and climatology of the building. Generally a building with a preponderant heat flow-up cycle should have an insulation chamber ventilated to the exterior. A building with a preponderant heat flow down cycle in a humid area, should not be ventilated to the exterior if the dew point can be reached above the deck and in the insulation chamber.

Alternate vapor barrier systems to those described on the specification pages are as follows and offered for assistance and reference:

a. Vinyl Type

Fire resistant adhesive and vinyl-type vapor barrier as listed by and applied as specified by Underwriters' Laboratories, Inc., and Factory Mutual may be used. Adequate adhesion of the vapor barrier to the deck and adhesion of the insulation to the vapor barrier for securing the entire system against wind uplift and movement, must be attained. (See Section 1.3.4. Attachments page 8)

Note: When installing insulation over vinyl-type vapor barrier apply approved adhesive over the approved vapor barrier in ribbons at the rate specified by U.L. and F.M.

b. Kraft Type

Fire retardant kraft lamination type vapor barriers, applied with Steep Asphalt as listed by and applied as specified by Factory Mutual may be used. Adequate adhesion of vapor barrier to the deck and adhesion of insulation to the vapor barrier for securing the entire system against wind uplift and movement, must be attained. (See Section 1.3.4. Attachments page 8)

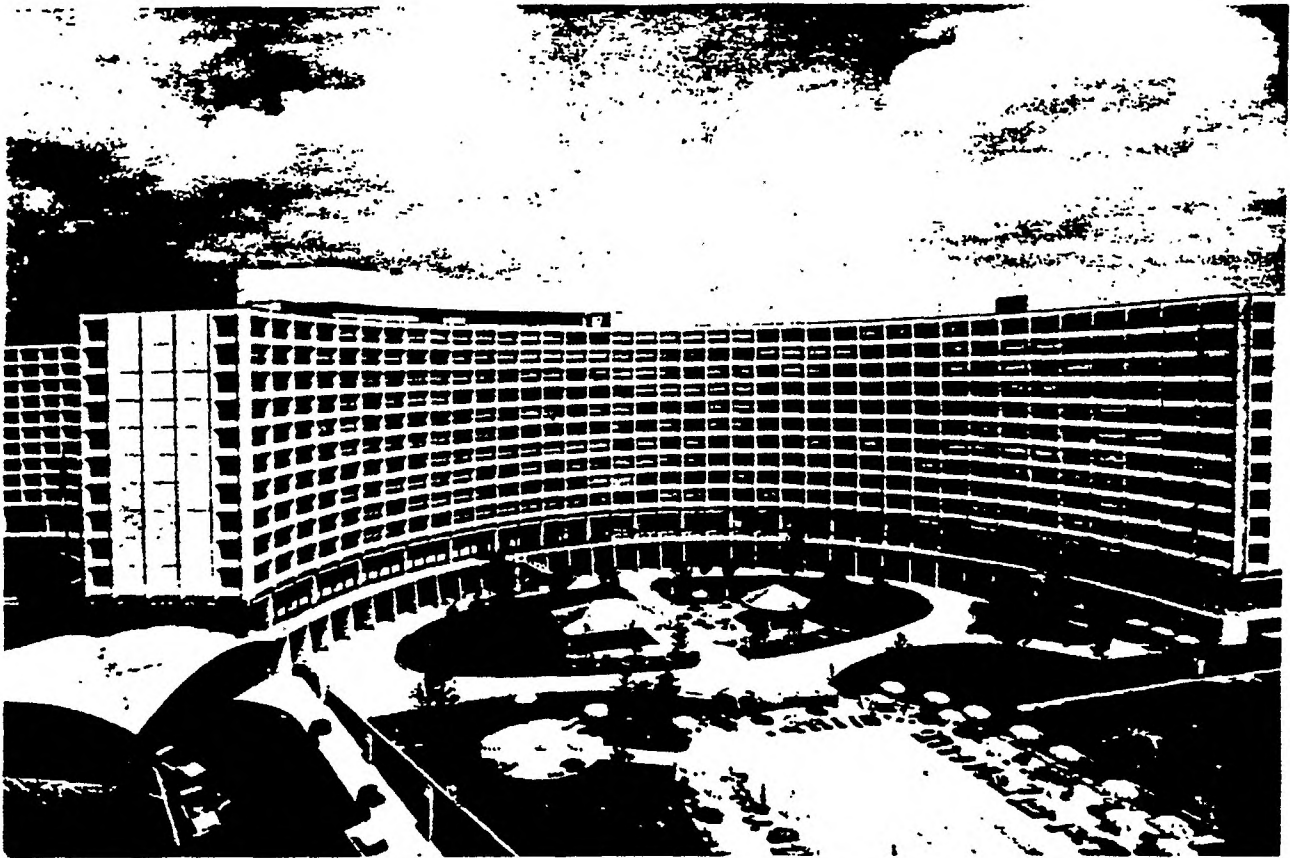
Note: This system is rated for insurance purposes by Factory Mutual only.

Care must be exercised so that the vapor barrier is not ruptured during installation. This is particularly true in areas over the flutes of the steel deck.

1.2.3 Water Stops (Temporary Protection)

Water stops consisting of two (2) plies of tarred felt and mopings of Old Style Pitch for flat roofs or asphalt felt and asphalt for steep roofs extending onto the deck at least six (6) inches and four (4) inches on top of the insulation, shall be applied at the end of each day's work over exposed edges of insulation. Water stops shall be continuous and tight.

This temporary protective measure must be removed cleanly when work is resumed.



A Koppers coal tar pitch roof protects the Washington Hilton Hotel, designed by architect William B. Tabler. Underground

facilities are also waterproofed with a Koppers 5-ply coal tar membrane system.

1.2.4 Cut-offs (Permanent Installation)

Venting of roof insulation at walls, curbs, eaves, etc., is recommended for all but a few special roof structures. Therefore, cut-offs should not be installed at edges of insulation adjoining these areas for venting purposes.

Cut-offs may be installed, however, provided they are constructed to run in one direction continuously to vented edges and provided no section of the roofing is isolated or blocked from venting.

1.2.5 Lightweight Insulating Fills

Lightweight insulating fills must have sufficient cohesive strength to provide firm attachment of the roofing to the structural deck and framing in order to prevent wind uplift damage or a blow-off of the roofing. At the time of the application of the roofing, the insulating fill will have been dehydrated of all excess water used at the time of placement. Application over these types of fills varies according to the characteristics of the fill and the condition under which the roofing material is to be applied. Consult Koppers representative for roofing specifications over the type of insulating fill to be used.

In general, a lightweight insulating fill must be able to vent itself and thereby dry, otherwise serious effects to the roofing membrane will result. Koppers will not accept a vapor barrier beneath a lightweight fill nor a fill over a type of substrate that will not permit adequate venting from below such as poured concrete, unvented metal decks, etc. Koppers will not be responsible for failure of the insulating fill to remain integral or for disbonding of the roofing from the surface of the insulating fill.

Provisions should be made wherever possible to provide additional venting such as notched wood perimeter nailers, etc., in conjunction with the venting from the underside of the deck. If board type insulation is to be applied over a lightweight fill,

provisions must be made between the fill and the board insulation to prevent fill moisture from affecting the insulation and roofing.

1.3 OTHER REQUIREMENTS

1.3.1 Materials Protection

Roll roofing materials and insulation should be stored indoors if possible, otherwise it shall be protected by raised platforms and covered with suitable weatherproof protective coverings such as tarpaulins, plastic sheeting, etc.

1.3.2 Wood Nailing Strips

All non nailable decks require wood nailing strips at eaves, edges, walls, roof openings, etc. for proper securing of metal flanges. Nailers must be securely and firmly attached to the deck or through to its supporting members. Nailers shall extend not less than 1" beyond the apron or flange.

Roofing felts for all decks having a slope of one (1) inch per foot or more must be back nailed and therefore non-nailable decks must be furnished with treated wood nailing strips. Wood nailers, installed on or in non-nailable decks for slopes one (1) inch per foot or more or when insulation is required of a non-nailable type, shall be run in the direction perpendicular to the direction in which the felts are to be laid.

Nailers should be treated to preserve their condition and hence their nail retentive power for the expected life of the roofing. Creosote or oil born preservatives may affect the roofing they contact and should not be used. Nailers should be pressure treated with a water born preservative such as Wolman salts or with penta applied in a liquified petroleum gas carrier such as the Cellon Process.

1.3.3 Cold Storage & Freezer Buildings

Koppers will not bond its roofing over these structures if insulation, or insulation and vapor barrier is installed over the deck and unless there is an adequately ventilated air space between the deck and insulated refrigerated area.

For procedures on non-bonded roofing applications, consult your local Koppers representative or Koppers Co. in Pittsburgh.

1.3.4 Attachment

Maximum adhesion or secure attachment of all components in the roofing assembly is necessary to satisfactory long-term performance of the roofing membrane. For proper adhesion of all roof components, Koppers suggests that the adhesive and fasteners, in the quantities specified by the manufacturer, be capable of passing a minimum uplift resistance of 30 pounds per square foot (psf). This uplift resistance translates into adequate lateral attachment of the built-up-roofing system.

Solid mopping has been found to provide an uplift resistance in excess of 120 psf.

Strip mopping, as suggested in the specifications in this manual, has been found to provide an uplift resistance in excess of 60 psf.

The following are the names of some manufacturers who provide nail and/or fastening devices for use with built-up roofing:

E/S Products, Inc., New Rochelle, New York
Simplex Nail & Manufacturing Corp., Americus, Ga.
Independent Nail Corp., Bridgewater, Mass.
Wheeling Steel Corp., Wheeling, W. Va.

Koppers will not be responsible for any damage caused by or the result of unsatisfactory attachment.

For further information contact your local Koppers representative.

1.3.5 Base Sheet Alternate

As a substitute for the first ply of tarred felt apply one ply of Koppers coated base sheet in a solid mopping of steep asphalt directly over the approved type of board insulation described in the specifications to be roofed, lapping each sheet four (4) inches over preceding sheet. Mop entire surface with uniform coating of Old Style Pitch. When specifying this alternate to any board type of insulated surface use the designation bs, for example Koppers Old Style pitch roof 17 wibs.

1.3.6 Expansion Joints (Building)

Since all materials expand and contract due to temperature and/or moisture, the use, location, and design of building expansion joints, especially the roof structure system, should be taken into consideration at the time of original building design.

Although provisions for adequate expansion joints are the responsibility of the building designer, Koppers offers the following recommendations for the protection of the roofing system against splits caused by expansion and contraction of the building for your consideration. Building expansion joints should be installed:

1. On large roof areas at least every 200 feet in each direction.
2. At all places where the structural supports and roof assembly change direction.
3. Where type of deck material changes.

Where control, expansion, or contraction joints are provided in structural steel, deck material, or deck system, provisions must be for continuation through the built-up-roofing system. Koppers realizes that in a climate controlled building there may be little or no expansion AFTER the building is in use, however, building expansion joints are still recommended based upon the following points:

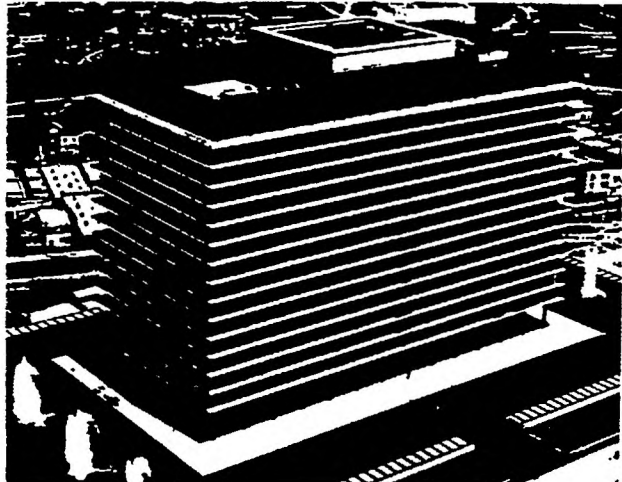
1. During construction the building will not be under a steady state temperature/humidity condition so that thermal and moisture movement can be sufficient to fracture the roofing.
2. If no building expansion joint is provided, the owner must

keep the building at the steady state temperature and humidity condition at all times as holiday shut-downs can fracture the roofing, due to the movement of system resulting from temperature/humidity variation.

