Re-Roofing

1.0 General

1.1 A large percentage of all commercial/industrial roofing involves installing a new roof on an existing building. The process of specifying and installing a roofing system in a re-roofing application can be more complex than that of specifying and installing a new roof. The design and installation team has to consider not only the new roofing system, but also the old roofing system and any constraints imposed by the existing building. In many cases, the building is occupied at the time of re-roofing, and the design and installation team must be sensitive to the needs and protection of the building occupants.

1.2 JM has prepared this section as a reference guide for architects, building owners, engineers and roofing contractors, to assist in evaluating an existing roofing system and choosing a course of action for re-roofing. The recommendations and suggestions contained in this section are a result of years of practical experience in the roofing industry. This section is not, however, a substitute for the services of a design professional who is able to take into consideration the specific details of a particular building and the building owner's requirements. No JM entity assumes any responsibility for structural design adequacy, performance of the roof deck or of any other elements of the building system not included in the roofing system.

1.3 JM maintains a network of field Technical Services Specialists who are well versed in the problems and opportunities involved in re-roofing. For further information, contact JM Technical Services at (800) 922-5922.

2.0 Evaluation of Existing Roofing Systems

2.1 One of the most important aspects of any replacement or re-cover project is the evaluation of the existing roofing system and support structure. Any evaluation should consist of investigating not only the existing roof system, but also the structural support system of the building. The condition of these two systems can have a significant effect on the performance of any replacement/re-cover system. The more accurate and comprehensive the preliminary evaluation, the more likely it will be to achieve a cost-effective and long-lasting solution to the problem.

2.2 Failure to conduct a meaningful and accurate evaluation can result in selecting a course of action which is inappropriate for that project, and may actually add to the problem rather than solve it. For example, there are certain conditions which will make a re-cover system an inappropriate course of action. If any one of these conditions is identified at any point in the evaluation process, a re-cover system should not be considered, and the only appropriate course of action should be a roof replacement. These conditions include:

1. Inability of the structural support system to bear the added weight of a re-cover system.
2. Deficiencies of the structural support system attributable to movement or deterioration.
3. The presence of moisture in the existing roof or deck system.
4. Any condition that would prohibit adequate attachment of the re-cover system.
5. Local codes or ordinances which prohibit re-cover.

3.0 History of the Roofing System

3.1 Any evaluation should begin with a search of the existing records. Wherever possible, the original specifications and drawings should be located and consulted. These documents can be used to determine if the structural support system can withstand the added load of a re-cover system. A re-cover system should not be considered if the overall weight will exceed the original design load limits of the support structure. In this case, a total or partial replacement is the only acceptable course of action.

3.2 A search of the records should be made to determine whether a roofing bond/guarantee was issued for the existing roof system. If a bond/guarantee does exist, the terms and conditions should be reviewed and the issuer contacted, as necessary.

3.3 Original contract documents can provide information about the composition of the original roofing system, as well as the identity of the original roofing contractor. An interview with the original roofing contractor can provide valuable information regarding the "as built" circumstances and details.

3.4 Other documents, such as minutes from the pre-job conference, reports by roofing inspectors, the manufacturer's original roof specifications and miscellaneous job correspondence can be very helpful in evaluating the system.

4.0 On-site Inspection

4.1 Following a careful investigation of the building records, an on-site evaluation of the existing roof system and support structure can be undertaken. This phase of the evaluation should include:

1. An interview with the building occupant.
2. A general inspection of the exterior of the building.
3. An inspection of the underside of the structural deck system.
4. An inspection of the existing roof system.

4.2 The following equipment may be useful for this phase of the evaluation:

1. Clipboard
2. Paper or evaluation checklist and pencil
3. Camera
4. Tape measure
5. Can of spray paint/waterproof marker
6. Roof plan
7. Flashlight
8. Equipment for core samples
9. Bag to carry tools and samples

5.0 Interview with Building Occupant

5.1 Before actually inspecting the building, the building occupant should be interviewed. This may provide valuable information regarding the condition of the existing system, as well as the source of some of the problems. The following list of questions for the building occupant may be valuable in evaluating the existing system:

1. Is the roof now leaking? For how long?
2. Where is the water entering the building?
3. Does water enter the building with every rain, or only during a driving rain?
4. Does water enter the building as soon as it starts raining, or does it take some time for the water to appear?
5. Does the water stop entering the building as soon as it stops raining, or does the roof continue to leak for hours/days?
6. Does water enter the building during clear dry weather or only during very cold weather (condensation)?
7. Do you know the cause of the roof leaks?
8. Has anyone attempted to repair the roof, and if so, do you know what has been done? Were the past repairs successful?

