PREVENTIVE MAINTENANCE MANUAL

NUCOR®
BUILDINGS GROUP

NUCOR BUILDINGS GROUP

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The Nucor Buildings Group (NBG) brands, again, thank you for your recent purchase of a pre-engineered building system. NBG is a high quality manufacturer of building systems, which have been designed in accordance with the Order Documents. Your building has been designed and manufactured to the highest quality standards to last for decades. Your building typically requires low maintenance, but if regular maintenance and care is provided, this building will service your needs to a greater degree for years to come. The best preventive maintenance that one can do is to perform scheduled annual inspections to identify and solve problems as they occur. This will help to optimize the service life of the building, keep the building aesthetically pleasing, functional, and virtually weather tight to protect your products, your facilities, and your personnel.

Standard details are tested for function. NBG is not qualified to act in the roll of the erector, General Contractor or Project Engineer of Record for the entire project. The contractor's failure to erect the building in accordance with the provided erection information shall not impose liability on NBG.

Before making any field modifications, please consult NBG. You may unknowingly void warranties and cause the structure to become unsafe. If unauthorized field modifications are made, you have also assumed all costs involved in the process of replacement or repair.

REPLACEMENT MATERIALS

Replacement materials can be obtained through your local NBG authorized Builder. In the event an authorized Builder is not available call your brand's division as listed below and ask for Customer Service. When calling NBG, have the original job number, year built, name of the project and original Builder information handy. This will help us identify and locate your specific building and aid us in supplying replacement parts.

American Buildings
El Paso, IL - 309.527.1500
Swansea, SC - 803.568.2100
Terrell, TX - 972.524.5407
Brigham City, UT - 435.919.3100

CBC Steel Buildings
Lathrop, CA - 209.983.0910

Kirby Building Systems
Portland, TN - 615.325.4165

Nucor Buildings Systems
Swansea, SC - 803.568.2100
Terrell, TX - 972.524.5407
Brigham City, UT - 435.919.3100
Waterloo, IN 260.837.7891

The purpose of this manual is to assist your efforts in maintaining and protecting your new building. It is also intended to help educate the new owner of the responsibilities of owning an engineered steel building manufactured by Nucor Buildings Group. Just as with a new home, your building will occasionally need attention to maintain current aesthetic appeal, warranty coverage, weather tightness and proper working order of accessory items. Likewise, you should not neglect the minimum routine annual maintenance of your building. Proper and timely maintenance is an integral part of the long term success of a roof system or structure in order for it to maintain it's original design integrity. Proper maintenance is also required in order to preserve the integrity of the Galvalume® protective coating and painting of the steel sheets. Performing scheduled annual inspections may be the best part of a preventive maintenance program. Doing so identifies problems and provides correction as the situations occur.

The outcome of several recent studies show that while the upfront and long-term costs of a metal roof system is significantly less than a built-up roof, there is still a certain amount of costs associated with routine maintenance. The figure quoted ranges from $0.02 to $0.05 per square foot annually. There are other maintenance costs associated with your Building. The most significant is the maintenance of the roof system.

The preventive information guide is available for your reference in order to practice routine maintenance. The information indicated in this manual reflects the minimum standards for routine maintenance and your specific building may require either additional special maintenance or more frequent routine maintenance, to which the determination is based solely on common sense by the owner. Some information within this guide is provided which outlines some Installation & Maintenance conditions that have been observed or experienced by building owners. In many cases, the nature of issues experienced by owners was not associated with the manufacturing of materials, but rather with how the materials were stored, shipped, handled, installed and/or maintained. Some information provided in this section is also related to outside product compatibility or improper design associated with materials that are not part of the metal building system scope. Some of these conditions are to be expected on a structure. This information is intended for additional information in order to help identify some common areas of concern so that they can be addressed or prevented. This information guide is not a certification or endorsement from NBG. Our mission is in no way to certify erection methods or engineering for specific project issues due to installation or damage. If that service is required, an independent, qualified consultant should be retained since the expertise of NBG does not extend to these areas. Services as aforementioned are not included in the scope of our order documents.

This manual has been designed to be as user friendly as possible. It is not intended to replace personal interaction. If you have a question on something that does not appear in this manual or on a situation that is dangerous to human life, consult your engineer of record, your Builder, or your NBG brand.

A. The perimeter walk

Take a walk around the perimeter of your building. Is there any “white rust”, dents or scratches on the panel? Is the finish itself acceptable; are there any blemishes? Are the fasteners all in place and well seated? Are the flashings in place at all locations? Are the cut ends de-burred and closed off where appropriate? Has the building been properly made weathertight? Are all of the small openings sealed against the elements, birds and rodents?

Are the downspouts in place as noted on the plans? Are they free of debris and well drained? Are there provisions for removing the water from the base of the building?

Are the doors and windows functional? Is the correct hardware in place? Are the requirements of ADA regulations met? Are the doors keyed alike? Do you have all the keys? Is the trim around the doors and windows installed inside and out?

Is the insulation protruding out from the base, base trim, or any other areas?

Have all chalk and construction markings been removed?

Are there structural parts left over? Do you know where they belong?

B. Inside your building

First walk the perimeter of the inside of the building. Note, are the columns structurally sound and are they all bolted down? Do the girts and flange braces seem to be in their appropriate places? All buildings will have some type of wind bracing. Are the rods under tension or loose? Is the building properly insulated or can you see areas which appear to be missing insulation? Check to see if light shows through at the eave, rake, or sill of the building; this is a dead give away that there are still things to be finished off.

Next inspect the rafters and interior columns, if applicable. There should be no gaps between the connection plates where the rafters meet the columns at the bolt locations. Check to ensure that the interior columns are structurally sound.

Finally, your building structural components were coated at the factory with a red or gray primer. Please note that this is for protection from the elements during shipment only and is not intended to be a finished coat. During some seasons of the year muddy foot prints on the structural steel are unavoidable. Any cleaning of the product surface is the responsibility of the Builder and should be considered "Dealer Prep". This is like the prep on a new car before you take ownership.