3. If the occupancy is fairly large, the sudden entrance of many wet employees on a rainy day may cause moisture movement in the roof structure system which can fracture the roofing.

1.3.7 Notice:

This roofing specification manual contains the latest and best available information as derived from Koppers long experience in the roofing industry. The design criteria and details contained herein have been compiled and are offered as a guide for consideration to assist the architect, owner and roofer in an attempt to provide the best roof possible for long, trouble-free service. Responsibility, however, for design of any roofing system, remains with the architect or engineer and building owner. The contents of this manual are subject to change at the discretion of Koppers Company as future developments and experience are achieved.



All waterproofing requirements, including the roof, of The Los Angeles Water and Power Building were met by Koppers coal tar materials. The architect was A. C. Martin & Associates.



All structures in the Del Amo Financial Center, Torrance, California are topped with Koppers coal tar pitch roofing systems. The architect: Victor Gruen Associates.

PROCEDURE

Select clauses as required. Optional clauses in *italic*.
Copy in color denotes built-up roofing specification

Condition of Surface to Receive Roofing

See Section 1.1.2, Page 4.

Material Quantity Requirements

See Section 1.1.8, Page 5.

Preparation Below Insulation

1. The wood roof deck shall be covered with one (1) layer of approved rosin-sized sheathing paper weighing approximately five (5) pounds per one hundred (100) square feet. The sheathing paper shall be lapped two (2) inches and secured to the deck by occasional nailing.

2. Two full thicknesses of Tarred Felt shall be laid over the entire surface, lapping each sheet nineteen (19) inches over the preceding sheet and nailing the sheets in place.

Application of Vapor Barrier Below Insulation

Note: When vapor barrier is required, use these procedures in addition to Preparation Below Insulation noted above.

Lay over the entire surface two (2) full thicknesses of Koppers Approved Tarred Felt, lapping each sheet nineteen (19) inches over the preceding sheet—mopping with Old Style Pitch the full nineteen (19) inches so that in no place shall felt touch felt.

For other types of vapor barriers see Section 1.2.2, Page 6.

Application of Insulation

1. Mop the entire surface with a uniform coating of Old Style Pitch into which, while hot, firmly embed the insulation. When roofs have an incline of from two (2) inches to six (6) inches per foot, use Steep Roofing Asphalt.

For application of roofing materials over insulation follow Application of Roofing Materials procedure in Section 2.2, Page 10.

Application of Roofing Materials Directly on Wood

1st. Lay one ply of rosin sized or other approved sheathing paper weighing not less than five (5) lbs. per 100 square feet lapping each sheet two (2) inches and nail sufficiently to hold in place.

2nd. Spec. No. 1 • Spec. No. 2

Apply over the entire surface of the sheathing paper, two (2) dry plies of Koppers Approved Tarred Felt. Lap plies nineteen (19) inches. Nail on twelve inch centers, 2" in from edge lap with nails thru flat tin discs or approved nails with integral caps. Nail shanks are to be of required length for maximum withholding power.

3rd. Mop with Old Style Pitch the entire surface, preceding the application of additional plies of felt and apply over the entire surface as follows.

4th. Spec. No. 1,

Apply three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-thirds (24-2/3) inches.

4th. Spec. No. 2

Apply two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches.

Mop solidly between plies with Old Style Pitch so that in no place shall felt touch felt.

On slopes one (1) inch per foot or more nail each sheet of felt with Simplex flat head or one (1) inch barbed roofing nails through flat tin discs, two (2) inches from the back edge on twenty-four inch centers.

5th. Pour over the entire surface of the roofing membrane a uniform coating of Old Style Pitch into which, while hot, embed not less than four hundred 400 pounds of gravel or three hundred 300 pounds of slag for each one hundred 100 square feet.

General Requirements on pages 4 through 8 and Detailed Specifications on pages 16 through 22 are a part of this specification and must be adhered to where applicable.

deck construction:

2.1 Wood Plank/ Plywood

SLOPE • Up to 2 in. per ft.

SURFACE • Aggregate

For recommendations on wood and wood treatment, contact: Koppers Company Inc., Forest Products Division, Lumber Sales Dept., 750 Koppers Bldg., Pittsburgh, Pa. 15219

Spec. No. 1 - 5 ply

Spec. No. 2 - 4 ply

Spec. No. 1 wi - 4 ply

Spec. No. 2 wi - 3 ply

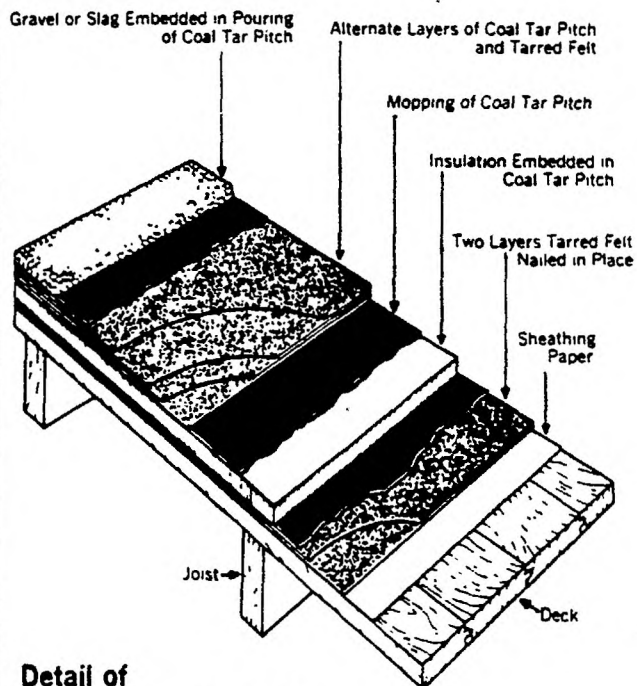
board type insulation

Spec. No. 1 wiv - 4 ply

Spec. No. 2 wiv - 3 ply

board type insulation and vapor barrier

Treated wood should be used where a vapor barrier is required, see Sec. 1.3.2, Page 7



Detail of
Specification No. 1 wi

Hot bitumen should never be applied directly to a wood deck. Sandwiched between the heat from above and the heat from below, such material finds its way through the boards into the building. Good practice demands the cushioning and blotting effect of a layer of sheathing paper followed by layers of dry felt. Shiplap and square edge boards should be avoided where possible. If the underside of the roof deck is exposed to air pressure created from open doors or windows, tongue-and-grooved lumber should be used.

deck construction:

2.2 Poured Portland Cement Concrete

SLOPE • Up to 2 in. per ft.

SURFACE • Aggregate

Spec. No. 5—4 ply

Spec. No. 7—3 ply

Spec. No. 5 wi—4 ply

Spec. No. 7 wi—3 ply

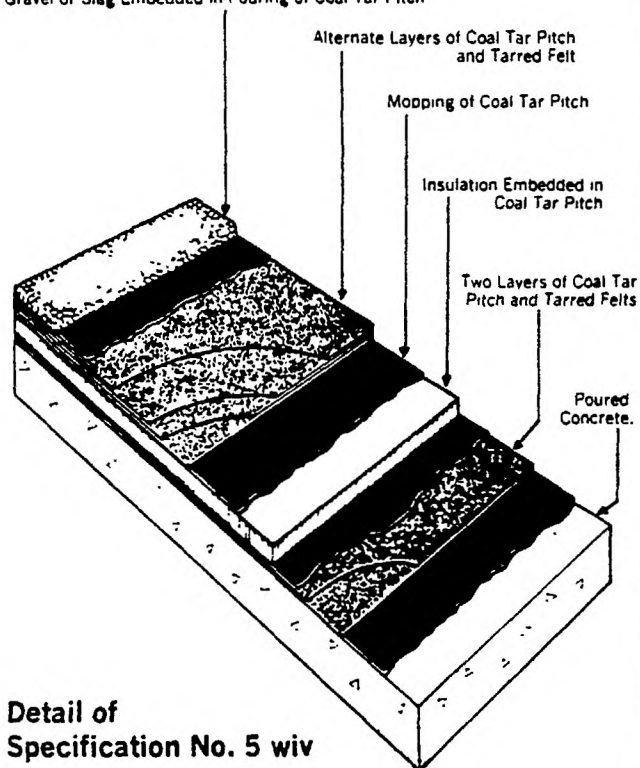
board type insulation

Spec. No. 5 wiv—4 ply

Spec. No. 7 wiv—3 ply

board type insulation and vapor barrier

Gravel or Slag Embedded in Pouring of Coal Tar Pitch



Detail of
Specification No. 5 wiv

Poured concrete decks sometimes cause trouble because the built-up roofing is laid before the deck is thoroughly dry—such as might happen when the general contractor is anxious to get the building under cover and so urges the roofing contractor to begin work shortly after the deck has been poured. When this happens the result is a blistered and buckled membrane or, just as serious, insulation curls and makes an unsatisfactory job. The roofing contractor, backed by the architect, should insist on a thoroughly dry deck before beginning work. He should also see to it that the deck is free of loose sand, frozen scale and other foreign matter. Projections should be removed, low points filled with cement grout or other suitable material, and all cracks pointed up.

PROCEDURE

Select clauses as required. Optional clauses in *italic*.

Copy in color denotes built-up roofing specification

Condition of Surface to Receive Roofing

See Section 1.1.2, Page 4.

Material Quantity Requirements

See Section 1.1.8, Page 5.

Application of Vapor Barrier Below Insulation

1. Apply a uniform coating of Old Style Pitch to the deck.
2. Lay over the entire surface two (2) full thicknesses of Koppers Approved Tarred Felt, lapping each sheet nineteen (19) inches over the preceding sheet—mopping with Old Style Pitch the full nineteen (19) inches so that in no place shall felt touch felt.
3. Extend all plies of felt up vertical surfaces and cut off at height of insulation.

For other types of vapor barriers see Section 1.2.2, Page 6.

Application of Insulation

Apply a uniform coating of Old Style Pitch over the entire surface into which, while hot, embed the insulation. If there are two (2) layers of insulation mop the entire surface of the first layer with Old Style Pitch into which, while hot, embed the second layer of insulation.

Application of Roofing Materials

1st. Mop deck (or insulation—as applicable) completely with Old Style Pitch.

2nd. Spec. No. 5

Apply over the entire surface, four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches. Mop solidly between each 27½ inch lap with Old Style Pitch so that in no place shall felt touch felt.

2nd. Spec. No. 7

Apply over the entire surface three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-thirds (24-2/3) inches. Mop solidly between each 24-2/3 inch lap with Old Style Pitch so that in no place shall felt touch felt.

For base sheet alternate see Section 1.3.5, Page 8.

