

How To Restore and Customize **Auto** **Upholstery & Interiors**



**Heat Shield Insulation
by Quiet Ride Solutions**

- *Plan Your Custom Interior*
- *Choose Materials and Tools*
- *Door Panels, Insulation and Headliners*
- *Seating, Carpeting and Dashboards*
- *Upholstery Maintenance and Protection*

Dennis W. Parks author of *How to Build a Hot Rod*



CHAPTER 4

INSULATION

Automotive insulation can be one of two types and may work as both types to a certain extent. The first type maintains a comfortable temperature inside compared to the extremes of heat or cold outside. Its use maximizes the effects and minimizes the workload of the automobile's heater and air conditioning systems.

A second type of insulation absorbs and damps unwanted sound. This works toward minimizing annoying engine and road noise inherent to all automobiles. By reducing extraneous noises, the insulation allows you to hear your stereo system or other audio communication equipment more clearly. It allows you to talk to other people in the vehicle without screaming.

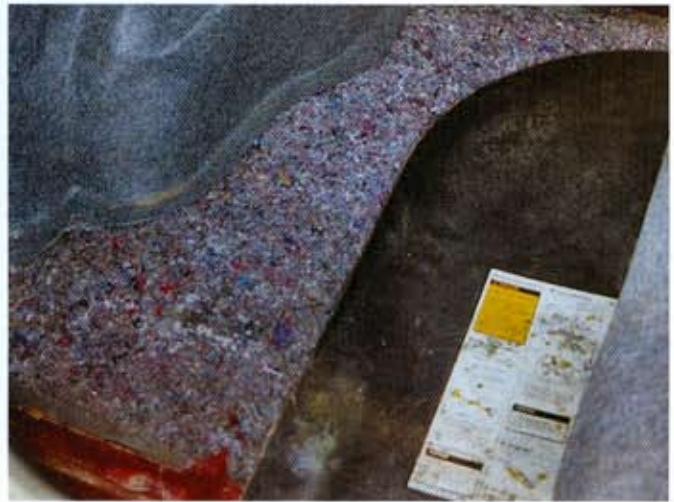
CLIMATE CONTROL

Whether your vehicle's body is made of steel, aluminum, fiberglass, carbon fiber, or something else, that material alone will do little to shield occupants from the ambient temperature outside the vehicle. If the sun beats down on a metal box, the inside gets very warm, very fast. If the box has an air conditioning system, the inside will be cooler, but the A/C unit will work much harder than necessary just to keep up. Likewise, a heater warms up the inside of that steel box on a cold day, but the heat quickly will find its way out of that uninsulated box. Just like your home, vehicles need insulation to keep the driver and passengers comfortable on all but that perfect day, meant just for cruising.

Early on, automotive designers realized this and began putting insulation material in relatively small amounts in vehicles. This material (usually jute felt) was found under the carpet or floor mats. On some higher priced vehicles, it could be found between the layers of the hood and the trunk lid.

Today's vehicles have more insulation in them than ones made years ago, but there is usually room for more. If you are rebuilding a vehicle, what may have been an adequate amount of insulation in the vehicle originally may need to be replaced. Although some insulation materials may seem expensive at first, their use will improve your driving experience, which is a bargain at most any price.

In their search for improved insulation, automotive engineers have borrowed from other disciplines. Reflective heat shields that the aerospace industry has developed work well in automobiles. This material, usually consisting of highly reflective aluminum, shields occupants and heat-



Beneath the trunk floor mat of this Chevrolet Beretta is jute felt insulation material. This material was originally made from natural jute fibers from Indonesia, but a petrochemical substitute is now available. Until relatively recent developments in man-made insulating material, jute felt was considered to be the best material for heat and noise insulation.

sensitive equipment such as computer systems from high temperatures produced by the exhaust and other systems.

Engineers have also developed materials that bond the heat reflective surface of aluminum to a fibrous padding. In addition to reflecting heat away from the surface, the padding material absorbs and dampens noise, providing some sound-deadening advantages.