C. Your Roof

Walk the perimeter of the roof. Are the gutters and downspout outlets in place as noted on the plans? Are they free of debris and well drained? Are the fasteners all in place and well seated? Are the flashings in place at all locations? Has the building been properly made weathertight? Are all of the small openings sealed against the elements, birds and rodents?

Walk the endlaps. Have the endlaps (R-Panel Roof, Loc Seam, SS360, SSII or CFR) been installed per plans? Do the fasteners exhibit penetration through the mastics? Are the fasteners all in place and well seated?

Walk the ridge or high eave. Has the ridge cap or high eave been installed per plans? Do the fasteners exhibit penetration through the mastics? Are the fasteners all in place and well seated? Is the ridge or high eave area free of debris and well drained? Are the panel closures weathertight and properly installed?

Inspect other areas. Is there ponding around curbs or in any other areas? Does the roof drain properly? Is there any "white or black rust", dents or scratches on the panels and trim? Is the finish itself acceptable? Are the fasteners throughout the entire roof in place and well seated? Do the mastics and caulks appear to be properly placed? Are there any dissimilar materials coming into contact with NBG buildings material?

As a custom manufacturer, NBG produces a wide array of structural framing systems including clear span rigid, modular rigid, tapered beam, and lean-to. All are available in standard or wide bay options. Crane support systems and mezzanines can also be included as part of the complete building package. Your building was designed to achieve the optimal design solution for your building requirements.

A. Primary Structural Steel: Main Frames

Modifications to Shape

All structural steel designed, detailed and provided is an integral part of the building system and must be off-loaded, stored, and installed per the manufacturers instruction. It is important to understand that any omissions or modifications of materials as provided by the manufacturer can compromise the design integrity of the structure. Any modification to the structural system must be reported to NBG's Quality Services Representative. For many reasons, no change can be made without the prior approval of NBG. By making field modifications without consulting NBG, you may unknowingly void warranties and cause the structure to become unsafe. You may also assume the costs and liability associated with any corrective action taken. Any party making such omissions or modifications without the consent of the manufacturer is taking design liability for the building system.

Adding Loads

Collateral loads, unless specified in the Order Documents, are assumed to be uniformly distributed. If suspended sprinkler systems, lighting, HVAC equipment, and the like, exceed 200 pounds, consult NBG. Be particularly watchful for individual structural members that appear to be loaded significantly more than others. The roof structure of your building has been designed to the specific load criteria by your Builder, Architect, Engineer of Record, or retained design professional. Any changes or modifications to your structure which add additional loads may adversely affect the buildings load capacity. Before hanging any items from the buildings framing or adding any additional loads to the roof (sprinklers, piping, roof top units, jib cranes, etc.), contact your Builder, Architect, Engineer of Record or competent licensed structural design professional. Any additional loads placed on the structure or hung from the roof which deforms the purlins or other structural components may seriously impair the structural integrity of the building and create dangerous conditions. If your Builder is not available, contact your local District Sales Manager for additional service. To locate your local Nucor representative please visit our website www.nucorbuildingsgroup.com or call your local plant for assistance.

Primer Coating

All structural members of the building system not fabricated of corrosion-resistant material or protected by a corrosion-resistant coating are painted with one coat of shop primer. All surfaces to receive shop primer are cleaned of loose rust, loose mill scale and other foreign matter by using, as a minimum, the hand tool cleaning method prior to painting. This method is outlined in the Steel Structures Painting Council specification SSPC_SP2. The Manufacturer is not normally required to power tool clean, sandblast, flame clean, or pickle. Many manufacturers do not have the ability to do so. The coat of shop primer is intended to protect the steel framing for only a short period of exposure to ordinary atmospheric conditions. The coat of shop primer does not provide the uniformity of appearance or the durability and corrosion resistance of a field-applied finish coat of paint over a shop primer. The Manufacturer is not responsible for the deterioration of the shop coat of

primer or corrosion that may result from exposure to atmospheric and environmental conditions, nor for the compatibility of the primer used to any field-applied coating. Minor abrasions to the shop coat caused by handling, loading, shipping, unloading, and erection are unavoidable. Touch-up of these minor abrasions is the responsibility of the End Customer, according to the MBMA Common Industry Practices.

Primer Touch-up

Structural Steel normally requires no maintenance except in the event of oxidation. If the structural steel is intended to be left in an un-painted state, clean the affected area and re-prime using the primer as supplied by the manufacturer to spot treat or touch-up. Additional touch-up primer is available through your local NBG authorized Builder. In the event an authorized Builder is not available, contact the Components Department of NBG for assistance.

If the structural steel is to have a topical finish coat of paint applied, clean the affected area and consult with a qualified contractor for the use of proper primers and paints to achieve the desired results. Touch up priming, topical painting of the structural steel, and compatibility of the factory applied shop coat to any field applied coating is the responsibility of the end customer or any sub contractors retained by the end owner for such work.

B. Secondary Structural Steel: Purlins & Girts

Modifications to Shape

All structural steel designed, detailed and provided is an integral part of the building system order and must be off-loaded, stored, and installed per the manufacturers instruction. It is important to understand that any omissions or modifications of materials as provided by the manufacturer can compromise the design integrity of the structure. Any modification to the structural system must be reported to NBG's Quality Services Representative. For many reasons, no change can be made without the prior approval of NBG. By making field modifications without consulting NBG, you may unknowingly void warranties and cause the structure to become unsafe. You may also assume the costs and liability associated with any corrective action taken. Any party making such omissions or modifications without the consent of the manufacturer is taking design liability for the building system.

Primer Coating

All structural members of the building system not fabricated of corrosion-resistant material or protected by a corrosion-resistant coating are painted with one coat of shop primer. All surfaces to receive shop primer are cleaned of loose rust, loose mill scale and other foreign matter by using, as a minimum, the hand tool cleaning method prior to painting. This method is outlined in the Steel Structures Painting Council specification SSPC_SP2. The Manufacturer is not normally required to power tool clean, sandblast, flame clean, or pickle. Many manufacturers do not have the ability to do so. The coat of shop primer is intended to protect the steel framing for only a short period of exposure to ordinary atmospheric conditions. The coat of shop primer does not provide the uniformity of appearance, or the durability and corrosion resistance of a field-applied finish of paint over a shop primer. The Manufacturer is not responsible for the deterioration of the shop coat of primer or corrosion that may result from exposure to atmospheric and environmental conditions, nor for the compatibility of the primer used to any field-applied coating. Minor abrasions to the shop coat caused by handling, loading, shipping, unloading, and erection are unavoidable. Touch-up of these minor abrasions is

the responsibility of the End Customer.