Where slope of deck is one (1) inch per foot or more and deck permits nailing, nail along back or upper edge of each sheet on twenty-four (24) inch centers. Where deck does not permit nailing, nailing strips are required and each sheet nailed along back or upper edge at spacings to assure penetration of nailers.

3rd. Pour over the entire surface of the roofing membrane a uniform coating of Old Style Pitch into which, while hot, embed not less than four hundred (400) pounds of gravel or three hundred (300) pounds of slag for each one hundred (100) square feet.

General Requirements on pages 4 through 8 and Detailed Specifications on pages 16 through 22 are a part of this specification and must be adhered to where applicable.

PROCEDURE

Select clauses as required. Optional clauses in *italic*.

Copy in color denotes built-up roofing specification

Condition of Surface to Receive Roofing

See Section 1.1.2, Page 4.

Material Quantity Requirements

see Section 1.1.8, Page 5.

Application of Vapor Barrier Below Insulation

1. On precast concrete slab or tile deck, strip mop with Old Style Pitch up to four (4) inches from the edge of each joint. Not less than 30% of the surface must be mopped, at a min. rate of 10 lbs. per 100 square feet.

2. Lay over the entire surface two (2) full thicknesses of Koppers Approved Tarred Felt, lapping each sheet nineteen (19) inches over the preceding sheet—mopping with Old Style Pitch the full nineteen (19) inches so that in no place shall felt touch felt.

3. Extend all plies of felt up vertical surfaces and cut off at height of insulation.

For other types of vapor barriers see Section 1.2.2, Page 6.

Application of Insulation:

Over Vapor Barrier. Apply a uniform coating of Old Style Pitch over the entire surface into which, while hot, embed the insulation. If there are two (2) layers of insulation (e.g. as required for pre-stressed concrete sections) mop the entire surface of the first layer with Old Style Pitch into which, while hot, embed the second layer of insulation.

Over Deck. On precast concrete slab or tile deck, strip mop with Old Style Pitch up to four (4) inches from the edge of each joint. Not less than 30% of the surface must be mopped, at a minimum of 10 lbs. per 100 square feet. While hot, embed the insulation. If there are two (2) layers of insulation (e.g. as required for pre-stressed concrete sections) mop the entire surface of the first layer with Old Style Pitch into which, while hot, embed the second layer of insulation.

For application of roofing materials over insulation follow Application of Roofing Materials procedure in Section 2.2, Page 10.

Application of Roofing Materials

1st. Each slab shall be spot or strip mopped with Old Style Pitch, keeping pitch moppings back at least four (4) inches from all edges of each slab joint. Not less than 30% of the surface must be mopped. When applying over insulation, mop insulation completely with Old Style Pitch.

2nd. Spec. No. 10

Apply over the entire surface four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches. Mop solidly between each 27½ inch lap with Old Style Pitch so that in no place shall felt touch felt.

2nd. Spec. No. 11

Apply over the entire surface three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-thirds (24⅔) inches. Mop solidly between the 24⅔-inch lap with Old Style Pitch so that in no place shall felt touch felt.

For base sheet alternate see Section 1.3.5, Page 8.

Where slope of deck is one (1) inch per foot or more and deck permits nailing, nail along back or upper edge of each sheet on a maximum of twenty-four (24) inch centers. Where deck does not permit nailing, nailing strips shall be installed and each sheet nailed along back or upper edge at spacings to assure penetration of nailers.

3rd. Pour over the entire surface of the roofing membrane a uniform coating of Old Style Pitch into which, while hot, embed not less than four hundred (400) pounds of gravel or three hundred (300) pounds of slag for each one hundred (100) square feet.

General Requirements on pages 4 through 8 and Detailed Specifications on pages 16 through 22 are a part of this specification and must be adhered to where applicable.

deck construction:

2.3 Precast Structural Concrete Sections ^{21a}_{Ko}

SLOPE • Up to 2 in. per ft.

SURFACE • Aggregate

Spec. No. 10—4 ply

Spec. No. 11—3 ply

Spec. No. 10 wi—4 ply

Spec. No. 11 wi—3 ply

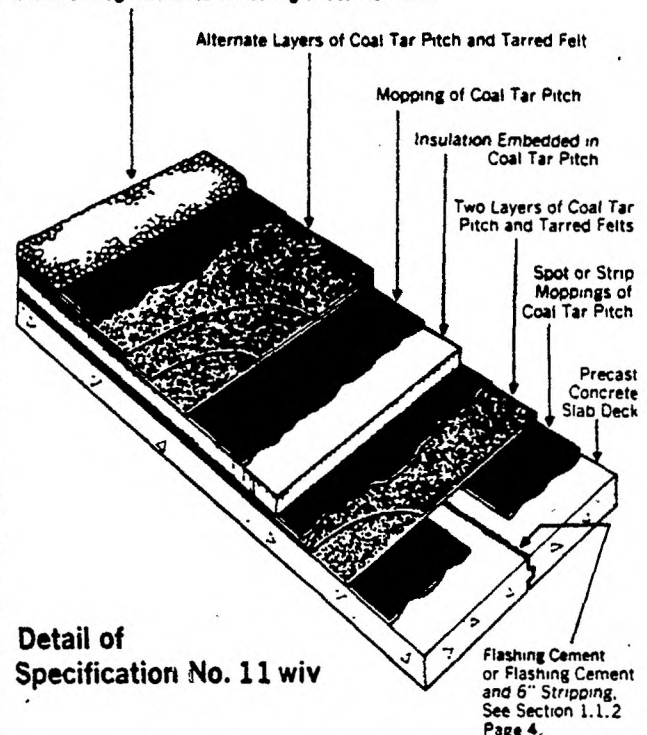
board type insulation

Spec. No. 10 wiv—4 ply

Spec. No. 11 wiv—3 ply

board type insulation and vapor barrier

Gravel or Slag Embedded in Pouring of Coal Tar Pitch



Detail of
Specification No. 11 wiv

Precast concrete structural section should receive the same careful scrutiny recommended for poured concrete decks, although as a rule the possibility of moisture being present due to insufficient drying time is not likely to be encountered. However, the contractor will often find one or more slabs resting unevenly which results in edges projecting above the surface. This may have been due to poor workmanship in laying the slab and should be corrected by resetting or leveling off. Where it is necessary to fill low areas, the use of cinder aggregate is not permitted since this material traps air and moisture, causing it to expand and crack when covered. The result is a badly blistered built-up roofing surface. All joints, whether grouted or not, should be caulked with trowel-grade asphaltic plastic cement. Sides and ends of slabs should be square. Slabs must rest firmly and evenly on supporting members. Slabs must be installed to prevent lateral and vertical movement.

deck construction:

2.4 Poured Gypsum (Precast Gypsum) Lightweight Insulating Concrete

SLOPE • Up to 2 in. per ft.

SURFACE • Aggregate

Spec. No. 12—5 ply

Spec. No. 13—4 ply

Spec. No. 12 wi—4 ply

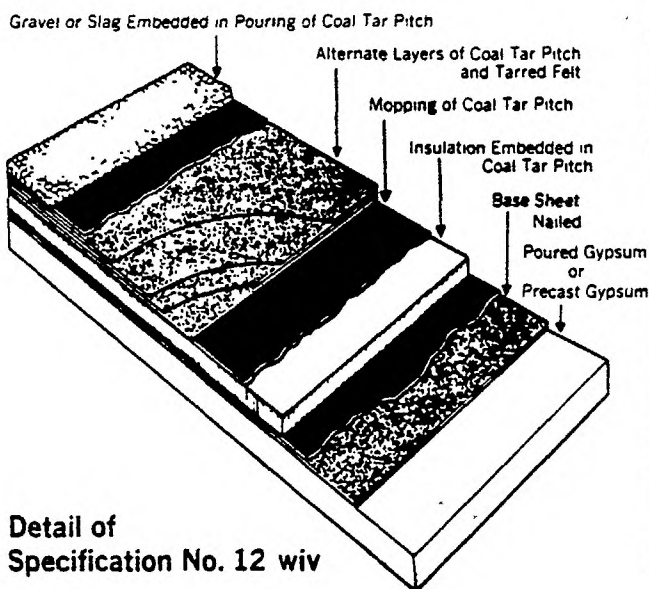
Spec. No. 13 wi—3 ply

board type insulation

Spec. No. 12 wiv—4 ply

Spec. No. 13 wiv—3 ply

board type insulation and vapor barrier



Detail of
Specification No. 12 wiv

The same recommendations applying to precast concrete slabs apply to precast gypsum slabs and gypsum metal bound planks. All uneven slabs should be reset or leveled off so that the roof will be laid on a flat and even surface, free from projections and low areas. Because these slabs are precast, the possibility of a high moisture content being present is more remote than in the poured gypsum deck.

Poured gypsum decks sometimes cause trouble because the built-up roofing is laid before the deck is thoroughly dry—such as might happen when the general contractor is anxious to get the building under cover and so urges the roofing contractor to begin work shortly after the deck has been poured. When this happens the result is a blistered and buckled membrane or, just as serious, insulation curls and makes an unsatisfactory job. The roofing contractor, backed by the architect, should insist on a thoroughly dry deck before beginning work. He should also see to it that the deck is free of loose sand, frozen scale and other foreign matter. Projections should be removed, low points filled with cement grout or other suitable material, and all cracks pointed up.

PROCEDURE

Select clauses as required. Optional clauses in *italic*.

Copy in color denotes built-up roofing specification

Condition of Surface to Receive Roofing

See Section 1.1.2. Page 4.

Material Quantity Requirements

See Section 1.1.8. Page 5.

Application of Membrane Below Insulation

1. Apply over entire surface one (1) ply of Koppers coated base sheet, lapping each sheet four (4) inches over preceding sheet and nailing at lap no less than nine (9) inches, and down center of each sheet on eighteen (18) inch centers.

2. Extend plies up vertical surfaces and cut off at height of insulation.

For vapor provisions contact your local Koppers Representative.

Application of Insulation Over Membrane (or Deck)

Apply a uniform coating of Old Style Pitch over the entire surface into which, while hot, embed the insulation. If there are two (2) layers of insulation mop the entire surface of the first layer with Old Style Pitch into which, while hot, embed the second layer of insulation.

For application of roofing materials over insulation follow Application of Roofing Materials procedure in Section 2.2. Page 10.

Application of Roofing Materials to Deck

1st. Install two (2) plies of tarred felt over entire surface lapped nineteen (19) inches with approved nails. Stagger nail four (4) inches and sixteen (16) inches from the lapped edge of the top ply.

Where lightweight insulating concrete cannot be nailed, apply the first ply of felt with spot or stripmopping using not less than 10 lbs. per square of pitch and on not less than 8" centers.

Alternate: Apply over entire surface one (1) ply of Koppers coated base sheet, lapping each sheet four (4) inches over preceding sheet and nailing at lap no less than nine (9) inches, and down center of each sheet on eighteen (18) inch centers.

2nd. Spec. No. 12

Apply three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-thirds (24-2/3) inches. Where slope of deck is one (1) inch per foot or more, nail each sheet of felt six (6) inches from the back edge on twenty-four (24) inch centers. All laps shall be mopped with pitch the full twenty-four and two-thirds (24-2/3) inches, so that in no place shall felt touch felt.

2nd. Spec. No. 13

Apply two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches. Where slope of deck is one (1) inch per foot or more, nail each sheet six (6) inches from the back edge on twenty-four (24) inch centers. All laps shall be mopped with pitch the full nineteen (19) inches so that in no place shall felt touch felt.

3rd. Pour over the entire surface of the roofing membrane a uniform coating of Old Style Pitch into which, while hot, embed not less than four hundred (400) pounds of gravel or three hundred (300) pounds of slag for each one hundred (100) square feet.

