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## **Maintenance, Repair and Restoration of Metal Roofs.**

The use of metal roofing systems is prevalent throughout the United States and is found on conventional structures as well as pre-engineered metal buildings.

Structural metal roof systems are usually low slope and provide the structural deck as well as weatherproofing.

Architectural metal roof systems are designed for relatively steep slopes. The metal roof panels shed water and depend on a solid sub-deck with waterproofing underlayments for a watertight assembly.

The metal roof system is attached to the building structure with fasteners installed through the panel (through-fastened) to hold the panels to the structural supports and at the laps; or through the use of concealed clips and machine-roll-locked seams ("standing seam").

## **Extending the Life of Your Roof with Preventive Maintenance.**

As with all roof systems, periodic inspection and maintenance of your metal roofing system is the key to maximizing the service life of the system and preventing early failure. Depending on geographic location, maintenance inspections should be conducted between two and four times per year and after any major storm.

**“What do I need to inspect?”**

## **Inspection points to emphasize are:**

- ***Supporting structures:*** Look for water stains on exterior walls, as this may suggest problems with flashings or walls. Check the underside of the roof assembly for water stains on insulation, ceilings, piping, ducts or structural members, as well as the underside of deck (if exposed) to identify potential areas of leaks. Noting potential problem areas on a diagram will assist in identifying the corresponding area on the roof for defects.
- ***Fastener condition:*** Check for missing, loose or deteriorated neoprene fasteners. Expansion and contraction of the metal panels due to temperature change or wind induced movement of metal panels can enlarge the fastener holes. In through-fastened systems, this movement often causes the fastener holes to become slotted, compromising the seal and water-tightness.

**About the Author:** Greg Thirnbeck, Vice President, Contract Administration is responsible for reviewing contract terms and conditions for D. C. Taylor Co. and assisting with risk management issues. In addition, he assists national clients with making informed roofing related decisions – from preventive maintenance to roof management programs.

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- **Sealant condition:** Exposed sealants at terminations and flashings will eventually crack or shrink and need replacement. Unanticipated component movement, especially in older systems, can also result in sealant failure.
- **Corrosion of panels:** Contaminants exhausted onto the panels, ponding water, and condensation drainage from HVAC units can corrode the metal panels. Debris accumulating on the roof, especially metal shavings, can accelerate corrosion and should be removed regularly. *Note: Be especially careful when walking over a metal roof that has been coated. Sometimes corrosion may be hidden underneath the coating, creating a safety hazard.*
- **Interior gutters:** Gutters installed at a juncture where two sloping roof sections come together are referred to as interior gutters (as opposed to gutters that are located on the exterior perimeter of a building). Unless constructed of stainless steel with welded seams or fully lined with heat-welded thermoplastic membranes, leaks can be a continuing headache at interior gutters. Differential movements between two roof sections tend to break soldered or caulked seams. Again, accumulation of debris can cause problems by plugging drains causing the gutter to overflow into the interior during intense rainfalls. Undersized gutters or an inadequate number of drains can also contribute to overflowing problems.
- **Wind damage:** Look for damaged or missing metal flashings at the roof perimeter. After major storms, walk the perimeter areas to ensure roof panels are secured. Check the field for deformed or uplifted metal panels. Fastener or concealed clip failure can result in roof sections "floating" while seams still appear intact.
- **Roof penetrations:** Rooftop penetrations will be a source of leaks if not properly flashed. Equipment installed by unskilled contractors or taking budget short-cuts may lead to improper flashing installation. Drainage and structural movement must be considered when installing flashings.
- **Damage to panels:** Foot traffic can damage the watertight integrity of laps, seals at fastener locations and even crack the light gauge metal in some situations allowing moisture infiltration. Workers should avoid the raised portion of the panel and walk on the flat surfaces, preferably close to or over structural members. If there is significant roof traffic, consider installing a walkway system. Elevated metal walkway assemblies are available to totally eliminate panel deflection due to foot traffic.

## “How do I know what to do when it’s time to replace the roof?”

- **Deflection:** Another issue to be aware of is the practice of attaching equipment to the purlins below the roof. If design loads are not taken into account, the purlins can deflect also causing the roof panels to deflect. This will result in broken seals at seams and laps and cause ponding water. Also if design loads are significantly exceeded, the possibility of catastrophic structural failure could occur.

### Roof Replacement Decisions

If the roof is at the end of its service life or repairs are no longer cost effective, it is time to consider a new roof or retrofit application.

The building owner is faced with the unenviable task of identifying possible solutions from scores of metal roofing, single-ply, coating, and sprayed-on foam system manufacturers. Some factors to consider that may help narrow the options :

- What activities are taking place inside the facility under the roof?
- What is the source of failure of the original system?
- What is the extent and nature of previous repair materials used?
- What are the building code and insurance requirements of a new system?
- Is additional insulation required or desirable?
- Is a vapor barrier required?
- What weight/structural limitations apply?
- How does the current or projected building use impact the type of roof system?
- What are management’s service life expectations or requirements? If you are planning on demolishing the building in five years, it wouldn’t make sense to install a twenty-year roof system.
- Will new rooftop units or other penetrations be added and how will roof traffic requirements be affected?
- Is resistance to chemical emissions or contaminants a requirement of the new system?
- Is the existing drainage system adequate?
- What budget or scheduling constraints affect the project?