Primer Touch-up

Structural Steel normally requires no maintenance except in the event of oxidation. If the structural steel is intended to be left in an un-painted state, clean the affected area and re-prime using the primer as supplied by the manufacturer to spot treat or touch-up. Additional touch-up primer is available through your local NBG authorized Builder. In the event an authorized Builder is not available, contact the NBG Components Department for assistance.

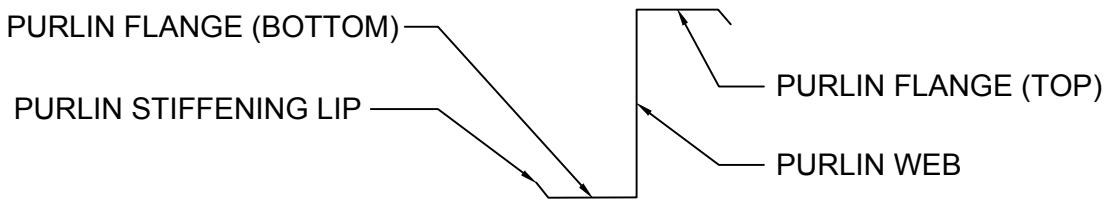
If the structural steel is to have a topical finish coat of paint applied, clean the affected area and consult with a qualified contractor for the use of proper primers and paints to achieve the desired results. Touch up priming, topical painting of the structural steel, and compatibility of the factory applied shop coat to any field applied coating is the responsibility of the end customer or any sub contractors retained by the end owner for such work.

Suspended Loads

Any load hung from the roof must be with the knowledge of NBG. The method of attachment to a roof support member varies with the type of load being suspended and supporting member. In no case should any part of a purlin (roof zee) be deformed to accommodate a suspended load. Should you need to hang a suspended load, contact your Builder, or Contractor who will coordinate with NBG. No modifications to the structure or addition of loads to the structure can be made without the knowledge of the project's engineer of record and NBG.

GENERAL RESTRICTION

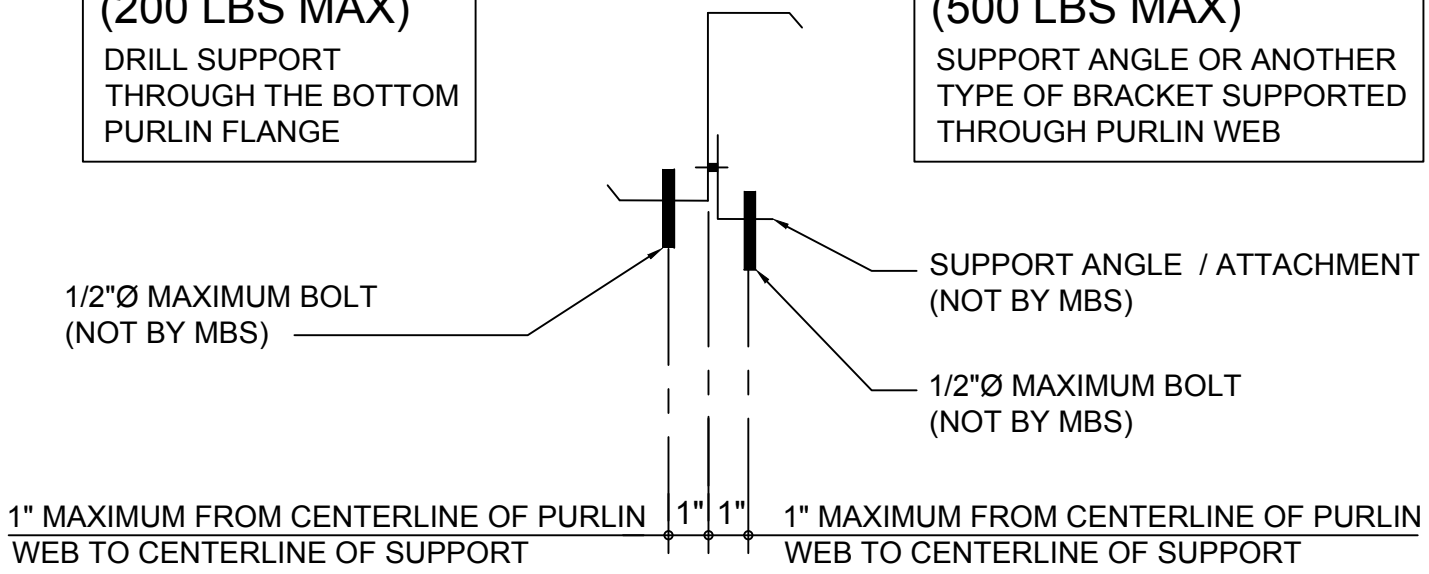
UNDER NO CIRCUMSTANCES CAN THE PURLIN STIFFENING LIP
BE FIELD MODIFIED FROM THE FACTORY SUPPLIED CONDITION.
ALSO DO NOT HANG ANYTHING FROM PURLIN STIFFENING LIP.