6.0 Interior Inspection

6.1 Following the interview with the building occupant, an inspection should be made of the underside of the structural roof deck. If possible, the following items should be checked on all decks, regardless of type:

1. Rust/water stains
2. Asphalt drippage
3. Indications of structure failure, corrosion or weakness
4. Deck span
5. Presence, type and condition of mechanical fasteners protruding through the deck

6.2 For specific deck types, also note the following:

Steel Decks
1. Unusual deflection of the deck
2. Existence of side lap fastening
3. Condition of spot welds

Pre-cast Units
1. Configuration of unit ("Ts", "TTs", slab, waffle slab, hollow core)
2. Size of joint between panels
3. Cracks or spalling in panels
4. Damage to edge of panels
5. Presence and condition of weld plates
6. Camber
7. General conditions and evenness

Lightweight Insulating Concrete
1. Substrate (corrugated metal, slotted metal, form board, wood, structural concrete)
2. Existence and condition of underside venting feature

Structural Concrete
1. Cracks
2. Spalling or efflorescence

Cementitious Wood Fiber Planks
1. Sagging of panels
2. Condition of tongue and groove joint
3. Presence and condition of side lap clips
4. Indications of panel movement
5. Indications of rot (punkiness) or loss of integrity

Gypsum Plank
1. Condition and dimension of joint
2. Sagging of panels
3. Spalling or punkiness
4. Indication of panel movement

Poured Gypsum
1. Substrate and condition (form board, metal, concrete)

Wood Board and Plywood
1. Condition and dimension of joints
2. Presence of blocking or ply clips at plywood joints
3. Indication of dry rot or insect infestation
4. Excessive knot holes
5. Warping
6. Condition of purlins or joists
7. Panel deflection

6.3 Roof leaks should be observed from the inside of the building to determine whether the water entry is occurring through or near roof drains, air conditioning ducts or other penetrations. A roof leak in the vicinity of a change in deck types could indicate a roof split, due to the lack of an expansion joint. Leaks at a wall line could indicate the failure of a base flashing, or water entry through the wall, coping or gravel stop.

7.0 Exterior Inspection

7.1 Before inspecting the existing roof system, a general inspection of the exterior of the building should be made from ground level. Bowing of masonry walls or tilting of precast panels indicate structural movement. Cracks in the masonry at corners, window openings, doorways or additions may indicate structural problems which must be resolved prior to roofing.

7.2 Efflorescence on masonry walls indicates water entry through the masonry or coping. If replacement/re-cover is to succeed, the masonry walls must be waterproofed.

7.3 Water stains, moss or algae on masonry usually indicate a deficiency in the gutter, gravel stop, down spouts, scuppers or through-wall flashing. It is likely that the roof adjacent to these stains will also be wet.

8.0 Rooftop Inspection

8.1 Only after all preliminary evaluations and inspections have been completed can an actual rooftop inspection be made with maximum effectiveness. To ensure that all information gained during this rooftop inspection can be properly utilized during the decision-making process, the information gathered should be recorded at the time of the inspection. Photographs of the general layout and specific deficiencies of the existing system may help the inspector refresh his memory at a later date, or illustrate conditions to decision makers who were not present during the inspection. Annotated roof plans and roof inspection checklists will provide similar assistance. Only after all the information gathered is considered as a whole can a comprehensive course of action be determined.

8.2 If a roof plan is not available before the rooftop inspection is made, one should be made during the inspection. Existing roof plans should be checked for accuracy, and any additions or demolitions should be so noted. Location of drains, scuppers, expansion joints, rooftop equipment, deck types, flashing details and slope of roof are just some of the items that should be noted on the roof plan.

9.0 General Overview

9.1 The first step of a rooftop inspection is a general overview of the roofing system. The first quick glance around the roof can set the tone and give direction to the rest of the inspection.

9.2 What is the general condition of the roof? Debris, standing water, vegetation and obvious signs of abuse, in many cases, indicate long-standing and far-reaching problems which may eliminate roof re-cover as a viable alternative. Initial impressions, however, must be followed up with specific inquiries.