These damper/reflective barrier combinations are available at automotive shops that sell interior products or at large home building supply centers. The material is sold in prepackaged rolls from automotive shops or in bulk from home improvement centers. It comes in various widths and is easily cut with scissors or a utility knife.

For use on floor surfaces, remove the carpet and floor mats, cut the insulation material to size, and slip it into place. Although reinstalling the carpet or floor mats will hold the insulation in place, spraying some contact cement onto the insulation material and the floor prior to installation will not hurt anything. On vertical surfaces or on the inside of the roof, a spray adhesive such as 3M's Top and Trim Adhesive is necessary to hold the insulation material in place. This is a contact cement, so the adhesive must be applied to both surfaces, allowed to become tacky, and

Reflective heat barrier insulation is being used in the roof of this Ford Model A pickup truck. Purchased in rolls (various widths are available), this material can be cut to the desired size and shape with scissors or a utility knife. It is secured to the roof between roof supports. This insulation material can be used on horizontal or vertical surfaces, but must be glued with contact cement. The cement is applied to both mating surfaces and allowed to dry to the point of being tacky before the pieces are joined. If the contact cement is not allowed to "tack up," it will not hold as well as intended.



pushed into place. Be sure to use a contact cement that is permanent or the insulation material from your ceiling may soon be in your lap. Use aluminum-faced tape or duct tape to cover any seams. Car tops get very hot while in the summer sun, so adhesive used to apply insulation material to the inside of a car roof should be rated as "high temperature." This adhesive should have a rating of at least 160 degrees Fahrenheit.

Insulation material alone will not help if there are significant air leaks in the vehicle's cabin structure. You must eliminate holes in the body, which should be repaired by welding in patch panels or replacing body panels if the holes are significant. Apart from rust-prone areas, holes are most commonly found in the firewall where electrical wires or heater hoses enter the passenger cabin from the engine compartment. On older vehicles, previous owners may have added holes, some of which may no longer be needed. If all holes are needed but have excessive clearance around them, use foam to seal the gap. Incomplete welds or missing seam sealer also allows air leaks. If this is the case, purchase seam sealer (an automotive caulking) at an automotive paint and supply store and apply. Collision damage that has not been repaired properly (or completely) also allows air leaks and may possibly cause noise problems.

You may also need to replace weather stripping around doors and windows. Replacement weather stripping can be purchased in kits for some vehicles or in bulk for most vehicles. If you need to replace weather stripping around your doors, run a piece of tape or draw a line around it to indicate proper placement prior to removing it. You can

now pull the old weather stripping off, using a putty knife if necessary to loosen hard to remove areas.

Fit the new weather stripping around the door to check for length and also to verify that the placement between the door and the body is correct. Now apply a bead of weather strip adhesive (sometimes referred to as "gorilla snot") to the back side of the weather stripping per the instructions. Some brands need to become tacky, while others don't. Place the weather stripping into position and allow to dry before driving the vehicle. Many body shops use strips of masking tape to hold the weather strip in place while it sets up. Wipe away any excess adhesive and you are done.

IMPROVED ACOUSTICS

As a car or truck operates, it generates noise. This noise is a result of the energy being transferred throughout the vehicle, creating a vibration. The body components such as the doors, floor, and roof act as a sounding board to transform this vibration into audible noise.

Years ago, the insulation material found beneath the carpet in vehicles was about all there was to deaden noise. Contemporary automotive design includes measures to improve the sound system by using acoustic material throughout the vehicle: from the engine compartment to minimize drivetrain noise; from the passenger cabin to minimize wind and road noise; and from the trunk compartment to minimize road and exhaust noise. These materials can also help prevent unwanted heat or cold from entering the passenger compartment. Ideally, the passenger