General Requirements on pages 4 through 8 and Detailed Specifications on pages 16 through 22 are a part of this specification and must be adhered to where applicable.

PROCEDURE

Select clauses as required. Optional clauses in *italic*.

Copy in color denotes built-up roofing specification

Condition of Surface to Receive Roofing

See Section 1.1.2, Page 4.

Material Quantity Requirements

See Section 1.1.8, Page 5.

Application of Vapor Barrier Below Insulation

A. Felt Type

Coat the ribs of the metal deck with Steep Asphalt and then install two 2 full thicknesses of Koppers No. 15 Asphalt Felt, lapping each sheet nineteen (19) inches over the preceding sheet, mopping with Steep Asphalt the full width of the nineteen (19) inch lap. Extend all felt up vertical surfaces and cutoff at height of insulation.

For other types of vapor barriers see Section 1.2.2, Page 6.

Application of Insulation and Roofing Materials

1st a. Install insulation in steep asphalt applied to deck at rate of 12 to 15 lbs. per 100 sq. ft. and place insulation while steep asphalt is still molten to provide good adhesion. See Attachment Section 1.3.4, Page 8.

b. If slope of deck is one (1) inch per foot or more, insulation must be able to retain nails and, in addition to being set in steep asphalt, insulation must be fastened to the metal deck with approved mechanical fasteners placed at all four (4) corners and the center of each sheet. If two layers of insulation are specified, top layer joints shall not coincide with joints of bottom layer. Fasteners shall be driven after the top layer of insulation is installed.

c. If U.L. and F.M. requirements are a factor for insurance rating, insulation must be listed and approved in accordance with their current data.

2nd. Mop a uniform coating of Old Style Pitch over the insulation preceding the application of roofing membrane.

3rd. Spec. No. 17 wi

Apply over the entire surface, four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches.

Mop solidly between each 27½ inch lap with Old Style Pitch so that in no place shall felt touch felt.

3rd. Spec. No. 18 wi

Apply over the entire surface, three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-thirds (24⅔) inches.

Mop solidly between each 24⅔ inch lap with Old Style Pitch so that in no place shall felt touch felt.

If slope of roof is one (1) inch per foot or more, each ply of felt shall be nailed along the back or upper edge on twenty-four (24) inch centers. If base sheet alternate is used, each ply of base sheet shall be nailed two (2) inches from the back or upper edge on twenty-four (24) inch centers.

4th. Pour over the entire surface of the roofing membrane a uniform coating of Old Style Pitch into which, while hot, embed not less than four hundred (400) pounds of gravel or three hundred (300) pounds of slag for each one hundred (100) square feet.

For base sheet alternate see Section 1.3.5, Page 8.

General Requirements on pages 4 through 8 and Detailed Specifications on pages 16 through 22 are a part of this specification and must be adhered to where applicable.

deck construction:

2.5 Metal Decks (Insulation Required)

SLOPE • Up to 2 in. per ft.

SURFACE • Aggregate

Spec. No. 17 wi—4 ply

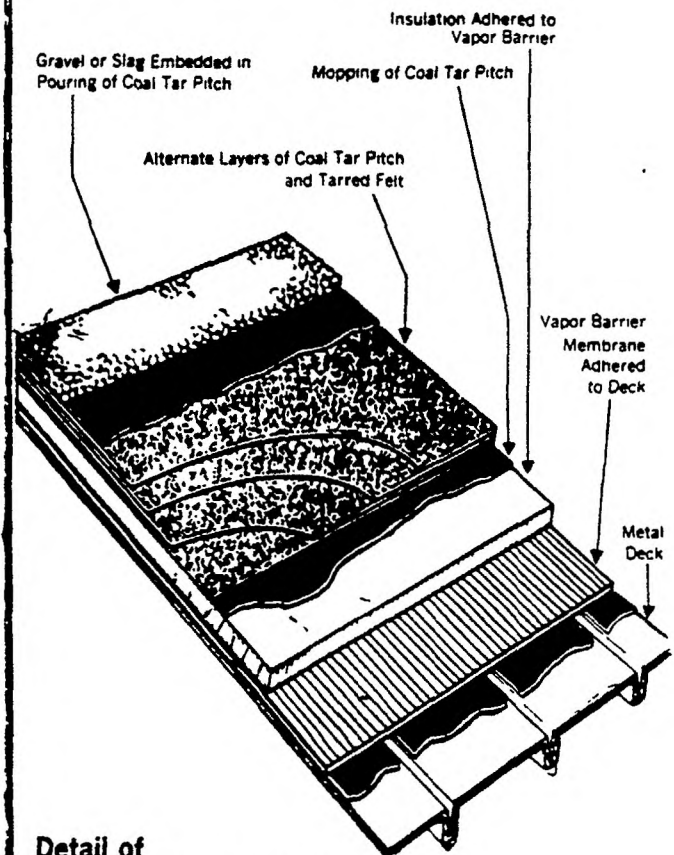
Spec. No. 18 wi—3 ply
board type insulation

Spec. No. 17 wiv—4 ply

Spec. No. 18 wiv—3 ply

board type insulation and vapor barrier

See Page 12 for lightweight insulating concrete—Section 2.4



Detail of
Specification No. 17 wiv

It is absolutely necessary to install insulation on a metal deck before the built-up roofing is applied.

A metal deck must be clean, smooth, and properly anchored to the steel purlins and all joints correctly lapped and fastened.

Type of metal deck, flute opening and various other factors determine the type and thickness of insulation required. Consult your Koppers representative for recommendations.

Metal roof decks shall be designed so that they will not have a deflection exceeding 1/240 of clear span under all types of loads (live & dead). Designer should take into account roof traffic conditions including mechanical equipment used for roof application.

deck construction: Poured Concrete
• Poured Gypsum • Precast Concrete

2.6 Water Cooled Roofs Water Retaining Roofs

SLOPE • Up to 1 in. per ft.

SURFACE • Double Aggregate (with double pour)

Spec. No. 23—4 ply—on deck

Spec. No. 24—3 ply—on deck

Spec. No. 23 wi—4 ply

Spec. No. 24 wi—3 ply

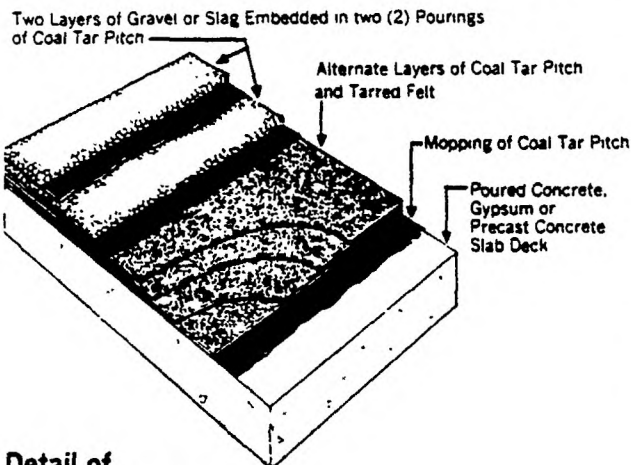
board type insulation

Spec. No. 23 wiv—4 ply

Spec. No. 24 wiv—3 ply

board type insulation and vapor barrier

NOTE: The base sheet alternate Section 1.3.5 shall not be used.



Detail of
Specification No. 23

DEFINITIONS AND DATA

Water Cooled Roof

Water is designed to be contained on the roof at all times at a constant level by means of a drainage system and a water source. (See note on cold weather conditions.) Water Cooled Roofs also include spray pond roofs where the roof is constantly sprayed with water but not necessarily kept at a constant level. Water Cooled Roofs should be applied over poured concrete, gypsum or pre-cast concrete decks.

It is mandatory that the water cooling system be closed down and the roof drained prior to cold weather. Neither roofing nor the structure will withstand the expansion caused by ice formation.

Water Retaining Roofs

Process Water: Water from manufacturing process, cooling towers, etc., that regularly deliver water across the roof for normal drainage.

Retarded Drainage Ponding: Drains are sized to deliver a controlled amount of water to the storm system and thus regularly necessitate heavy water ponding.

PROCEDURE

Select clauses as required. Optional clauses in *italic*.

Copy in color denotes built-up roofing specification

Condition of Surface to Receive Roofing

See Section 1.1.2, Page 4.

Material Quantity Requirements

See Section 1.1.8, Page 5.

Application of Built-up Roofing

1st. Mop deck completely with Old Style Pitch.

2nd. Spec. No. 23

Apply over the entire surface four (4) plies of Koppers Approved Tarred Felt, lapping plies twenty-seven and one-half (27½) inches. Mop solidly between each 27½ inch lap with Old Style Pitch so that in no place shall felt touch felt.

2nd. Spec. No. 24

Apply over the entire surface three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-thirds (24-2/3) inches. Mop solidly between each (24-2/3) inch lap with Old Style Pitch so that in no place shall felt touch felt.

All felt shall be turned up not less than four (4) inches at vertical surfaces.

3rd. Pour over the entire surface of the roofing membrane a uniform coating of Old Style Pitch into which, while hot, embed not less than four hundred (400) pounds of gravel or three hundred (300) pounds of slag for each one hundred (100) square feet.

4th. All loose gravel or slag shall be swept from surface and a second uniform pouring of approximately eighty-five (85) pounds of Old Style Pitch shall be applied over the gravel or slag, into which, while hot, shall be applied a second layer of three hundred (300) pounds of gravel or two hundred (200) pounds of slag for each 100 square feet. The entire surface shall then be thoroughly broomed free from all loose gravel or slag. It is advisable to roll the finished surface with a light roller so that aggregate is thoroughly embedded.

Note:

- At points where water pressure from the spray may be excessive, the roof surface should be protected with treated board platforms or other suitable construction to break the force of the water. These platforms should be laid on top of the roof surface and not fastened to the deck.
- Insulation under a Water Cooled Roof should be of a type which is rigid, dimensionally stable with high compressive strength and of a sealed cellular structure such as Foamglas.
- At all points where roofing membrane meets a vertical surface the flashing specifications used shall be as follows:
Water Cooled Roofs—Koppers Flashing Specification No. 110 *only* shall be used. See Pg. 17.
Water Retaining Roofs—Either Koppers Flashing Specifications No. 108 or No. 110 shall be used. See Pgs. 16 and 17.
- Insulation and vapor barrier, if used, shall be applied according to procedures found in basic specifications 5 & 7 (Pg. 10), 10 & 11 (Pg. 11), 12 & 13 (Pg. 12).
- Specifications 23 and 24 may be applied over wood deck (Pg. 9) or metal decks (Pg. 13) *only* if used as Water Retaining Roofs. Insulation and vapor barrier, if used shall be applied according to procedures found with these specifications.
- Roof Structure design live loads for specifications 23 and 24 shall be a minimum of 50 psf and deflection shall not exceed 1/360 of the span, both in addition to the anticipated weight of the water. Insulation joints must be taped. Vapor barriers must be two ply, solid mopped. Use steep asphalt over metal decks. Wood must be treated to prevent warping (see Section 1.3.2 Page 7).

General Requirements on pages 4 through 8 and Detailed Specifications on pages 16 through 22 are a part of this specification and must be adhered to where applicable.

PROCEDURE

Select clauses as required. Optional clauses in *italic*.

Copy in color denotes built-up roofing specification

Condition of Surface to Receive Roofing

See Section 1.1.2. Page 4.

Material Quantity Requirements

See Section 1.1.8. Page 5.