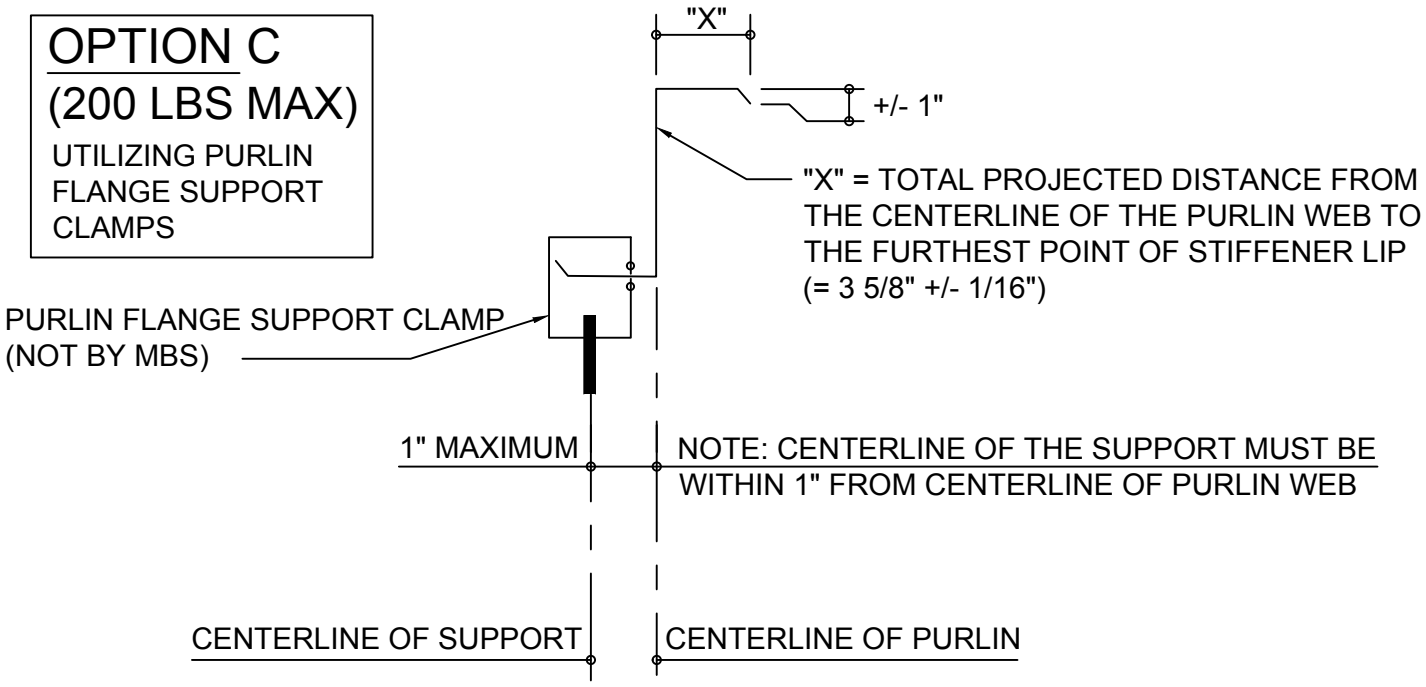
SUPPORT ATTACHMENT OPTIONS

OPTION A
(200 LBS MAX)
DRILL SUPPORT THROUGH THE BOTTOM PURLIN FLANGE

OPTION B
(500 LBS MAX)
SUPPORT ANGLE OR ANOTHER TYPE OF BRACKET SUPPORTED THROUGH PURLIN WEB



OPTION C
(200 LBS MAX)
UTILIZING PURLIN FLANGE SUPPORT CLAMPS



C. Crane Systems

Structural Bolts normally require no maintenance except in instances where the structure is exposed to vibration, such as a structure with an overhead crane. In this instance, bolts are required to be inspected at least once a year or per OSHA requirements. Crane Bracing is also required to be checked at least once a year. Crane systems require constant maintenance. Follow the guidelines outlined by your crane system manufacturer. For inspection and maintenance of cranes, refer to the applicable section of ANSI B30.11 chapter 11-2, ANSI B30.17 chapter 17-2, and CMAA Crane Operators Manual.

Crane Loads

Any building designed for crane loads was designed and provided as per the initial requests indicated on your order documents. Any change to the building from the original design must be reviewed and authorized by your Builder, Architect, Engineer of Record or competent licensed structural design professional. If your Builder is not available, contact your local District Sales Manager for additional service. To locate your local NBG representative please visit our website www.nucorbuildingsgroup.com or call your local NBG plant for assistance.

D. Wind Bracing

The bracing provided with your structure is of significant structural importance. All bracing which is in place after the erection of the building should remain in place. Never allow removal of any bracing by any contractor or maintenance personnel. If there are any questions regarding the removal or relocation of any bracing, please contact your customer service representative for assistance. To locate your local NBG representative please visit our website www.nucorbuildingsgroup.com or call your local NBG plant for assistance.

Tension

Check annually to insure that all wind bracing members (cables or rods) are under tension. Consult NBG for specific project related questions.

E. Building Evolution

Adding and Removing of Openings

Often adding a framed opening is as easy as cutting a hole in your sheeting and framing it in. At times, wind bracing must be moved or opening locations affect column flange brace placement. By making field modifications without consulting NBG, you may unknowingly cause the structure to become unsafe. Always consult NBG if you have a project-specific question.

Additions to your Building

Your NBG Builder can assist you in developing an expansion of an existing NBG building. NBG buildings can be designed with future expansion in mind.

Proper and timely maintenance is an integral part of the long term success of a roof system in order for it to remain weathertight. Proper maintenance is also required in order to preserve the integrity of the Galvalume ® protective coating or painting of the steel sheets. Maintenance of the system is a requirement and responsibility of thebuilding owner. All roof & wall panels along with trims and flashings designed, detailed and provided by the manufacturer are an integral part of the building system order and must be off-loaded, stored, and installed per the manufactures instruction. It is important to understand that any omissions or modifications of materials provided by the manufacturer, can compromise the weathertightness or protective coating integrity of the materials. Any such omissions or modifications without the consent of the manufacturer can void product warranties provided by the manufacturer.

General

Storage and installation of the wall & roofing system shall be in accordance with NBG's installation instructions. You should not store material on the surfaces of your panels, including roof areas of your building. Roof and wall panels should not come in contact with or be marked with any graphite or lead markers. Roof and wall panels should not come in contact with copper, lead flashing, exposed iron or debris. The use of treated lumber in association with painted or unpainted Galvalume ® steel sheets is a known corrosive and will cause premature deterioration of the protective panel coating. Wall panels should be kept clear of dirt & soil. Air conditioning condensation water should not be allowed to drain onto your roof or wall panels and condensate lines should always be plumbed to the eave of the structure.