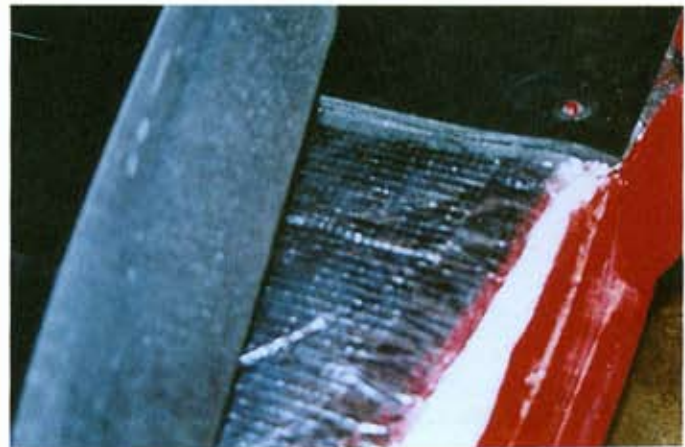
Anytime you are fortunate enough to have the bare hulk of a vehicle to deal with, sound deadening and thermal insulation should be added, such as in the roof of this hot rod coupe. The roof will not need to be insulated as much for sound as it will to keep out the sun's heat and keep in the air conditioner's cold air.

compartment would be a soundproof box. For the best results, a reflective heat-barrier-type insulation should be used in conjunction with a sound deadening insulation.

Sound deadening can be accomplished in one of two ways; damping or absorbing. Damping is the reduction of vibration and noise generated by resonant vibration in areas such as body panels, door panels, floorpans, and roof panels. Damping material should be at least one-half the thickness of the material to which it is being applied and cover approximately one-third to one-half of the surface area. The most effective material used in damping is a self-adhesive rubberized asphalt material that is acoustically "dead" because of its dense mass and weight, about 2 pounds per square foot. The best automotive dampers are water repellant.

Absorbers are materials that soak up sound and prevent sound waves from reflecting. Absorbers consist of dense fibrous materials with open pores. Open-cell foams and fiberglass are examples of sound-absorbing materials. Thick materials absorb low to high frequencies, while thin materials mainly absorb medium to high frequencies.

Material such as Dynamat is available to improve the sound quality in our automobiles. Dynamat is a thin, flexible, easy-to-cut-and-mold sheet that stops noise-causing resonance and vibration. This type of sound-deadening material can be applied to a specific panel to minimize its resonance, or it can be applied to an entire surface area to create a sound barrier and thermal insulator. Applying Dynamat to the inside of the doors only can make a noticeable reduction (3 to 6 decibels) of road noise. Covering the



The floor on this same hot rod can be well served with both damping- and absorber-type sound-deadening material. Closest to the floor is the absorber material that soaks up the sound from the drivetrain and the road. The next layer (partially pulled up in the photo) is the damping material that reduces vibrations that cause unwanted noise.

trunk and roof will further reduce the amount of road noise inside the vehicle.

Four grades of Dynamat make it suitable for a variety of applications and budgets. For the best compromise between cost and damping efficiency, Dynamat Original is available. It is suitable for most locations (floors, doors, side panels, and trunk floors), except where it would be installed upside down such as car roofs. Any of the other three grades would be suitable for that particular application. Dynamat Original requires a heat gun for application.

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INSTALLING SOUND DEADENING MATERIAL

Before installing Dynamat, clean the area with a quick drying, residue-free solvent such as wax and grease remover found at an automotive paint and supply store. Spray or wipe the cleaner on with a clean towel, then wipe it off with a second towel to clean the surface thoroughly and ensure a permanent bond between the surface and the Dynamat.

Make a cardboard or paper template for the size and shape of the Dynamat to be installed. Use a utility knife or scissors to cut the Dynamat sheet to the correct size and shape. Remove the blue release liner from the back of the Dynamat and apply the Dynamat to the prepared surface. On large surfaces, remove the release liner in sections,

working your way down and across the panel. To install Dynamat onto vertical surfaces or upside down, use an upholstery adhesive, such as 3M's Top and Trim Adhesive. This is a contact cement that should be applied to both surfaces for best results.