Application of Roofing Materials

1st. Install one ply of Koppers coated base sheet with minimum four (4) inch side and six (6) inch end laps in a solid mopping of minimum 190°F softening point steep roofing asphalt. All side and end laps shall be continuously sealed the full width of the lap.

ALTERNATE: As an alternate to mopping, lay one (1) ply of rosin-sized sheathing paper lapped two (2) inches minimum and nail to hold in place. Then lay one (1) ply of Koppers coated base sheet lapped not less than four (4) inches and nail along center of lap not less than nine (9) inches on center and thru the center of each sheet on eighteen (18) inch centers with mechanical clinching type fasteners as recommended by the Structural Wood Fiber Products Association or by the designer, such as Simplex Tube-Lok nails.

For bonded roofing applications, fasteners, other than Tube-Lok nails, must be acceptable to Koppers. Fasteners shall be applied at the minimum rate of one (1) per square foot as recommended by the Structural Wood Fiber Products Association.

2nd. Solidly mop the entire surface with Old Style Pitch.

3rd. Spec. No. 27

Apply three (3) plies of Koppers Approved Tarred Felt, lapping plies twenty-four and two-thirds (24-2/3) inches.

3rd. Spec. No. 28

Apply two (2) plies of Koppers Approved Tarred Felt, lapping plies nineteen (19) inches.

Mop solidly between plies with Old Style Pitch so that in no place shall felt touch felt.

4th. Pour over the entire surface of the roofing membrane a uniform coating of Old Style Pitch into which, while hot, embed not less than four hundred (400) pounds of gravel or three hundred (300) pounds of slag for each one hundred (100) square feet.

Insulation and Vapor Barrier

1. Insulation without vapor barrier. Install insulation in steep asphalt in conformance with 1st paragraph. Nailable insulation not exceeding one (1) inch thick may be installed using 1 1/4 inch Simplex Tube-Lok nails at all four corners and at center of board. Installation of roofing over insulation shall be as per specification outlined above with base sheet mopped solidly to the insulation in steep asphalt.

2. Insulation with vapor barrier. Install two (2) plies of No. 15 asphalt felt lapped nineteen (19) inches in steep asphalt as per 1st paragraph of this specification. Both plies shall be mopped solidly so that in no place shall felt touch felt. Install insulation in solid mopping of steep asphalt. Roofing over insulation is to be in accordance with the details of the specification above with base sheet mopped solidly to the insulation.

General Requirements on pages 4 through 8 and Detailed Specifications on pages 16 through 22 are a part of this specification and must be adhered to where applicable.

deck construction:

21a
Ko

2.7 Wood Fiber

SLOPE • Up to 1 in. per ft.

SURFACE • Aggregate

Spec. No. 27 – 4 ply

Spec. No. 28 – 3 ply

Spec. No. 27 wi – 4 ply

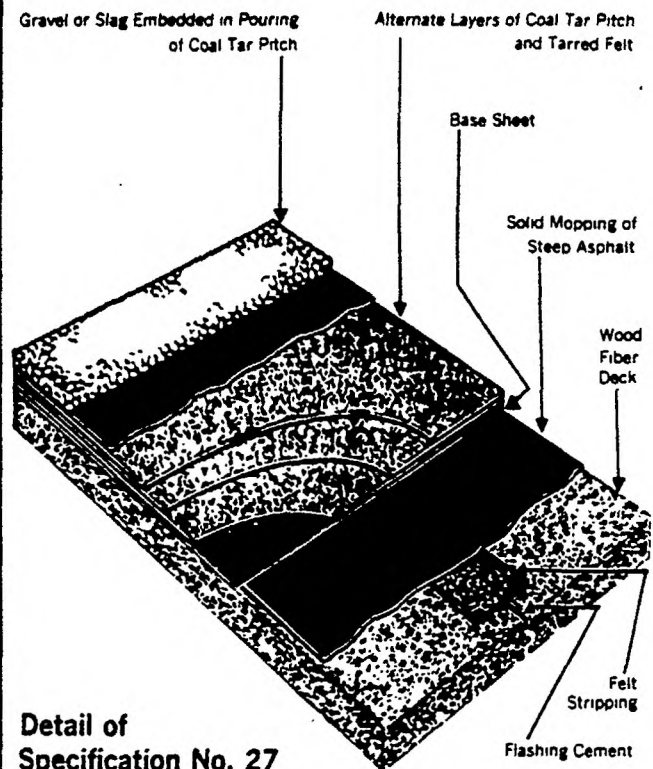
Spec. No. 28 wi – 3 ply

board type insulation

Spec. No. 27 wiv – 4 ply

Spec. No. 28 wiv – 3 ply

board type insulation and vapor barrier



All decking must be installed in strict accordance with the particular deck manufacturer's recommendations for installation. Deck material must be protected during shipment, job site storage and prior to roofing application. No planks which have become structurally weakened due to moisture, fractures or mutilated edges may be used. All joints must be level and preferably grouted full and level with plank surfaces as recommended by the deck manufacturer. All planks must be well anchored to supporting members to resist movement in a fashion recommended by the deck manufacturer. Any planks which bow or deflect or do not seat securely must be replaced. Responsibility for the selection of a particular type of wood fiber deck, its installation, provision for expansion and contraction, its suitability to job requirements, and its ability to support anticipated loads in its environment rests with the designer and deck manufacturer.

3. Koppers Flashing Specifications

3.1 General

Flashings are the terminal closures of a roofing system which perform a waterproofing, and in some systems, a decorative function. Flashings must be installed at all intersections formed by vertical surfaces. Their importance cannot be stressed too strongly. Water entering the roofing system through flashings can result in water vapor forces which will destroy the effectiveness of the roofing.

Koppers flashings are an integral part of a Koppers roof. Designed for

flexibility so that slight movements do not dislodge them and fastened securely to the wall, they give many years of service.

It is particularly important that the top edge of the flashing be protected by counter flashing, which will insure a diversion of the water away from any opening which might develop between flashing and wall. In any case where the design or anchoring system of metal counter flashing is difficult, the top of the flashing system should be double stripped with Koppers Glasfab

4" wide set in Koppers tar base cement for Specification 110 or Koppers flashing cement in Specification 108.

Metal work is only useful for decorative, water shedding, or protection against mechanical damage, and is not a waterproofing part of the flashing system. Because of the high coefficient of expansion of sheet metals and the large temperature changes experienced on a roof, sheet metal or exposed metal components must be isolated from the waterproofing com-

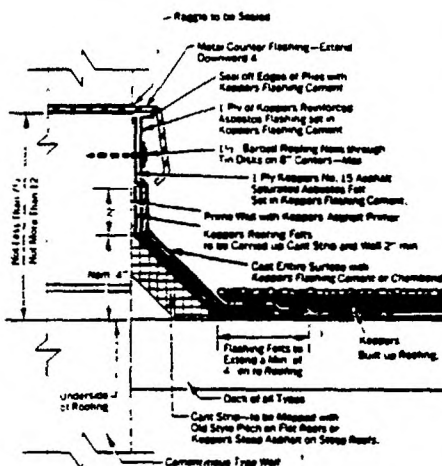
3.2 Specification No. 108 (reinforced asbestos)

Recommended where sunlight is the predominant exposure.

Should be used for all high flashing.

METAL CAP
ASBESTOS BASE (1+1)
COATED SURFACE

Application Detail



Specification No. 108

Application

Extend plies of roofing felts and pitch moppings up all walls, parapets and curbs for a distance of two (2) inches above cant strip.

A raggle not less than seven and one-half (7½) inches or more than twelve (12) inches above the roof deck is to be provided except where capped nailers are used.

Prime all masonry walls from top of roofing felts to raggle with Koppers Asphalt Primer. Allow to dry thoroughly.

In a uniform coating of Koppers Flashing Cement, install one (1) ply of Koppers No. 15 Asphalt saturated asbestos felt extending from the raggle to not less than four (4) inches from the base of the cant onto the roof. On top of this apply a second uniform coat of Koppers Flashing Cement into which embed one (1) ply of Koppers reinforced asbestos base flashing (reinforced fabric side down). Nail with one and one-half (1½) inch masonry roofing nails through flat tin discs along upper edge eight (8) inches o.c. maximum into mortar joints. For concrete construction, nail to treated wood nailing strips set in flush with the surface with appropriate nail through flat tin discs.

End laps for the two (2) plies shall be not less than three (3) inches and stag-

gered not less than twenty-four (24) inches. End laps of reinforced base shall be nailed vertically a minimum of once into the wall at upper edge and once into the cant at a point not lower than the mid point of the cant.

End laps of reinforced base after nailing shall be covered with a strip of Koppers asbestos felt not less than four (4) inches wide set in a coating of Koppers Flashing Cement.

Coat entire surface of flashing with Koppers Flashing Cement or Koppers Chembond (including nail caps along top edge of flashing as well as top edges of felts to seal at wall).

Interply and top coatings shall be troweled uniformly, full height and continuously approximately one-eighth (1/8) inch thick. Plies must be laid in smoothly with no pockets, wrinkles or buckles.

Install metal cap flashing.

NOTE: Hot applied steep asphalt may be used as an alternate to the two (2) interply troweling of asphaltic plastic cement. One (1) ply of No. 15 asphalt felt may be used in lieu of the one ply underlayment sheet of No. 15 asphalt asbestos felt when required. All other requirements of this specification must be adhered to.

Specification Number	Applicable Notes	General	Bondable Classification	Brief Description
3.2 108	3, 4, 5,	Metal Cap Reinforced Asbestos Base Asphalt Coated Surface	20 year Type	Asphalt primer 1 ply No. 15 asphalt asbestos felt 1 ply reinforced asphalt asbestos felt Both plies set in flashing cement Top nailed every 8" o.c. max. plus all end laps at top and into cant above cant mid-point. Strip all end joints Heavy top coat of flashing cement or Chembond Metal cap and pointing
3.3 110	1, 2, 3, 4	Metal Cap Asbestos Base Tar Coated Surface	20 year or 15 year Type	Concrete priming oil (coal-tar) 2 plies No. 15 tarred felt 2 plies No. 15 tarred asbestos felt All plies set in tar base cement Top nailed every 10" o.c. maximum Heavy top coat of tar base cement Metal cap and pointing

NOTES:

1. This specification must be used in conjunction with Koppers water cooled roofs.

2. This specification is recommended for use with any coal tar pitch roof specification where ponded or standing water will lay in contact with the flashing.

ponents of the roofing and flashing system as efficiently as possible to prevent the metal from splitting the membrane.

Flashing should be installed as roofing progresses to prevent water damage to insulation or deck under the roofing. If this is not possible water cut-offs must be installed and later removed when flashing is installed. Metal counter flashing or a top seal of Glasfab and flashing cement must be installed as flashing progresses.

The basic Koppers flashings require a metal cap flashing to be inserted in the raggle immediately upon completion of base flashing. The cap flashing is to extend into the raggle not less than two (2) inches and is to have not less than a four (4) inch exposed apron extending down over the base flashing. Completely fill raggle with Koppers flashing cement.

NOTE:

1. If bonded flashing is required, it must be installed in conjunction with a Koppers bonded roof and can be bonded for

standard periods up to but not greater than the period for which the roofing is bonded. To be bonded, flashings must be set at least 7½" above the roofing base.

2. Metal Cap flashings are not bondable and are not included under any flashing bond.

3. Metal work of any description used as flashing or a part of a flashing system is not bondable and is not included under any flashing bond.

3.3 Specification No. 110

(for water cooled roofs)

Recommended for water and corrosive atmosphere exposure. Low capped and sealed flashings.