Annual Routine Maintenance

Once a year, check flashing and sheeting interfaces and lap joints in the metal for proper seal and potential loose fasteners to ensure connection and weathertightness. Endlaps, eaves, ridges, curbs, translucent panels, and other interfaces should be inspected and maintained yearly. Normal adjustments or tightening of fasteners may be required. Should repair be required, please contact either the original Builder or the manufacturer for proper methods and maintenance material requirements. Panel end-lap maintenance and rebuilding instructions are available from the manufacturer. This includes the removal of fasteners and mastics, proper cleaning, and reinstallation of mastics, hardware and fasteners. It is important that this maintenance is completed according to the manufacturers recommended methods and instructions to achieve weathertightness and prevent the nullification of material warranties.

Installation & Clean-up

During installation & maintenance, the use of cutting tools that damage the painted panel finish should not be used. When field-cutting or mitering roof & wall panels or trims and flashings, non-abrasive cutting tools such as nibblers, shears, scissors or tin-snips should be used. Abrasive cutting tools such as mechanical grinders, or saws can damage the Galvalume ® or painted finish and create excess metal shavings that can corrode the panels. The use of non-approved cutting devices may void your manufacturer’s material warranty. Painted surfaces should be cleaned daily (whether during construction or maintenance work) of all filings, cuttings, screws, pencil markings, and debris to prevent damage due to oxidation of foreign materials. In addition to this, thoroughly clean all panels, trim, and gutters of all foreign material upon completion of construction & maintenance.

WARNING: Always test cleaning procedures in a small inconspicuous area before use on a large scale.

Routine Washing

(NOTICE: If located within a 1000 feet of a saltwater shoreline, roofing or siding should be washed with potable water annually.) A 5% solution of commonly used commercial detergents can be used on heavily soiled areas and will not harm your panel surface. Always rinse thoroughly with water. Do NOT use wire brushes, steel wool, sandpaper, abrasives or similar cleaning tools which will mechanically abrade the coating surface. Use a cloth, sponge or a soft bristle brush for application. For best results, cleaning should be done in the shade or on a mild cloudy day.

Walls

Cleaning

The following is the suggested maintenance for the upkeep of NBG panels:

1. Dirt may cause apparent discoloration of the paint when panels have been exposed to dirt-laden atmospheres for long periods of time. Chalking may cause some change in appearance in areas of strong sunlight. A good cleaning will often restore the appearance of these buildings and an occasional light cleaning will help maintain good appearance**.**

2. In many cases, simply washing the building with plain water using hoses or pressure sprays will be adequate. In areas where heavy dirt deposits dull the surface, a solution of water and detergent (1/3 cup laundry detergent per gallon of water for example) may be used. A soft bristle brush with a long handle may be useful. A clean water rinse should follow.

3. Mildew may occur in areas subject to high humidity, but is not normally a problem due to the high inherent mildew resistance of the baked finishes used. However, mildew can grow on dirt and spore deposits in some cases. To remove mildew along with dirt, the following solution is recommended:

   1/3 cup laundry detergent
   2/3 cup tri-sodium phosphate
   1 quart sodium hypochlorite 5% solution (chlorine-based bleach)
   1 gallon water
   Rinse with clean water immediately after use.

Rust

Once a year inspect the panels for rust. Should any rust or rust stains be found, determine the source, such as steel filings from drilling, sawing, grinding, etc. and remove them. The rust stain can generally be cleaned off with one of the following: soap and water, mineral spirits, or a mild polishing compound as used on a car finish. If you have any questions or concerns regarding rust on panel or trim surfaces, contact your local Builder. If your Builder is not available, contact your Construction Services Representative for additional service.

Paint Scratches

Scratches to the paint should be brush touched (artist brush) with touch-up paint. If the scratched area has not rusted, the paint may be applied without surface preparation. If the area is rusted, remove the rust; prime the affected area and brush with color matched touch-up paint. Some additional touch-up paint is available from your Nucor Buildings Group authorized Builder or from Nucor Buildings Group Steel Store.

Non-Water Soluble Deposits On Galvalume ® (zinc-aluminum) Finishes

Use mineral spirits (with a Neutral PH) to remove non water soluble deposits (tar, grease, oil, paint, graffiti, etc.) from the panel surface. Do not use any other harsh caustics or acidic compounds or cleaners that could potentially cause premature failure of the coating and otherwise create permanent damage to the protective panel finish.

Non Water Soluble Deposits On Silicone-Polyester & Polyvinylidene Fluoride (PVDF) paint finishes

Use a diluted mixture of the common household commercial cleanser “Tide” & Water to remove non water soluble deposits (tar, grease, oil, paint, graffiti, etc.) from the panel surface. Do not use any other harsh caustics, abrasives, or acidic compounds or cleaners that could potentially cause premature failure of the coating and/or otherwise create permanent damage to the protective panel finish. Solvents that may also be used to remove these items from paint panel finishes include:

Alcohols - Not aesthetically detrimental when properly applied
- Denatured Alcohol (Ethanol)
- Isopropyl (Rubbing) Alcohol
- Methanol (Wood Alcohol)-Note: Methanol is toxic

Petroleum Solvents - Not aesthetically detrimental when properly applied
- VM & P Naphtha
- Mineral Spirits
- Turpentine (Wood or Gum Spirits)

Aromatic and Other - Use with caution:
- Xylol (Xylene)
- Toluol (Toluene)

Limit contact time to under 5 minutes maximum and test before using, exposure long enough to damage paint finish will void your finish warranty.

DO NOT use acetone paint remover, Lacquer thinners, Esters, Ketones, Methyl Ethyl Ketone, or Methyl Isobutyl Ketone on Silicone-Polyester or Polyvinylidene Fluoride (PVDF) paint surfaces. Contact and exposure with these products can result in blemishes detrimental to the aesthetics of your metal building and will void your warranty

Most organic solvents are flammable and/or toxic and must be handled accordingly. Keep away from open flames, sparks and electric motors. Use adequate ventilation, protective clothing and goggles. A fresh water rinse should be used after application of alcohols, solvents, or aromatics to ensure that all residue is removed.