10.0 Perimeters

10.1 The perimeter of the building should be the first point of inspection, since the majority of roof leaks and related problems occur in this area. Base flashings should be checked for integrity and watertightness. Counterflashings should be checked to ensure that they are in place, properly attached, caulked where necessary and performing their intended function. Metal, stone, concrete and tile coping should be checked for solid attachment and watertightness. A missing piece of coping can allow a significant amount of moisture into the roofing system in a relatively short period of time. Coping joints should be checked for their integrity. Loose or missing grout, or deteriorated or improperly applied caulk, can be a source of water entry to an otherwise stable base flashing system. The inside of parapet walls should be checked for cracks, water stains, moss and algae that would indicate water entry from a source other than from the base flashing.

10.2 The base flashing itself should be checked to see if it has physically deteriorated. Improper nailing along the top of the base flashing frequently causes the base flashing to either sag below the level of the counterflashing or to fall off the wall entirely. Blisters behind the base flashing can indicate water entry. Diagonal wrinkling, or “tenting” of the base flashing material, is a classic sign of differential movement between the wall and the deck. “Bridging” flashing materials can indicate differential movement or membrane shrinkage. Splits in BUR or modified bitumen flashing materials are normally a clear indication of differential movement within the structure. Laps in the base flashing material should be checked to see if they are solidly adhered. Lightning arrestor systems, sign and antenna support systems, and conduits are frequently attached to a parapet wall after the completion of a roofing system. Those attachments may be a source of water entry if improperly flashed or maintained.

10.3 Gutters should be checked for rusting of metal and clogged downspouts. The stripping at joints in the gravel stop should be carefully scrutinized, since leaks caused by splits at this location are common. A gravel stop whose profile contributes to ponded water can create problems for the rest of the roofing system, as well as being a source of leaks in itself.

11.0 Field of Roof

11.1 After a thorough inspection of the roof perimeter has been completed, attention should focus on the main body of the roof. Areas of ponded water can be a result of inadequate slope in the original design, deflection of the structural deck, improper installation of the original roof insulation or deterioration of the insulation. The actual cause should be determined and noted on the roof plan. Ponded water is one of the most harmful conditions for any type of roofing system, whether existing or new. If ponded water is not present at the time of inspection, the inspector should look for signs that would indicate its presence during periods of precipitation. Stains on the surfacing and vegetation growth are common indicators. Vegetation growth is harmful, not only because it indicates a condition of ponded water, but also because the roots of the vegetation can penetrate the membrane and allow for infiltration of moisture into the system.

11.2 Obvious signs of abuse, such as discarded lumber, masonry blocks, steel and other construction items, should be noted, and the membrane checked for possible damage. Vandalism, such as bullet holes, arrows and welding rods which have been intentionally embedded in the roof, should also be noted.

11.3 The surfacing of the membrane should be inspected to determine its condition. Wind scouring of gravel surfaces is a common problem, particularly at corners which face the prevailing winds. Excessive gravel may be a problem in that it not only places too much weight upon the structure, but also allows an accumulation of dirt and debris, which may foster ponded water and vegetation growth. Excessive surfacing of any type may promote membrane slippage in steep slope applications. Too little gravel can promote premature aging of the membrane, due to lack of protection from ultraviolet attack. Roof coatings, such as Hypalon® on single ply membranes and aluminum roof coatings on built-up membranes, should be checked to see that they are present in quantities sufficient to perform their intended function. In extreme cases, "alligatoring" of asphalt coatings can literally tear open the membrane. Industrial residue, oils, animal fats or other chemical contaminants should be identified and eliminated at the source.

11.4 Mineral and metal face surfacings on membranes should be checked for quantity and adhesion to the membrane.

11.5 Curling or wrinkling of organic felts may indicate decay of the membrane. "Picture framing" of the membrane above roof insulation generally indicates the absorption of moisture by the insulation due to the effects of condensation. It can also indicate inadequately attached roof insulation. The membrane should be checked for "fishmouths," "mole runs" and open laps.

11.6 Occasional blistering of the membrane normally indicates a minor error in application that can be easily repaired. Severe blistering throughout the roof area, however, is a clear indication of major problems. Blistering on a large scale would indicate installation of wet materials during construction, or it may be an indication that the membrane substrate is laden with moisture. The moisture may also be a result of roof leaks or improper vapor retarder design. Care should be taken to determine the exact cause of the blistering so that it may be eliminated in the re-roofing construction.