METAL CAP COMPOSITION BASE (2+2) COATED SURFACE

Application

Cant strips shall be installed at the angle between the roof deck and the parapet wall or any other similar perpendicular surfaces.

Extend plies of roofing felts and pitch moppings up all walls for a distance of two (2) inches above cant strip.

A raggle of not less than ten (10) inches above the roof deck is to be provided for water cooled roofs and water retaining roofs.

Prime all masonry walls from top of roofing felts to raggle with Koppers Concrete Priming Oil (coal tar base). Allow to dry thoroughly.

Set two plies of Koppers Approved Tarred Felt in trowelings of Koppers tar base roof cement. Have plies extending from the bottom of the raggle; the first extending out onto the deck not less than four inches from the bottom of the cant strip, and the second, one inch beyond the first. Over this apply two layers of tar saturated asbestos felt similarly imbedded in Koppers Tar Base Roof Cement, each ply extending onto the deck one inch beyond the preceding ply.

Nail with one and one-half (1½) inch barbed roofing nails through flat tin discs

at upper edge approximately ten (10) inches o.c. (For brick or block construction, nail into vertical mortar joints. For concrete construction, nail to treated wood nailing strips set in flush with the surface.)

Felts are not to exceed ten feet three inches (10'3") in length. Ends of connecting strips are to overlap three (3) inches and are to break at least twenty-four (24) inches with laps of underlying strip.

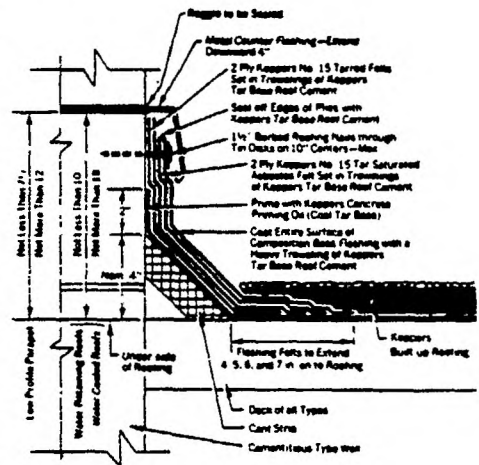
All plies of felt shall be firmly pressed into the trowelings of Koppers Tar Base Roof Cement so that there will be no wrinkles in the finished surface.

Coat the entire surface of the composition base flashings with a heavy troweling of Koppers Tar Base Roof Cement. Install metal cap flashing.

NOTE: This specification must be followed for flashing water-cooled roofs.

It may be specified for use with any Koppers roof in lieu of standard flashing specification where additional protection against water laying in contact with flashing is anticipated.

Application Detail



Specification No. 110

Materials	Piles or Coats Required	Unit	For 100 LF x 12" = 1 Square Approximate Quantity Required
Asphalt Primer	1	Gal.	½ Gal. — (basis 300 sq. ft. per gal.)
No. 15 Asphalt Asbestos Felt	1	4 sq. rl. (3' x 144 LF = 432 sq. ft.)	½ Roll
Reinforced Asphalt Asbestos Felt	1	1 sq. rl. (3' x 36 LF = 108 sq. ft.)	1 Roll
Flashing Cement or Chembond	3	Lbs.	240 lbs. — (basis 3 x 80 lbs. per 100 sq. ft. at ½" per coat) Chembond 2 to 3 gallons per 100 sq. ft.
Concrete Priming Oil	1	Gal.	½ Gal. — (basis 300 sq. ft. per gallon)
No. 15 Tarred Felt	2	4 sq. rl. (3' x 144 LF = 432 sq. ft.)	½ Roll
No. 15 Tarred Asbestos Felt	2	4 sq. rl. (3' x 144 LF = 432 sq. ft.)	½ Roll
Tar Base Cement	5	Lbs.	264 lbs. — (basis 4 x 44 lbs. per 100 sq. ft. at ½" per coat interply) (basis 1 x 88 lbs. per 100 sq. ft. at ½" per coat top coat)

3. All End laps of plies of flashing systems must be staggered or broken with underlying plies.
4. Nailing strips must be provided where necessary to assure maximum holding power.

5. One (1) ply of No. 15 asphalt felt may be used for the one ply underlayment in lieu of the No. 15 asphalt asbestos felt when required.

4. Flashing Details

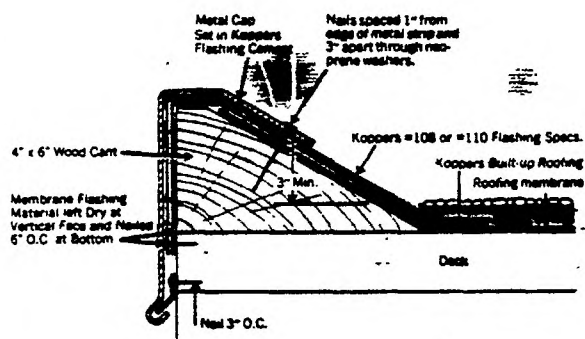
GENERAL INFORMATION

There are numerous flashing details that have been proven by experience over the years. There are normally a number of acceptable construction details for accomplishing one purpose. The architect should select a detail that best serves the purpose under the various and different conditions concerned with the specific job at hand. In certain cases, slight modifications are necessary to adjust a proven detail to job conditions or one method may serve better than another.

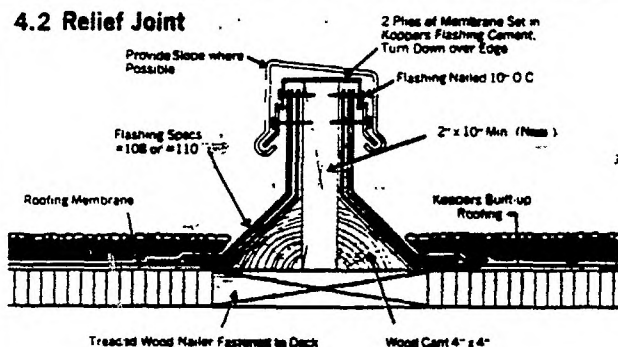
The details shown in this manual are some suggestions based on experience. Space limitations prohibit listing many others.

Design or selection is a responsibility of the architect. Koppers representatives are available to review flashing details to assist the architect in providing the best details for specific jobs.