Cutting/Drilling

Field cutting and drilling of panels and trim is a normal process during the life of a metal building. The use of improper tools or cutting techniques can result in an unfavorable appearance of the finished product, and may void your warranty from the manufacturer.

Some of the most common activities that require field cutting of panels and trim are:

• Replacing damaged panels •Adding holes at pipes, etc. • Mounting external fixtures

Drilling

It is important that any and all shavings from drill bits and self-drilling screws be wiped off of the siding and roof panels. The byproducts of the drilling process are actually hot metal shavings. These shavings can imbed themselves into the finished coat of the material, resulting in rust.

Panel warranties do not cover this type of damage.

Cutting

Full width panels should always be cut with a shear or power nibblers. The hot metal shavings produced by a grinder or hot saw will burn through the panel causing the primer to evaporate into ashes. This is one of the most common reasons for rust. This rust may appear immediately or may not appear for months, and is not covered under the panel warranty. By using a shear or nibblers, this hazard can be avoided.

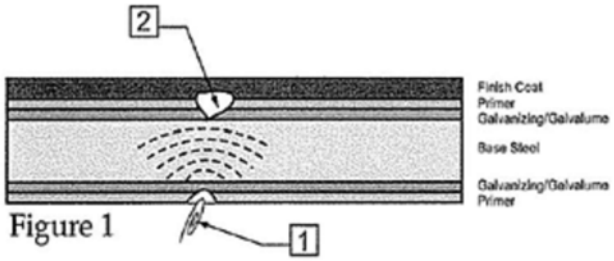


Figure 1

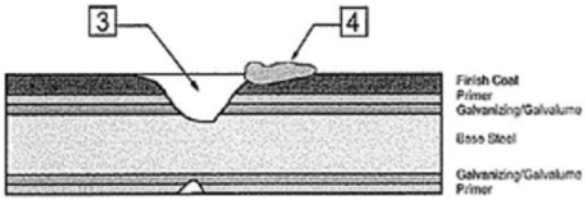


Figure 2

Figure 1 1. Hot sparks caused from cutting the panel burns through the primer.
2. The primer under the finish coat on the opposite side is also burned.

Figure 2 3. In time, the finish coat collapses causing black steel to be exposed.
4. As a result, red rust appears on the panel.

Painting

It is likely that during the life of your metal building the exterior panels will require touch-up paint. Sherwin Williams' Industrial Coatings Division can match and supply the correct primer and finish paint. Please note that all atmospheric conditions have some effect on the panel finish; give this due consideration. Consult your Order Documents or contact NBG for the correct type of paint supplied on your particular project.

Touch-up of these areas are the responsibility of the End Customer.

Roofs

General

Galvalume ® and its chemical make-up is designed to withstand minor cuts and abrasions. The unique

aluminum/zinc coating on the steel will virtually "heal" those minor abrasions that occur. That same “healing” property that protects the panel also causes the Galvalume ® coating to be highly reactive when in contact with some types of foreign debris such as copper wires, drill shavings and the like. When left on the roof, these materials can cause the panel to rust. The Galvalume ® roof must be kept free of debris in order to reach the expected service life.

The NBG "CFR", "SS360", "SSII", "Loc Seam" or "R-Panel Galvalume ® roof panels will give you years of productive life if properly installed and maintained. However, a regularly scheduled program of preventative maintenance is required in order for the roof to function. A reasonable schedule of maintenance begins with proper inspection during construction and a follow-up plan within 60 days after occupancy. Your roof should be maintained annually thereafter.

Trapezoidal Standing Seam Roof Systems
Larger “CFR”, "SS360", and "SSII" roofs are designed to "float" or move as the temperature of the roof changes. This action of floating allows the roof to expand and contract with normal temperature changes. This is a unique feature of standing seam roofs on the market today. Since the roof moves, it must not be restrained in any way. Flashings at the ends of buildings must be allowed to float in concert with the roof. Before adding additional fasteners or flashings to the building ends, be sure to contact your NBG Builder for specific instructions.

Vertical Rib Roof System
The “Loc Seam" Roof System is a vertical rib panel that is perfect for architectural requirements. This is a weathertight roof system that is ideal for hips and valleys. The panels are installed with concealed fastener clips allowing for thermal movement. It is mechanically seamed for weathertightness.

Through Fastened Roof System
Smaller projects can often utilize the "R-Panel" roof system. This roof is attached directly to the roof secondary members and does not allow the roof system movement as the previous roof systems. While the cost of the roof system and labor required to install this type of roof system is less, the need for routine maintenance is no less important.

Inspection
During erection your roof is subjected to construction traffic. This is normal and should be minimal provided the contractor uses good judgment. It is recommended that the owner take the following steps before the erector leaves the jobsite. These same steps should be followed on your annual visit.

Keep a log of your maintenance work. This will help you set a good schedule as well as document what steps were taken, and when. Periodic roof maintenance should start with a walk through the building interior to observe if modifications have been made to the primary or secondary support members. Make sure hangers for heaters or sprinklers do not extend above the structural or touch the standing seam roof. Make sure fire walls that extend to the roof do not restrict the panel movement or create ponding.