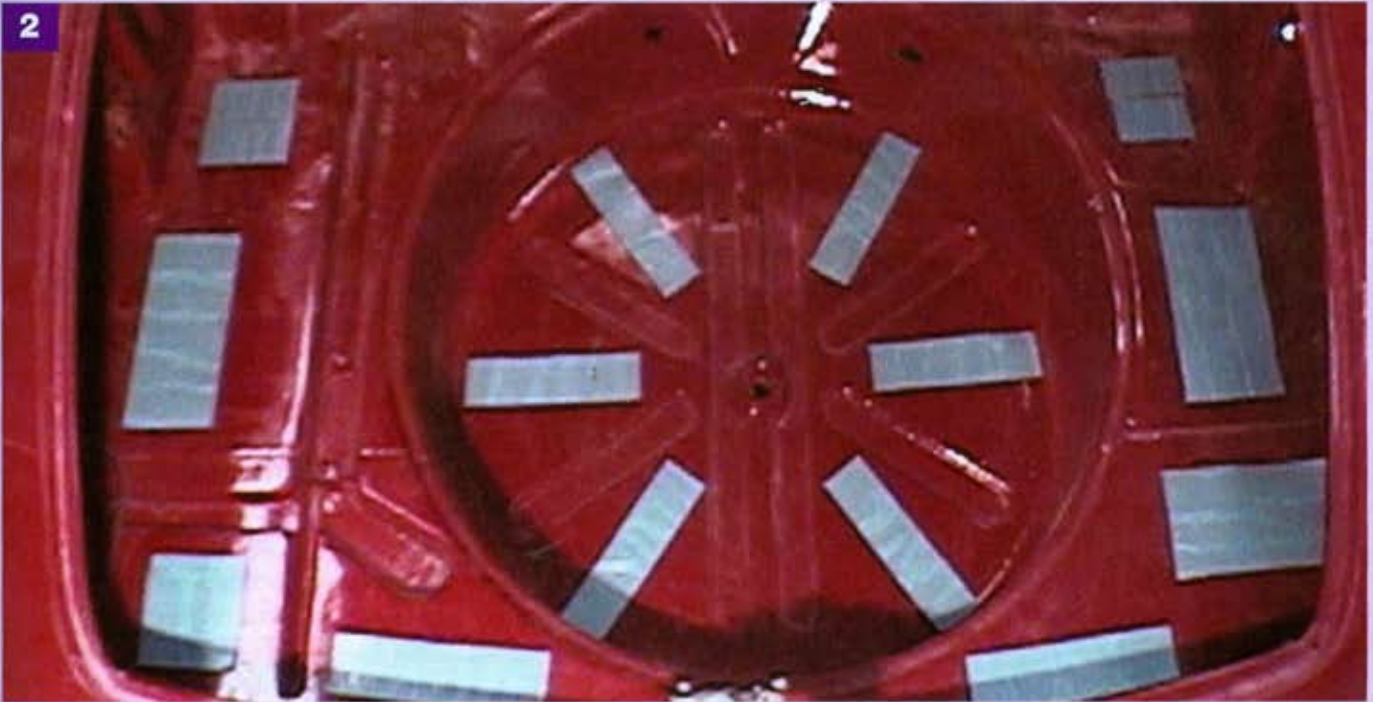
Use a small roller to work the Dynamat into all the contours of the metal panel. If any air pockets form, slit them with a utility knife and work the air out with the roller.

After the Dynamat is in place, install a layer of reflective heat-barrier-type insulation. You can use cardboard or Kraft paper to make patterns, then cut the material with a pair of sharp scissors. With the reflective insulation in place, use aluminized tape or duct tape to cover the seams.



As seen in this photo, it is not necessary to completely cover the surface. Photos courtesy of Quiet Ride Solutions

2



Dynamat materials can be installed in areas other than the passenger cabin to minimize heat and noise. Install it in the trunk using the same procedures as elsewhere.

3



To maximize efficiency, install a layer of heat-barrier-type insulation. Use cardboard or Kraft paper to make patterns.

Considered to be four times better than the original and at half the weight, Dynamat Xtreme is primarily used where heat is a factor such as on the floor or firewall. For hard-to-reach areas such as outer door skins or inner fender wells, Dynashield (liquid Dynamat) is recommended. Being a liquid, it must be sprayed on, taking 48 hours to cure. More suitable for racing applications, due to its extremely light weight, is Dynaplate. Three layers of Dynaplate is stronger than average car sheet metal. Two layers damp better than Dynamat Xtreme and weighs 32 percent less.