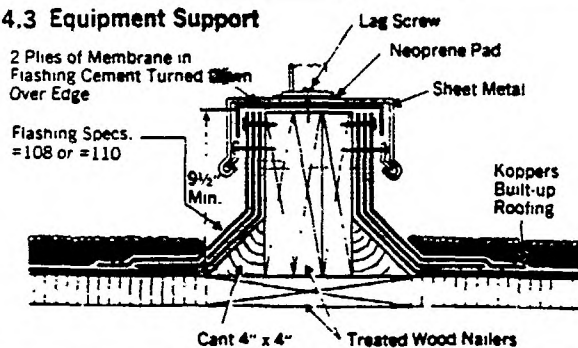
4.1 Raised Edge



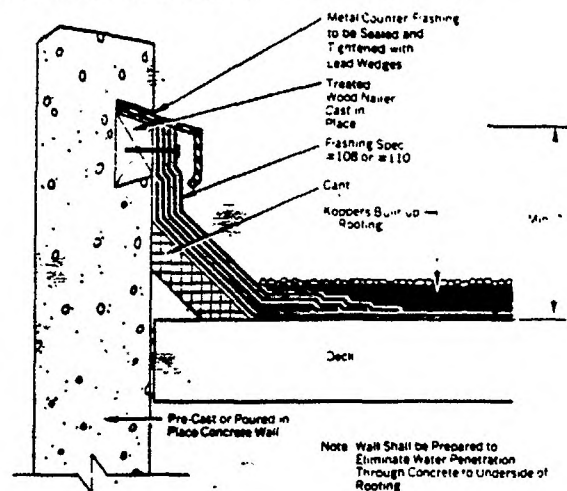
4.2 Relief Joint



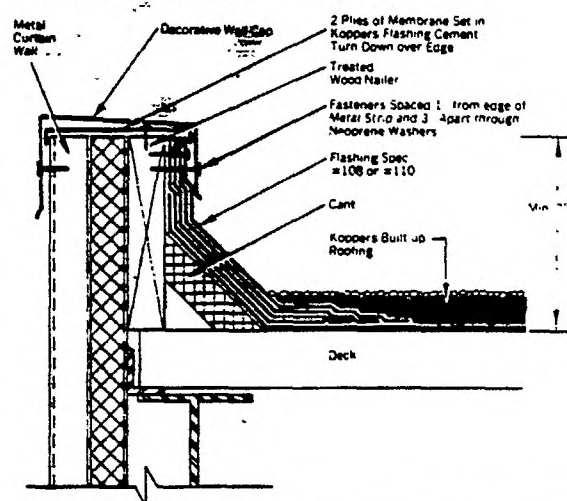
4.3 Equipment Support



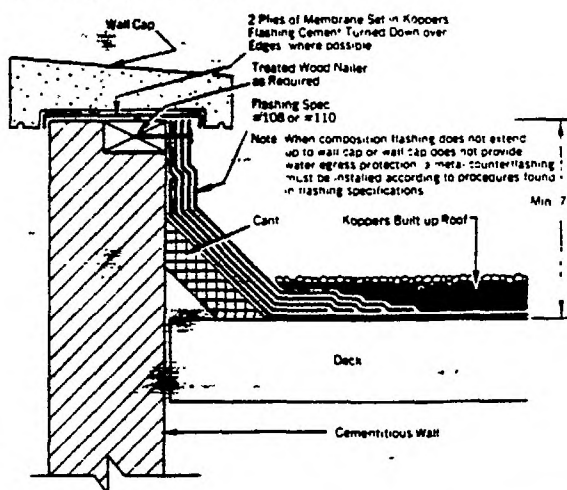
4.4 Parapet/Precast or Poured Concrete



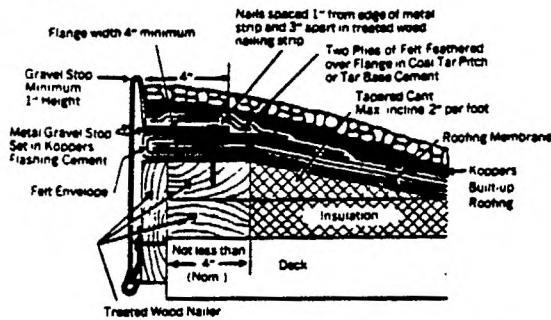
4.5 Parapet/Metal Curtain Wall



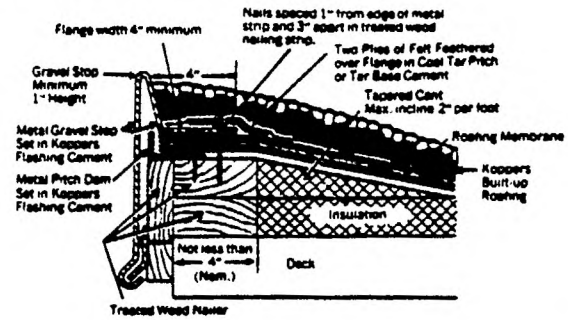
4.6 Parapet/Wall Cap



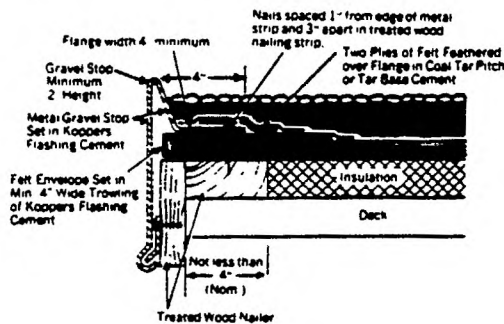
4.7 Tapered Cant



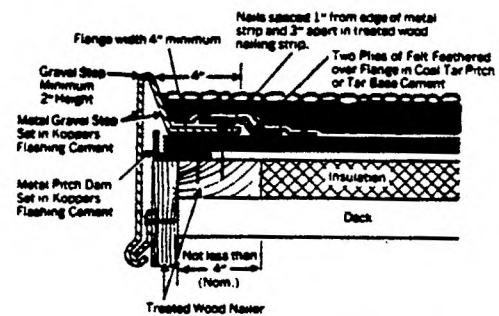
4.8 Tapered Cant



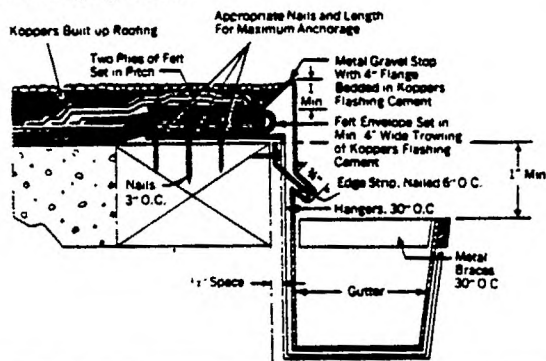
4.9 Flat



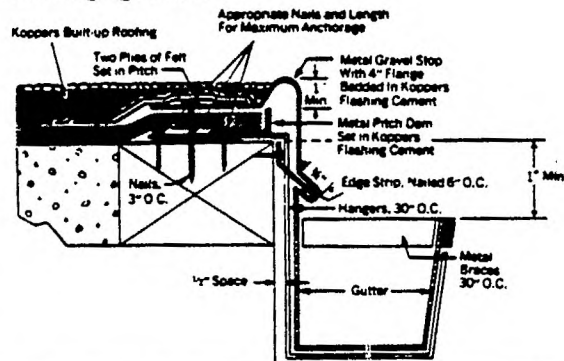
4.10 Flat



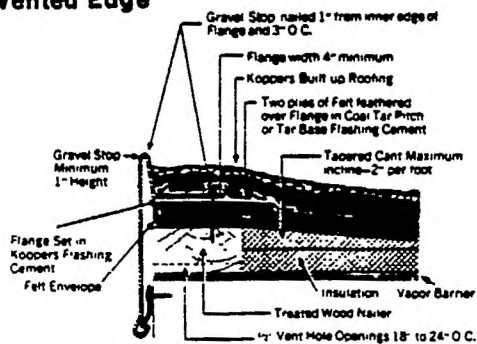
4.11 Hanging Gutter



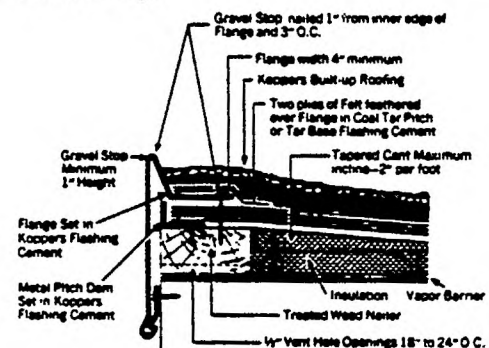
4.12 Hanging Gutter



4.13 Vented Edge



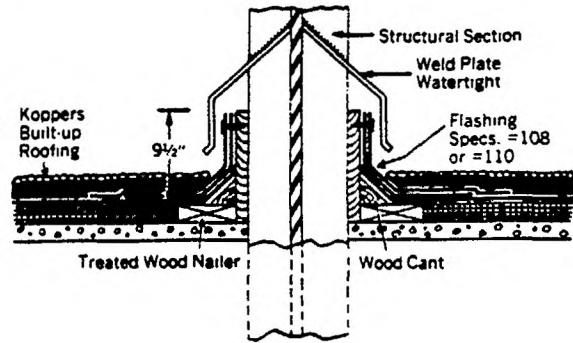
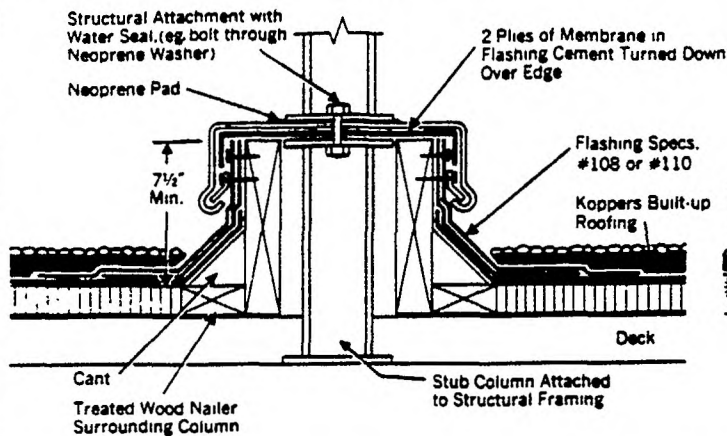
4.14 Vented Edge



Flashing Details (continued)

4.15 Future Columns, Sign Supports and Angle Irons

4.16

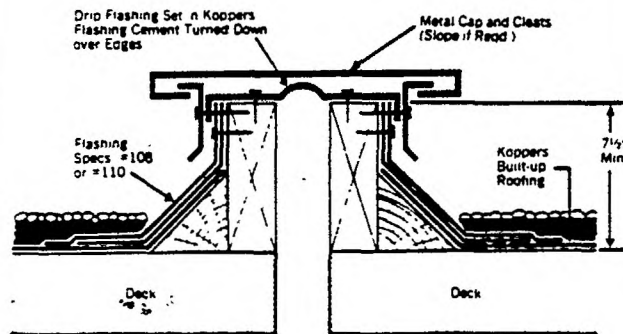


At all locations where stub or future columns, sign supports and angle irons are to penetrate built-up-roofing, Koppers recommends wooden curbed base units with cant strips to be installed to accept standard built-up composition-flashing system. Where structural steel section extends beyond "stub"

height, metal cap flashings with tight fit to the structural section must be fabricated and continuously welded to the projection to assure a watertight metal cap.

For pitch pocket design consult your local Koppers sales representative.

4.17 Curbed Expansion Joint



Curb expansion joints are to be flashed in accordance with Koppers specifications for parapet walls and must provide nailing to hold metal cap and flashing membrane in place. Metal cap must be designed to expand so as not to disturb flashing.

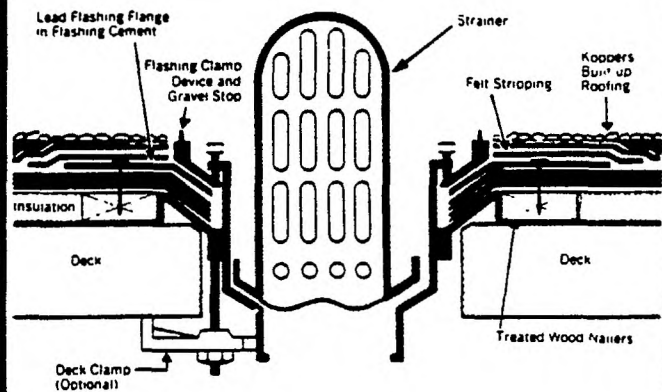
It is the responsibility of the designer of the building to provide for adequate expansion joints.

For the protection of the roofing system against splits caused by expansion and contraction, Koppers recommends that an expansion joint be installed: (1) on large roof areas at least every 200 feet in each direction. (2) at all places where the structural supports and roof assembly change direction. (3) where type of deck material changes.

Where control, expansion, or contraction joints are provided in structural steel, deck material, or deck system, provisions must be made for continuation through the built-up roofing system.

See Section 1.3.6 (Expansion Joints) Page 8.

4.18 Roof Drain



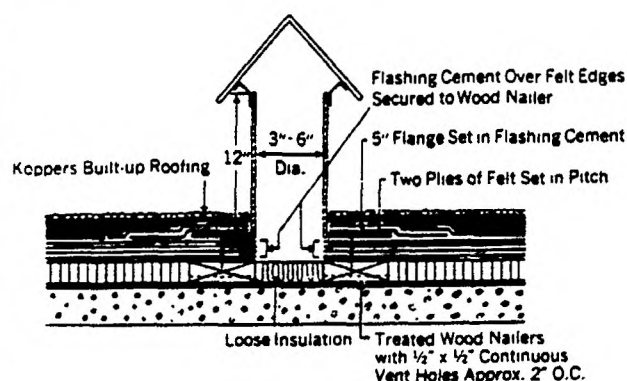
All roof drains shall be provided with metal roof drain flashing flanges which extend at least 12" beyond drain opening and shall be stripped with felt in accordance with drain detail. All drains should be provided with expansion joint sleeves.

The sheet metal flange furnished with the drain must be cemented to the surface of the felt with hot coal tar pitch or flashing cement. Over the flange apply, with alternate moppings or trowelings, two (2) reinforcing plies of tarred felt so that the first extends not less than three (3) inches beyond the outer edge of the flange, and the second not less than six (6) inches.

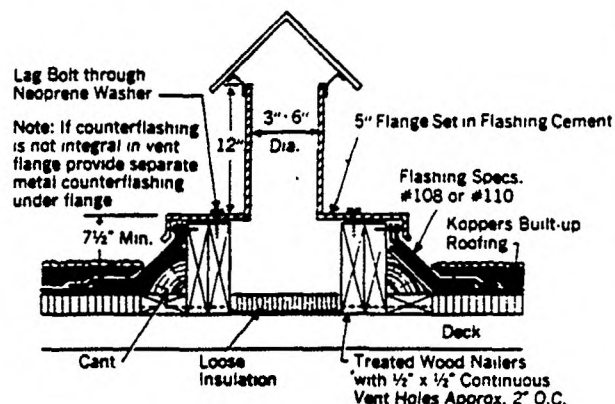
Roof drains must be of a type provided with a wide lead or copper flange. Strainer construction should provide adjustment for meeting variations in roof level or slope.

To obtain proper drainage, roof drains should be located at points of lowest expected deflection in roof deck.

4.19 Roof Vent (Existing Building)



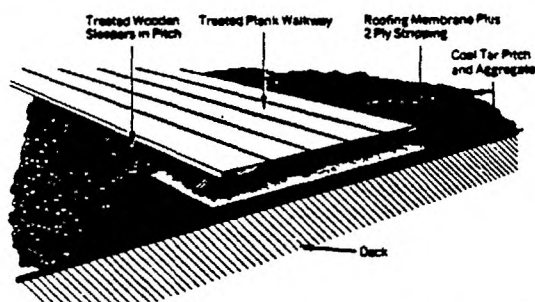
4.20 Roof Vent (New Building)



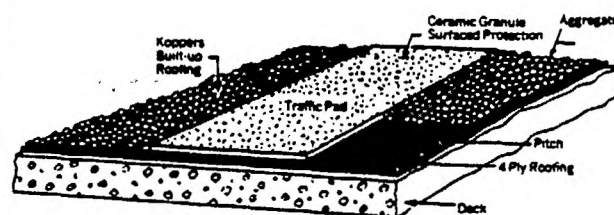
Koppers does not recommend occasional or spot vents through the roof as the only venting method or a substitute for underside or continuous vented systems. There may be certain instances where spot or mushroom type vents might be deemed advisable by the designer for a new building (eg. at expansion joints for vent relief on long run underside continuous venting

systems, etc.) For new construction, wooden curbed base units with cant strip to accept a standard built-up composition flashing system is recommended. For existing construction where relief is required to vent the saturated insulation cavity, spot vents may be used without wooden curbs.