11.7 Roof splits are normally a result of differential movement between building components. Areas which exhibit the greatest tendencies for differential movement should be examined from the roof side to determine if the membrane has split. Some of these are:

- Over building expansion joints
- Over seismic openings
- Along the line of building additions
- The point at which deck types change (e.g., concrete to steel)
- The point at which deck panels change direction
- The smaller dimension of roof offsets (L, T, U shapes)
- Large expanses of roof area (dimensions greater than 200' [60.96 m])

11.8 Differential movement must be accommodated if a new membrane is to have any chance of success.

12.0 Equipment and Accessories

12.1 After a thorough inspection of the roof perimeter and the field of the roof, all rooftop-mounted equipment should be carefully examined. Equipment that has been added after the original construction and not properly flashed is a common source of roof leaks. Areas where equipment has been removed and the roof not properly sealed is also a common source of water entry. Sheet metal coverings for HVAC units and other rooftop equipment should be closely checked for holes and missing or improperly fitted panels. Many "roof leaks" have been traced to improperly installed or deteriorated rooftop equipment. Equipment that contains refrigeration units or electrical motors should be checked to ensure that oil or grease is not being deposited on the membrane.

12.2 Roof drains should be checked to see that they are open and properly flashed. Clamping rings must be tight and seals in place. The seal between the roof drain and the plumbing system should be checked to ensure that it is watertight. Improperly flashed or stripped expansion joint covers can be an easy route for water entry. Joints between individual shop-made sheet metal covers and factory-made covers with integral bellows should be inspected. Since many of these expansion joint covers are raised above the roof level, they can easily suffer damage when equipment is dragged or rolled across them. The basic material of the metal flange and bellows should be inspected for material deterioration. The termination of expansion joint covers at roof edges, or parapet walls, should be checked to ensure that the transition plane is watertight.

13.0 Roof Cuts

13.1 While roof cuts are not generally recommended in newly constructed roofing systems, they are very valuable and, in fact, essential in a comprehensive evaluation of an existing roof system. Roof cuts allow the inspector to verify the exact construction of the roofing system. Roof cuts also allow the inspector to determine, beyond a shadow of a doubt, if the roofing system contains any moisture at the point of the roof cut. Roof cuts are valuable in further assessing the condition of the top surface of the roof deck. When roof cuts are to be used to determine the construction of the roof membrane, they should be 6" x 45" (152 mm x 1143 mm) in size and cut at a right angle to the laps of the membrane. This method of sampling is more meaningful than small square cuts because they reveal whether a base felt (if used) was properly lapped, and if the ply felts were installed with the proper exposure. The frequency of the roof cuts may vary greatly, depending upon the size and the condition of the existing roof. At least one roof cut should be made in each distinct roof area. Any area which is thought to have wet insulation or wet deck material should be sampled. If moisture is found, sampling should continue at relatively close intervals, so that the limit of moisture intrusion can be defined. For this type of sampling, a small “core sampler” of about 2" (51 mm) in diameter is preferred. Regardless of the type of roof cut taken, great care should be exercised to ensure that these areas are properly repaired. Improper repair of test cuts can only lead to further deterioration of the existing roofing system.

14.0 Nondestructive Testing

14.1 Over the last decade, several methods of nondestructive moisture detection have been developed and refined. Properly done, and verified through core sampling, they provide the decision maker with an accurate analysis of the degree of moisture infiltration into an existing roof system. These systems have the advantage of not actually penetrating the roofing system, and thereby weakening it. None of these systems, however, actually detect moisture.

Re-roofing Options

15.0 General

After the old roofing system has been thoroughly evaluated, alternatives can be examined. Simple maintenance may be adequate up to a point. As a statement from the National Institute of Standards and Technology (formerly the National Bureau of Standards) reads, however, “There comes a time in the life of a roof on every permanent structure when it is no longer practical or economical to effect repairs, and when that time comes, re-roofing is the only solution.”

The selection of an appropriate re-roofing system depends upon many factors. In new construction, it is possible to design a roof system by gathering data from drawings, engineering calculations and specifications for related components. When re-roofing, however, the new roofing system must fit the existing structure and conditions.

After collecting all background data and conducting physical inspections, a course of action may be determined.
The choices are:

1. Complete tear off and replacement
2. Partial replacement
3. Re-cover (roofing over the old membrane)

16.0 Replacement

16.1 The complete removal of the old roof system is always the best and safest option. In this way, all questionable materials are eliminated. There is no possibility of inadvertently leaving any wet or deteriorated insulation in the new system. Questions of asphalt, membrane or insulation incompatibilities are not a concern, as they would be in a re-cover system.