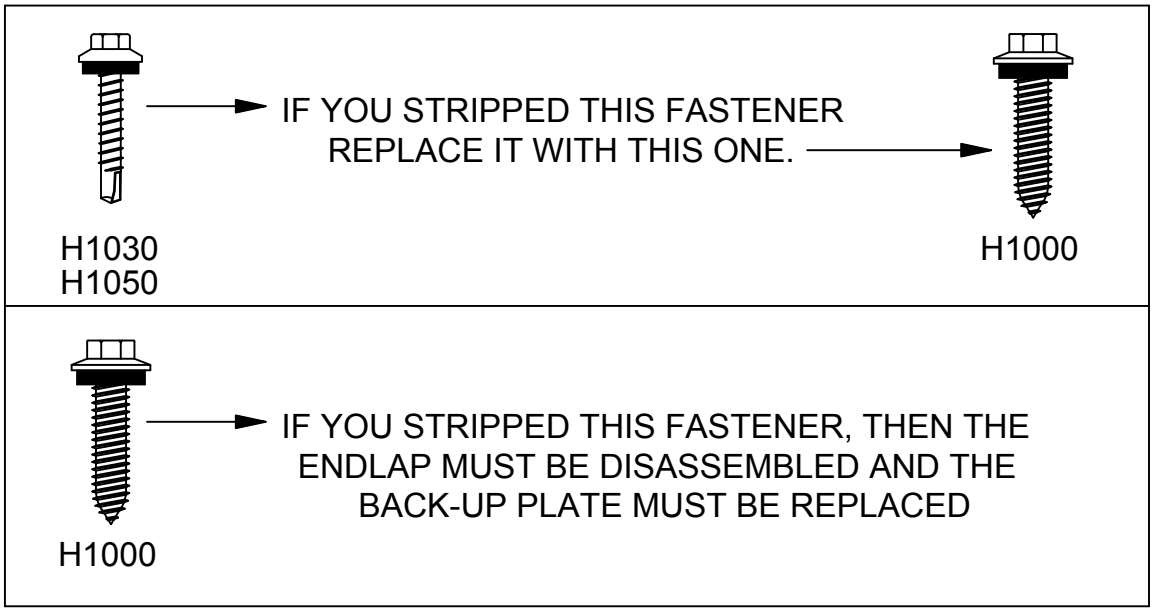
Safety First / The Building Exterior
Walk the exterior edge of the building at ground level and repair any downspouts that have clogged or been dislodged in any way. Once on the roof, make sure you are aware of any potential safety issues such as steam or hot water vents, electrical lines, translucent panels and the like, and take the necessary precautions to prevent an accident. Be sure to follow all state and local safety requirements as well as rules of good common sense. Beware of the potential for nests of wasps or bees on the roof.

Walking the Eaves
Walk the eaves of the building, using approved safety methods and take care not to get too close to the edges. Make sure all gutters and downspouts are clean and free of debris. Look for any irregularities, including missing fasteners and stripped or broken fasteners.

Any fastener that was not seated properly will work itself out eventually. Replace any unseated or loose fastener with the next larger fastener size.

STRIP A FASTENER?

FASTENER REPLACEMENT GUIDANCE



Fasteners

The fasteners provided with your structure are important to the long term success of your panel finishes and the design integrity of the system. Do not locally obtain or substitute fasteners on a project, unless otherwise authorized by the manufacturer. Replacement fasteners can be obtained through your local NBG authorized Builder. If your Builder is not available, please contact our Components Representative for assistance.

"CFR", "SS360", "SSII" and "Loc Seam" Panel Endlaps

The panel endlaps should be checked for any unseated fasteners or back-up plates that may not be properly engaged. An endlap in which the back-up plate is properly engaged will feel firm underfoot.

Should you find an improperly installed back up plate on your roof, remove the fasteners and gently pry the endlap apart and clean any mastic from the panels. Affix the back up plate in the proper position with the back-up plate tabs, re-install mastic and apply gun grade caulk between the two panels. Make sure the caulk covers the endlap completely, especially in the areas around the fastener holes. Replace fasteners using the next larger size or the "goof"screw as supplied by NBG.

"R-Panel" Endlaps

The endlaps on the R-Panel Roof are located over a purlin and are connected with screws – Check for any screws that are stripped or washers that are not seated along the endlap, ridge, rakes and eaves. Stripped screws must be replaced with an oversized fastener.

Ridge Areas

Walk the area adjacent to the ridge, being careful not to step directly on the cap. The ridge should be free of pending water and debris. Check for and remove any debris in the area. Check for any fastener that may not have been seated well. Review interface between the ridge and the rake flash or any parapet condition. Inspect the rake flash and check for any area where the flash is not seated to the panel.

Single Slope Buildings

Don't forget to walk the high side of a single slope building. Check for tightness of flashings and fasteners. Verify that the seal between the flashing and the panel closure is in place.

Expansion Joints

Larger buildings have longitudinal and transverse expansion joints. During your walk through, make sure to look for any irregularity in a flashing joint or for any loose fasteners.

Parapet Conditions

Be sure to check parapet (high/low) conditions or areas where blowing rain and snow severely test the design and installation of your building. Flashings must be allowed to "float" on standing seam roofs, yet prevent moisture from entering the building. When maintaining the roof, be sure to look for any loose fasteners or mastics. Remove any debris from parapet areas. Be careful of the addition of any fastener that will restrict movement of the roof. A restrained roof may cause maintenance problems in a system-related area. Consult your NBG builder and the Erection Drawings for specifics.

Roof Curbs and Hatches

Look around all roof hatches and curbs for debris left by erectors or repair men. All debris must be removed from the roof. Check for seated fasteners and ponding water. Water must flow freely around all curbs. Never use tar or apply topical mastics to the surface of the panels. Topically applied sealants will only conceal the cause of a problem. You may want to consider some type of permanent work platform around those units that

require constant maintenance to avoid excessive foot traffic on the panels that could lead to ponding water. Condensate lines from air conditioner units expel water contaminated with lead or copper. This must not be allowed to come in contact with the roof panel. The copper and lead are very reactive with the steel panels and can cause rust. This water must be piped off the roof to the building exterior.

Corrosive Materials

Graphite, lead, copper, treated lumber, lead flashing, exposed iron, salt, chlorine, ammonia & miscellaneous debris including dirts & oils are all commonly known corrosives to the protective Galvalume® coating and can cause premature deterioration of panel finishes. These materials specifically, but not limited to other contaminants, can be severely detrimental to the integrity of the coatings provided. Failure to keep building contaminants from contact with your panel surfaces can void panel warranties.

Dissimilar Materials

Iron pipes for gas lines, structural steel framing for roof units, and similar installations must be painted to prevent rusting. Water run-off from rusted iron or steel will diminish the life of the panel and should be piped off of the roof. Lead or copper can not be used on the roof for any reason. Never use a pencil to mark information on the roof. The graphite used in pencil leads is not compatible with Galvalume® and will quickly destroy the protective coating.