Any surface that you have access to is a good candidate for installing Dynamat; however, for best results, it should be applied to the insides of the doors, trunk, and floor areas first. If you choose to install more, it should then be applied to the interior panels of the rear deck, roof, hood, and then the fenders.

When installing any sort of insulation material in a vertical panel, such as the inside of a door or quarter panel, don't let the insulation material extend all the way to the lowest point of the cavity. The insulation material could soak up any moisture that enters into this area (such as rain-water or spilled liquid) and become an origin point for rust.

Another popular type of insulation is LizardSkin Ceramic Insulation. This product is more suitable for specially constructed vehicles (during the building process) or complete rebuilds that have been gutted on the interior. The liquid coating can be applied to a vehicle that is already finished; however, the extensive disassembly and masking required may prove to be impractical for some applications.

LizardSkin Ceramic Insulation is a water-based composition of air-filled ceramic and silica particles. These are combined with acrylic binders, making it similar to paint products in consistency. LizardSkin Ceramic Insulation claims to reduce engine and solar heat transfer by 25 to 30 degrees or more. It also serves to reduce noise by as much as 10 to 12 decibels.

Since LizardSkin Ceramic Insulation is a liquid, it can be applied to any clean and dry primed or painted rust-free surface. It can be brushed, sprayed, or even rolled on. Prior to application, mask off the areas that are not to be coated. Masking paper or masking film can be purchased at a local automotive paint and body supply store. Ambient temperatures must be 70 degrees Fahrenheit (21 degrees Celsius) or above. LizardSkin Ceramic Insulation should be applied in thin coats (0.010 to 0.015 inch), and will require three or four coats to achieve the desired thickness of 0.040 to 0.060 inch (about the thickness of a credit card). LizardSkin Ceramic Insulation must be allowed to dry fully to the touch between coats (dry finish will be flat/dull). Curing time before sanding or addi-

tional finishing is 24 hours at 70 degrees Fahrenheit (21 degrees Celsius) or warmer.

SPRAY-ON UNDERCOATING

Another type of insulating material readily available at many auto parts stores is spray-on undercoating. This comes in aerosol cans and can be installed with relative ease. Although the heavy-duty version of this stuff isn't as common on the bottom of new vehicles as it used to be, spraying it inside of doors and fenders can help to minimize unwanted road noise and exhaust noise.

To spray this material inside of doors, make sure the windows are all the way up, then remove the interior door panel. The size of the door and window mechanism access holes varies from one vehicle to another; however, you should be able to spray most of the inside of the exterior door skin by directing the spray through these access holes. Spray approximately a 1/8-inch layer of the undercoating. Thicker coatings may leave residue on the door glass as it moves up and down.

Avoid getting any of the spray undercoating on the interior of the door or on the window riser mechanism. On metal parts, the undercoating can be removed by rubbing the part with a cloth soaked with a bit of kerosene.

Spray-on undercoating also can be applied to the inside of fenders. To spray the inside of the rear fenders, remove the trunk lining, if there is one. This is easy to do on most vehicles as the trunk lining material, at one extreme, lies there or, at the other extreme, may be held in place with plastic bolt-like fasteners. With the plastic fasteners, you can remove them by turning them counterclockwise. Remove the fasteners and pull the trunk lining out of the way. Like the bare door panels, the fenders have access holes. Apply the undercoating in layers up to about 1/8-inch thick. It isn't necessary to let the undercoating "dry" like paint material; however, you may choose to leave the trunk lining off until you are finished with all your undercoating application throughout the vehicle. This allows you to see if you missed any spots and won't hurt the undercoating as it firms up. When you are finished, reinstall and secure the trunk lining as it was previously.

Front fenders usually don't have any sort of lining in front of them, yet there may be other obstacles to contend with, such as a battery, windshield washer reservoir, or a myriad other engine-related items. The choice of which obstacles can be removed easily and which ones are not worth the trouble varies with each vehicle and is up to the person applying the undercoating. For this purpose, some undercoating products have a flexible hose attached to the nozzle that makes application somewhat easier.