A complete tear off will also reveal problem areas in the structure and deck assembly, if they exist. Deck panels may be found to be deteriorated and in need of replacement because of leakage over an extended period of time. Deterioration of the deck and fasteners may not only be caused by leakage, but may also be due to a condensation problem, revealing the need for a vapor retarder.

A good solid deck is essential. Any rusted, decayed or otherwise damaged deck should be replaced. Without a sound base, the new roofing system cannot be expected to perform over the long term.

16.2 Considerations

When designing a replacement roof system, additional roof components or features may be required because of the occupant's changing needs, or to accommodate changes in interior conditions. For example, a new manufacturing process may now be housed inside the building, or perhaps an old manufacturing facility is now an office building. In most circumstances, when specifying a roof system in a total replacement, any JM membrane and insulation system appropriate for that particular deck may be used.

16.3 Adding Components

Insulation. Many older buildings are seriously underinsulated by current standards. The owner may wish to upgrade the thermal performance of the roofing system to provide a more comfortable environment for the occupants of the building, as well as to reduce energy costs. Before adding significant amounts of insulation, however, careful consideration should be given to potential condensation problems created by the additional "R" value. For more information, consult the "Vapor Retarders" section of the JM Commercial/Industrial Roofing Systems Manual.

Expansion Joints. Prior to removal of the old roof, the location of splits, diagonal wrinkling in base flashings or other signs of differential movement should be noted. If these indications are present, the designer should consider the addition of expansion joints and expansion joint covers. See the "Specialty Roofing Products" section and the "Roof Decks" section for more information.

Additional Drainage. One of the most common problems found on older buildings is the lack of proper drainage. Many were designed with "dead level" roof decks, and, in theory, drainage should be adequate. Unfortunately, it rarely is. Elevations of columns are never exact and deck units may have a slight camber or curvature, which, under normal deflection of the deck from the weight of roofing and rooftop equipment, can cause portions of the roof deck to sag below the level of the drain. This is especially true if the drains are located at columns. Even if slope was provided originally by varying the height of columns and girders, the roof may not drain, due to settlement of the building. A clogged drain that has allowed water to build up can also result in a permanently deformed deck.

The most effective way to provide proper drainage on an existing structure is to install a factory-tapered insulation system. These tapered insulation systems can be custom designed for the individual drainage requirements of practically any building, and they afford the owner higher thermal performance. **For more information on tapered insulations, contact the JM Tapered Systems Group at (800) 343-1283, or (800) 341-8032.**

Small areas of ponded water can possibly be treated with the addition of sumped roof drains. Ponding that occurs between existing drains or scuppers can be treated by the addition of crickets or saddles between these features.

16.4 System Selection

Of all the re-roofing alternatives, total replacement allows the designer the greatest latitude for selection of a replacement system. Any JM commercial/industrial roofing system appropriate to the deck type may be used when the existing system is totally removed.

17.0 Partial Replacement

17.1 Partial replacement normally entails removing an existing membrane and any damaged or wet insulation and installing new insulation and a new membrane.

Rigid roof insulation is a substantial part of the cost of any roof system. When the existing insulation is found to be dry and in good condition, it is in the building owner's best interest to reuse this asset. This can be a viable course of action if properly undertaken.

When the membrane is removed, the existing insulations may be checked visually for damage and moisture. All wet and damaged insulation must be replaced. To be acceptable in a partial replacement system, existing insulation must yield a smooth, rigid surface for attaching the new system. Some insulations and membrane systems are better suited than others for this option. Asphalt-attached built-up and modified bitumen membranes can be effectively removed from perlite-based insulations. A layer of new insulation should **always** be installed on top of the old insulation prior to installing any type of new membrane.

Attachment of the new system to the building structure is a key element of a successful long-term roofing system. Removal of the existing membrane exposes the existing roof insulation and allows it to be mechanically attached to the deck system, if it is not already attached.

A new layer of insulation must be applied over the existing layer to ensure a smooth, dry substrate for the new membrane. This new layer of insulation will also serve to cover any insulation fasteners in the existing insulation. This not only

protects the membrane from fastener back-out, but also increases the thermal efficiency of the insulation system. No membrane should be adhered directly to the old insulation. The old insulation surface should be primed and the new insulation should be adhered in hot steep asphalt.

In a partial tear off, additional weight will be placed on the structure. The effect of the replacement roofing system on the structure should be reviewed by a qualified structural engineer to ensure that the additional weight can be supported.

Provisions for proper drainage must be made. This can be done by the installation of tapered roof insulation, crickets, saddles, sumped drains, or any combination of these components.