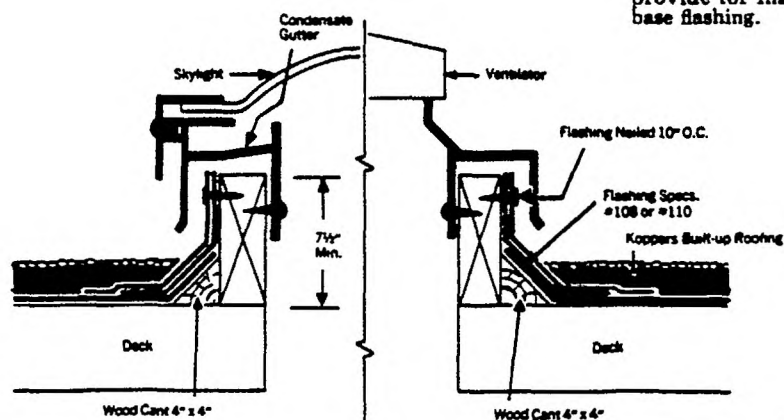
4.21 Walkways Treated Wood Walkway



4.22 Traffic Pad



4.23 Roof Opening

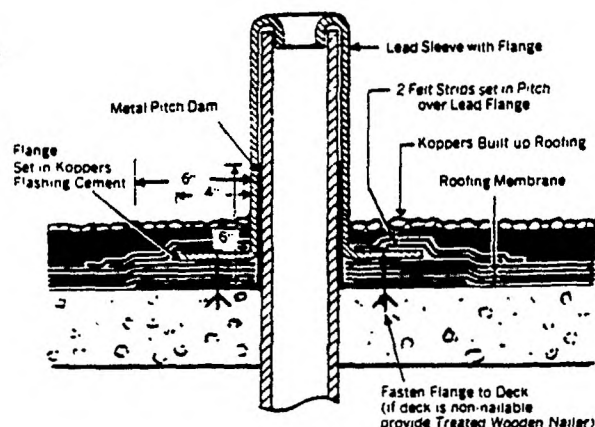


Curbs extending a nominal 8 inches to 12 inches above roof surface shall be provided at all openings for skylights, ventilators, expansion joints, etc., to provide for installation of adequate base flashing.

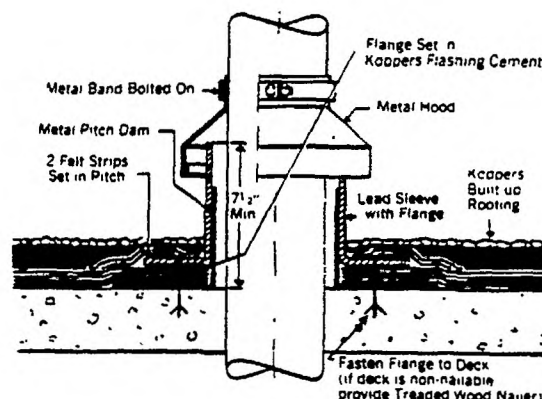
4.24

Vent Pipes, Stacks, Flagpoles, and Other Projections

4.25



All vent pipes, stacks, flagpoles, or other projections penetrating the built-up roofing, whether indicated on drawings or not, must have a proper metal sleeve flashing with flange, pan flashing with flange or other flashed flashing installed. Behind metal sleeve and beneath roofing membrane next to deck install metal pitch dam as shown in detail. The sheet



metal flange must be cemented to the surface of the felt with a mopping of hot coal tar pitch. Over flange apply, with alternate moppings, two (2) reinforcing plies of tarred felt so that the first extends not less than three (3) inches beyond the outer edge of the flange and the second not less than six (6) inches.

5. KOPPERS Bonded Roofing Program

Bonds for Koppers Roofing and Flashings are available for the listed specifications in this manual. Roofing and flashing must be constructed in accordance with Koppers specifications, Koppers materials and by a roofing contractor approved by Koppers in writing. Any deviations from specifications or requirements of bond procedure must be approved by Koppers.

Koppers bonds are available for 10, 15 or 20 year terms. Bonds only cover built-up roofing and flashings where approved.

Koppers will issue its standard roofing bond for coal tar pitch flat or low-sloped roofing and will include such Koppers steep asphalt roofing as required in conjunction with the flat or low-sloped roofing, provided the steep roofing does not exceed 50% of the total roofing to be bonded. All roofing to be bonded must be constructed in conformance with Koppers specifications.

Koppers bonds are not available for residential roofing.

Koppers bonds are transferable upon timely written notification of a change in property ownership.

Koppers bonded roofing program provides for use of proven specifications, quality materials and that the roofing will be applied by a qualified Koppers Approved Roofing Contractor. It also provides for discussion of specifications during the planning stage, consultation during construction and assistance to the owner throughout the bond term as may be necessary in relation to leaks, additional items to project through or be placed above the roof or any matter related to the performance of the roofing. It further provides for repairs of leaks to the roofing not occasioned by defects in the building, abuse, or extreme weather conditions during the term of the bond up to the monetary limit specified in the bond. Flashing membranes may be included on request in riders to the bond.

Koppers bonds do not cover repair, installation or replacement costs of decking materials, vapor barrier materials, insulation products, metal work or products in the roofing assembly furnished by others, nor will Koppers assume responsibility for any damage to the bonded roofing or flashing caused by or the result of the use of these products, their installation or attachment. Bonds are not effective in cases of vandalism or owner abuse.

Koppers bonds are available within the continental limits of the United States in all cases except those areas where Koppers does not presently provide inspection service.

Flashing endorsements when required for bonded roofing may be for terms up to but not exceeding the term for which the roofing is bonded.

Charges for roofing bonds are made on a per square 100 square feet basis of the roofing membrane. If a flashing endorsement to the bond is required, the area of flashing is included for computing the total bond charge. Information on bond charge fees and minimum charges with relation to monetary coverage limits and terms are available through Koppers Approved Roofing Contractors, Koppers District Offices and local Koppers Roofing Representatives. Bond charge payment is due at the time the bond is issued and no additional charge is necessary during the term of the bond.

Koppers reserves the right to cancel a bond if the roof is damaged due to causes not covered by the bond if it is determined that its satisfactory performance for the remaining term of the bond is impaired. Cancellation due to damage of this type does not provide for any refund of the original charge.

KOPPERS

Pittsburgh, Pennsylvania

Bonded Roof

Bonded (Blanket Bond) by

The Aetna Casualty and Surety Company
800 Chatham Center • Pittsburgh, Pennsylvania 15219Certificate
of Coverage No.Roofing
ContractorAddress
City &
State

Owner

Address

Name of Building

Address

Guarantee Period: Years from

Date of Completion of Roof.

Amount of Guarantee: \$

Total Area of Bonded Roof

Squares.

Bonded Composition Flashing

Lineal Feet.

This is to certify that the above-named owner is entitled to the benefits of the Bond set forth below.
Koppers Company, Inc.

By: _____

KOPPERS COMPANY, INC., a corporation of the State of Delaware, with offices in the Koppers Building, Pittsburgh, Pennsylvania 15219 (hereinafter referred to as "Koppers") and THE AETNA CASUALTY AND SURETY COMPANY, a corporation of the State of Connecticut, with office at 800 Chatham Center, Pittsburgh, Pennsylvania 15219 (hereinafter referred to as the "Surety"), guarantee to each owner of a building within the United States and its possessions upon which certain materials sold by Koppers were used in the construction of a roof and to whom there has been issued a Certificate of Coverage under this bond, properly completed and signed by a duly authorized representative of Koppers, that subject to (A) the stipulations and conditions herein contained, and (B) the maximum aggregate liability specified in said Certificate, Koppers will during the period set forth in said Certificate, at its own expense, make any repairs resulting solely from ordinary wear and tear by the elements that may be necessary to maintain said roof in watertight condition. The term "ordinary wear and tear by the elements" as used herein shall not include damage caused by lightning, windstorm, hailstorm or other phenomena of the elements. The term "roof" as used herein shall include all composition flashing specifically referred to in a Certificate of Coverage, and shall exclude all other flashing and metal work.

This bond is made subject to the following further conditions:

- (a) The owner of said roof shall notify Koppers promptly in writing if such repairs are required, and in case of failure of Koppers to make said repairs within a reasonable time, shall notify the Surety by registered letter of such default.
- (b) Nothing in this bond shall render Koppers or the Surety liable in any respect for any damage to said building or any contents thereof or for any consequential damages.
- (c) Neither Koppers nor the Surety will be liable for any damage to said roof caused by:
 1. Traffic, or storage of materials thereon.
 2. Settlement, expansion, contraction, distortion, cracking or failure of the roof deck, copings, walls, structural members or foundation of said building.
 3. Distortion, expansion or contraction of any unbonded flashings or any metal work.
 4. Failure of any materials used as a roof base or as insulation over which said roof is applied.
 5. Failure of materials supplied by others.
 6. Infiltration or condensation of moisture in, through, or around the walls, copings, building structure or underlying or surrounding materials.
- (d) All liability of Koppers and the Surety shall cease immediately and automatically if said roof is used in a manner or for a purpose for which it was not designated, or if any additions, alterations, or repairs (excepting only emergency temporary repairs) are made by anyone except a Koppers-Approved Roofer using Koppers' materials under the supervision of or subject to the inspection of Koppers.
- (e) Where tile, cement, and/or other traffic surfaces are built over said roof, neither Koppers nor the Surety will be responsible under this bond for the expense of removing or replacing such traffic surfaces or for repairing any damage to the roof occasioned by the installation or action of such surfaces.

Signed, sealed and dated as of this 1st day of January 1968.

ATTEST:

Templeton Smith
ASSISTANT SECRETARY

ATTEST:

Ann Krawetzky
RESIDENT ASSISTANT SECRETARY

KOPPERS COMPANY, INC.

Otto Wheely
VICE PRESIDENT
THE AETNA CASUALTY AND SURETY COMPANY
Ann Chas. K.
RESIDENT VICE PRESIDENT

This is to certify that the original of the above Bond is on file with PITTSBURGH NATIONAL BANK, Pittsburgh, Pennsylvania.

Dated January 1 1968

PITTSBURGH NATIONAL BANK

L. P. Scherer
VICE PRESIDENT

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Koppers sponsors an architectural design competition. The competition is offered on a selective basis to accredited schools of architecture, nationwide. It is intra-scholastic only, with separate and identical awards being made to the winning student at each participating school.

Participation is offered to fourth year or sub-senior students only. The program is designed to be incorporated into the regular fourth year curriculum in which all sub-senior students would be involved.

Awards consist of a \$1,000 grant for tuition assistance at each of the several participating colleges and universities. In such cases where tuition costs may be less than \$1,000, the balance of this fund is placed at the disposal of the head of the Department of Architecture for use in furthering the educational aims of his department.

Additional information and complete details can be obtained by writing Koppers Co. Inc., Architectural Student Design Competition.



flat roof design competition for architectural students

Sales Offices

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*District Offices

Other Koppers Building Products Are Described In Other Sweets' Files

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Fire Retardant Shakes and Shingles	$\frac{21e}{Ko}$		
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OM-49-119



KOPPERS
Architectural and
Construction Materials

KOPPERS COMPANY, INC.,
Pittsburgh, Pa. 15219