### Reroofing Options

**Coatings or Liquid-Applied Systems:** Coating systems will address surface corrosion and will improve the appearance of the roof. The reflectivity of a white coating can help reduce thermal heat gain resulting in lower interior temperatures. If the existing roof is sound, there is minimal movement (or the movement can be controlled) and loose fasteners can be tightened or replaced, a liquid-applied system can correct leaks at panel laps and fasteners.

There are a variety of coating systems with different properties and costs. The most common are elastomeric coatings. The application process starts with a thorough cleaning. Rusted panels are treated with a primer and damaged panels are replaced. Special flashing procedures, such as self-adhering tapes and reinforcing fabrics are applied at laps and flashings; and exposed fasteners are sealed. The coating is then applied in a number of coats to achieve the specified thickness. Many coating manufacturers offer limited warranties, up to ten years, depending on system details and coating thickness.

***Polyurethane Foam Re-cover:*** This system is not typically used over architectural metal roof systems. Sprayed Polyurethane Foam (SPUF) can be applied over an existing metal roof if the roof is of sufficient gauge and otherwise meets the manufacturer's requirements. Since the system is somewhat rigid, a SPUF system does not accommodate movement well, but it has the distinct advantage of adding significant R-value. This also virtually eliminates damage from expansion and contraction of the roofing surface, since the metal panels are now insulated from daily temperature changes that may cause panel movement. In addition, it is not necessary to apply reinforcing fabric over the laps and at the fasteners.

The application process is similar to coatings. Damaged panels must be replaced. Surface corrosion must be treated or primed to assure good adhesion of the foam. The foam is then spray-applied, generally in several passes, to the desired thickness (at least 1"). Finally, a coating is required to protect the SPUF from ultraviolet damage. If desired, granules can be set in the coating before it dries to improve resistance to foot traffic and provide additional traction.

***Single-Ply Re-cover:*** Single-ply systems are frequently used to re-cover metal roofs. You begin by replacing damaged roof panels, then, insulation is cut to size and installed on the flat panel areas to match the height of the raised panel ribs. A second layer of rigid board insulation (preferably a moisture-resistant insulation such as polyisocyanurate) is then mechanically attached over the entire roof surface. The insulation provides additional R-value for the roofing system and a stable substrate for the single-ply roofing system.

Finally, a single-ply roofing system is either fully adhered or mechanically attached. A variety of manufacturers offer specifications for installing their systems over metal roofing. As most metal roof systems utilize light-gauge metal panels, it is imperative that the correct type and frequency of fasteners is utilized. Factory Mutual Global recommends the roof-covering fasteners actually engage the underlying structural members. If aesthetics are an issue some manufacturers offer a ribbed system that is similar in appearance to architectural metal roofs.

***Metal Re-cover:*** A new metal roof can be installed over an existing low-slope, metal roof system. In this application, the existing building structure must be sufficient to withstand the added weight. Corroded panels and fasteners from the existing system do not generally

### About D. C. Taylor Co.:

With more than 50 years of commercial and industrial roofing experience, D. C. Taylor Co. provides responsible roofing, inside and out, by delivering expert roofing and OmegaSTARR<sup>SM</sup> roof retention services needed to keep clients' facilities protected and secure. D. C. Taylor Co. has more than 60 service and roofing crews and 5 service areas: Atlanta, Georgia; Cedar Rapids, Iowa; Chicago, Illinois; Concord, California; and Phoenix, Arizona. The company has been ranked among the nation's largest industrial roofing contractors for over 20 years.



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require replacement. It is generally a good idea to install fiberglass blanket insulation between the two systems. This process can provide an excellent new metal roof while minimizing labor associated with removal or repair of the existing roofing system. Disruption of building operations is also reduced. Systems with roll-locked seams are preferred as they minimize the problems associated with exposed fasteners and neoprene gaskets.

**Replacement with a New Metal System:** In some cases, existing metal roof systems are replaced with a new metal system. Existing structural supports may be corroded, a number of new penetrations may need to be installed, or other conditions exist that make it expensive or undesirable to leave the existing metal roof in place.

### Final Factors to Consider

- In deciding which option to select, you can see there are many factors you must consider. One of the most important factors leading to the success or failure of your project is the selection of the roofing contractor. The following questions may help you select the roofing contractor that works best for you.
- Is the contractor spending time on your roof examining and verifying existing conditions?
- Is the contractor asking questions to understand how a roofing project might impact your business?
- Does the contractor have the training, knowledge, and experience to make roofing recommendations appropriate for the existing structure?
- Does the contractor's crew have the supervision, training, skills, and knowledge to safely and effectively complete the project once a solution has been identified?
- Does the contractor have the ability to develop a safety plan that identifies potential risks and includes counter measures to reduce those risks to you, your employees and your facility?
- Will the contractor leave your facility and grounds in the same condition as when they arrived?
- Does the contractor have a clearly defined process for making sure the project goes smoothly? (Holding preconstruction meetings and addressing issues such as identifying potential risks, developing a scheduling plan, identifying staging/access areas, and finally establishing a clear line of communication will go a long way to make your project run smoother.)
- Is the contractor responsible and trustworthy? Will the contractor be there today and tomorrow to assist with the long-term care of your roof?

These are questions only you and your company can answer. If you have already established a relationship with a roofing contractor you can trust, you are on your way to having roofing peace of mind.