Because a new layer of insulation will be added in most cases, all flashing must be checked for proper height. Existing curbs may need to be built up to provide an 8" (203 mm) minimum flashing height. If at all possible, units should be lifted up during the re-roofing so that they may be flashed properly.

17.2 Flashing Systems
Whether a partial replacement or a complete tear off, old flashings should be entirely removed. The exception to this would be with some single ply roof systems, where the flashings can be left in place provided that they are adhered tightly to their substrate. Walls and curbs should be repaired and built up to an acceptable height above the membrane. An entirely new flashing system should then be installed. Additional wood blocking may need to be added at the perimeter of the building and at all base flashings in order to accommodate increased insulation thicknesses. The designer is urged to review the flashing specifications in the JM Commercial/Industrial Roofing Systems Manual.

18.0 Re-cover

18.1 It must be emphasized that a total replacement of a failing roof is preferable to either a partial replacement or re-cover. The test cuts taken during the evaluation phase will determine if the existing roof is suitable for a re-cover. If the test cuts reveal extensive areas of wet insulation, then total replacement of the roof is the only viable choice.

There are some circumstances, however, which may justify examining re-cover as an option:

- A non-insulated or insulated system which has been thoroughly investigated and found to be dry and in good condition except for normal wear and tear.
- When the contents of the building are so critical that they cannot be exposed to possible water damage for even a short time. Computer facilities and museums might fall into this category.
- High rise buildings in dense metropolitan areas may make the removal and disposal of an old system impractical. The U.S. Environmental Protection Agency (EPA) regulates the disposal of hazardous waste products. The local EPA office should be contacted for guidelines before removing and disposing of any existing roof system containing asbestos or other hazardous material.
- Unusual construction techniques in the original construction may make it impossible to remove an existing roof system without damaging the building's structural support system.

18.2 Considerations
There are three basic considerations that must be taken into account before any re-cover system can be a success.

1. The structure must be able to safely support the weight of the new roof.
2. There can be no entrapment of moisture in the new or old roofing system.
3. There must be some means of positive attachment of the new roofing system to the building structure.

A structural engineer should inspect and certify that a building can support the added weight of a re-cover system prior to the start of work. Local building codes should also be checked to ascertain that a re-cover is permitted.

The existing roof should be carefully checked to ensure that it contains no moisture that will adversely affect the new roofing system. Moisture in the existing roofing system can be a cause of blistering of the new system and can cause premature failure. Prior to installing a re-cover system, the old roof should be cut in a random pattern. This will ensure that if the new roof leaks, the water will not be trapped between the old and new roofs, seriously degrading the new roofing system or becoming a safety problem. Cutting the old membrane will also allow moisture vapor to escape from the old system. Roof vents installed in the new system will allow the moisture vapor to pass to the atmosphere. The installation of one roof vent for every 1,000 ft^2 (92.9 m^2) is recommended.

All roofing systems, whether new or re-cover, must be attached at some point to the building structure. It is recommended that a base sheet or divorcing layer of insulation be mechanically attached through the existing roof and into the structural roof deck before the re-cover membrane is installed. If the existing roofing system is securely attached to the building structure, consideration can be given to adhesively attaching the re-cover system to the existing system. Insulation or a venting base sheet may be "spot mopped" with hot asphalt to a smooth surface or a "spudded" gravel surface, and an appropriate bituminous membrane solidly mopped to that.

18.3 Flashing

All existing flashings on the roof must be completely removed and replaced even when the existing membrane is being re-covered.

As with new construction, JM recommends an 8" (203 mm) minimum flashing height above the roof membrane. In many cases, this will require raising existing curbs and counterflashing. New flashings must not cover existing through-wall metal flashings or weep holes in masonry walls. Existing metal counterflashing can be reused if it is in good condition.

18.4 Compatibility of Roofing Components

With the wide variety of roofing materials available today, it is important to ensure that the materials used in the re-cover system are compatible with those in the existing roof.

If a divorcing layer of new insulation separates the old and new roof, compatibility problems can be minimized. New insulation should be mechanically attached through the old roof and into the structural deck whenever possible.

Systems that contain polystyrene insulation must be treated with care. Hot asphalt will readily melt polystyrene. A divorcing layer of insulation over the polystyrene may not be sufficient protection as asphaltic or solvent-laden cements can easily flow through the joints of the new insulation and affect the polystyrene.

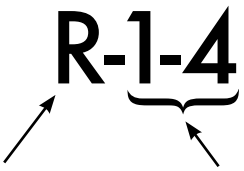
Fresh coal tar pitch is usually incompatible with asphalt-based roofing systems and most single ply systems. Asphalt can generally be used in conjunction with older coal tar pitch roofs in which the volatiles in the coal tar pitch have dissipated. Higher softening point asphalts are less likely to be incompatible with coal tar pitch than low softening point asphalts. Extreme care should be taken when mechanically attaching new insulation or a new roofing system through an existing coal tar pitch roofing system. If the fasteners are not properly insulated they can conduct enough heat to cause the low melting point coal tar pitch to flow and drip into the building.

18.5 Re-cover Base Specifications

Determining the condition of an existing roof and the need for a new roof involves complex evaluation procedures. Each project has its own specific problems that require individual assessment. The following are Re-cover Base Specifications for use in re-covering existing roof systems. The base specifications provide divorcement from the old roof. After application of the appropriate “Base” specifications, any built-up or modified bitumen roofing specification shown in the current JM Commercial/Industrial Roofing Systems Manual may be selected to be applied over the Base Specification.

Re-cover Specifications

JM Re-cover Specifications consist of two basic parts. A letter indicates how the existing membrane is to be treated, and one or two numbers indicate how the base of the new membrane system is to be attached to the structure. Because of the complexity of re-cover conditions, it is impossible for any specification system to cover every eventuality. **A JM Technical Services Specialist should be consulted to determine if a re-cover system on any specific building is eligible for a JM Peak Advantage Roofing Systems Guarantee.** A general listing of normally acceptable re-cover specifications follows the specification descriptions.



Existing Membrane		New System Base
R	Remove Membrane	1. Mechanically Attach Existing Insulation
SW	Sweep Surface	2. Mechanically Attach New Insulation
SP	Spud Surface	3. Spot Mop New Insulation
		4. Solid Mop New Insulation
		5. Mechanically Attach New Base Sheet
		6. Spot Mop New Base Sheet

Remove Membrane (R) Local agencies and building codes should be consulted regarding removal and disposal of potentially hazardous materials. Remove only as much membrane as can be completely covered with a new roofing system in the same work day. If removal reveals wet or damaged insulation or decking, suitable repairs or replacement must be made prior to installing the new system. Existing insulation must be primed with JM Concrete Primer prior to the application of hot asphalt. Wood blocking/nailers must be replaced or added to accommodate the new roofing system. Proceed with the installation of an approved New System Base, followed by an approved JM roofing system specification.

Sweep Surface (SW) Using a manual or mechanical method, remove the loose gravel from the surface of the existing roof system. Care should be taken to ensure that the existing membrane and membrane surface is dry. Areas that are determined to be wet or damaged must be completely removed and replaced with materials that are compatible with the new system. The existing membrane should then be randomly cut with an axe or other device at an approximate rate of one 6" (152 mm) cut per 10 ft^2 (0.92 m^2). Proceed with the installation of an approved New System Base, followed by an approved JM roofing system specification.

Spud Surface (SP) Using a manual or mechanical method, remove **all** the gravel from the surface of the existing roof system. After removal of the gravel, the existing membrane surface must be flat and smooth with no remaining gravel or debris. Wet or damaged areas of existing membrane must be removed and replaced with new, dry materials compatible with the new roofing system. The existing membrane should then be randomly cut with an axe or other device at an approximate rate of one 6" (152 mm) cut per 10 ft^2 (0.92 m^2). Proceed with the installation of an approved New System Base, followed by an approved JM roofing system specification.

1. **Mechanically Attach Existing Insulation.** All wet and damaged insulation boards must be completely removed and replaced with an approved insulation that is compatible with the new roofing system. Use an approved, corrosion-resistant fastener of sufficient length to penetrate through the existing insulation and into the structural deck. If fastening insulation to a metal deck, the fasteners must be of sufficient length to penetrate the decking a minimum of ¾". While top flange engagement of the metal deck is always recommended, in re-cover or re-roof constructions, where the metal deck may not be visible or accessible, it is acceptable for insulation fasteners to engage the bottom flange of the deck.

2. **Mechanically Attach New Insulation.** Apply the units of approved JM roof insulation with long joints continuous. End joints should be staggered so that they are offset at least 12" (305 mm) from the end joints in adjacent rows. If the new insulation is being installed over an existing layer of insulation, all joints in the insulation layers must be offset a minimum of 6" (152 mm) between layers. Use an approved mechanical fastener of sufficient length to penetrate through or into the deck, as required for the specific fastener. If fastening to a metal deck, the fasteners must be of sufficient length to penetrate the decking at the bottom of the rib opening. Fasteners should be placed in the pattern for the FM Global approval desired, but never closer than 6" (152 mm) from any edge of the insulation board. Fasteners are to be driven through the appropriate insulation plates. Care should be taken not to overdrive or underdrive the fastener. Overdriving the fastener will cause the insulation plate to "cup" and can result in inadequate performance and damage to the membrane. Underdriving can cause the insulation to be loose from the deck and allow the fastener to penetrate into the membrane.

Apply only as much insulation as can be covered by a complete roof membrane in the same day. Do not leave insulation exposed to the weather.

If a vapor retarder is to be used with this construction, it should be placed on top of a minimal base layer of mechanically attached insulation. The bulk of the thermal roof insulation should be placed on top of the vapor retarder. Refer to the "Vapor Retarders" section of the JM Commercial/Industrial Roofing Systems Manual for more information.

3. **Spot Mop New Insulation.** For spot mopping, set the approved JM insulation board into spot moppings of hot asphalt (within ±25°F [±14°C] of the EVT). The spot moppings shall be applied by machine at the rate of approximately 7 lb/100 ft^2 (0.3 kg/m^2). Porous substrates may require greater amounts of asphalt. The spots shall be approximately 12" (305 mm) in diameter and 24" (610 mm) on center. Adjacent rows shall be staggered. Apply only as much insulation as can be completely covered with a finished roof membrane in the same day. Do not leave insulation exposed to the weather.

4. **Solid Mop New Insulation.** Firmly set the units of approved JM roof insulation, long joints continuous and short joints staggered, into a full mopping of hot asphalt (within ±25°F [±14°C] of the EVT). The asphalt should be applied at an nominal rate of 30 lb/100 ft^2 (1.5 kg/m^2). Porous substrates may require greater amounts of asphalt. When adhering insulation with hot asphalt, board size must be no greater than 4' x 4' (1.22 m x 1.22 m). If insulation is being installed over an existing layer of insulation or in multiple layers, all joints must be offset a minimum of 6" (152 mm) between layers.

Apply only as much insulation as can be covered by a complete roof membrane in the same day. Do not leave insulation exposed to the weather.

5. **Mechanically Attach New Base Sheet.** Using an approved JM base sheet, start with a 12" (305 mm) width (the use of a specific base sheet may be a condition of guarantee). The subsequent base sheet courses are to be applied full width, lapping the preceding felt 2" (51 mm) on the side laps and 4" (102 mm) on the end laps. Nail the side laps 9" (229 mm) o.c. Down the longitudinal center of each felt, place two rows of nails spaced approximately 11" (279 mm) apart, with the nails staggered on approximately 18" (457 mm) centers. Use nails or fasteners appropriate to the type of deck, with 1" (25 mm) minimum diameter caps. For additional fastener information, refer to the Fastener Data in the "Roof Decks" section of the current JM Commercial/Industrial Roofing Systems Manua

6. **Spot Mop New Base Sheet.** Using an approved JM base sheet, start with a 12" (305 mm) width (the use of a specific base sheet may be a condition of guarantee). The following base sheet courses should be applied full width, lapping the side laps 2" (51 mm) and the end laps 4" (102 mm) over the preceding felts. Set each felt firmly into spot moppings of hot asphalt (within ±25°F [±14°C] of the EVT). The spot moppings should be applied by machine at the rate of approximately 7 lb/100 ft^2 (0.3 kg/m^2). The spots should be approximately 12" (305 mm) in diameter and 24" (610 mm) o.c. Adjacent rows should be staggered.

Recommendations

The following chart lists recommendations, by membrane type, for re-cover of an existing membrane. Because of the complexity of re-cover, no set of recommendations can take into account all of the variables which may exist on any particular job. It is the responsibility of the design professional to thoroughly evaluate all of the existing conditions involved in a specific project and choose an appropriate system. **No JM Peak Advantage Roofing Systems Guarantee will be issued on any re-roofing project unless specifically approved prior to the start of work. For assistance and approval, contact a JM Technical Services Specialist.**

Recommended Specifications

BUR or Modified Bitumen

R-1-4
R-5-4
R-2
SW-2
SW-4*
SP-2
SP-3
SP-4*
SP-5

* SW-4 & SP-4 acceptable only with approval of a JM Technical Service Specialist and only when using JM approved insulation.