Debris

At least once a year, clean the roof & gutters of leaves or other debris which can trap or pond water on the roof. Wash dirt & debris from the panel surface. Local conditions govern the frequency of necessary routine maintenance. It is the responsibility of the owner to keep the roof free and clean of debris and corrosive materials at all times.

Penetrations

Penetrations are pipes, curbs, and other items that penetrate a metal roof panel. Penetrations must be flashed properly to assure a weathertight roof assembly. When inspecting the roof, you should see that pipe flashings have a weathertight seal at the panel surface. Ensure that the penetrations are secure and not prone to movement. Penetrations should not impede the flow of water. Curbs should be properly flashed, especially at the corners; skylight domes or panels should be checked for deterioration. As with any inspection, you should check for missing or loose fasteners, as well as possible corrosion of the metal panels.

Pipes, Supports, & Condensate Lines

Pipes, conduits, and supports for roof-supported units shall be of a non-corrosive or rust free material. Field painting of pipes and supports may be required to resist corrosion. Condensation from roof-top units shall be piped to interior or exterior locations. Damage due to condensate water is not covered under manufacturer's warranty.

The Roof in General

Observe all panel side laps to make sure the erector properly seamed each side lap. Also review the panel surface for pitted, worn, stained or rusted areas. If there are areas of concern found on the roof panels,

contact NBG Construction Services. Remove all debris from the roof at least once a year. Make sure all workmen who enter the roof know to remove their trash and debris. This will simplify the maintenance process.

Sealants & Mastics
Sealants & Mastics (gray or white tapes) are designed to be used as gaskets. In order for them to perform properly, clamping action is established by using fasteners at predetermined locations. Proper location of fasteners and mastics will assure that seals perform as designed. See the Erection Drawings for specific locations. Mastics are effective only when applied between two pieces of metal and are not to be used topically.

Sealant Removal
Precautions should be taken to prevent sealants from getting on the painted surface, as they may be difficult to remove. Sealants should be removed promptly with a solvent such as alcohol or a naphtha type of solvent. Caution: It may be possible for solvents to extract materials from sealants that could stain the painted surface or could prove harmful to the sealants. Test a small inconspicuous area first, before wide spread use.

Butyl Caulking
Butyl Caulking is applied between panel seams or joints as directed by the Erection Drawings. Butyl caulk is a non-skinning caulk that is effective when used between pieces of metal. It is not to be used topically.

Polyurethane Caulking
Polyurethane Caulking is a skinning caulk applied between trim laps or joints as directed by the Erection Drawings. This caulk is typically used in areas that may be exposed to the elements.

Topical Coatings
The use of tar and other topical applied products should not be permitted or utilized as a method of leak repair. The use of topical coatings will void panel warranties and is detrimental to the performance of the materials. The use of any topical coating or other topical applied product is prohibited, unless specified by the manufacturer.

Ice & Snow Buildup

You should be familiar with the roof load specified for your building regarding snow & live loads. Any significant accumulation of snow and ice may threaten the structural integrity of your roof if it approaches or exceeds the design roof capacity. In the event of severe winter storms, the accumulation of snow and ice should be carefully monitored and frequent inspections made to detect any deflection of the roof system, damming or clogging of gutter systems, ponding or unusual drifting conditions.
Excessive ice & snow should be removed from roof areas. Please refer to our Snow Removal Guidelines for additional information specific to the proper removal of snow & ice. The removal of snow & ice should be performed by experienced personnel according to the Snow Removal Guidelines provided, in order to avoid damage to the roof or the structure. Appropriate precautions should be taken to minimize the risk of injury on the roof during hazardous conditions. Excessive ice & snow removal is particularly important in gutter areas (eaves & valleys) and in areas of the roof sheltered from wind (behind facades, stepped roof conditions, etc.).

If any evidence of structural distress is noticed, contact the building manufacturer, your Builder, or consult with a competent licensed structural engineer or professional for assistance in avoiding damage or catastrophic failure of the roof system.

Foot Traffic

Roof traffic is a leading cause of roof leaks. If routine traffic is unavoidable, have your builder install a walkway designed for use with your roof panel. When walking on the roof is required:

- Avoid stepping on the ridge caps.
- Avoid stepping on lap joints in roof panels and flashings.
- Avoid walking near roof curbs or other roof penetrations.
- Avoid stepping on panel ribs between purlins.
- Do NOT step in or on gutters or the gutter hanger system.
- Do NOT step on or near translucent panel skylights. **!!! CAUTION !!!** If skylights are present in your roof, extreme care should be exercised when working in those areas. **NEVER STEP DIRECTLY ON A SKYLIGHT, OR IN THE SURROUNDING AREA ADJACENT TO A SKYLIGHT.** Skylights may not support the weight of a worker, and bodily harm could result from a fall. Please follow all OSHA and/or other state and local safety guidelines applicable for the particular jurisdiction.

Gutter and Downspouts

Clear all debris (leaves, dirt, etc.) from gutters and downspouts as required periodically and kept free-flowing at all times. The frequency required is dependent on the building's surroundings.

Foliage

While bushes and trees enhance the appearance of any building, their contact with the panel systems can produce scratches in the paint surface which can eventually cause problems. Keep bushes and trees trimmed back from the panel surfaces.

Damaged Trim

Trims located around openings (corner trims, base trims, jamb trims, etc.) can sometimes get damaged by vehicle traffic and can lead to weathertightness issues. Replacement trim can be obtained through your local NBG authorized Builder. If your Builder is not available, contact your local NBG Components Representative for additional service. To locate your local representative please visit our website www.nucorbuildingsgroup.com or call your local NBG plant for assistance.

Accessories

General

Windows, doors, vents, and louvers should be checked yearly for loose fasteners and any moving parts should be lubricated as necessary.

Gravity Vents / Roof Vents

Gravity roof vents are designed to allow inside air to be vented to the outside. The throat and dampers also can allow blowing rain and snow to enter the inside of the building. Inspect vents annually for debris, bird intrusions, etc. Inspect pull chains and lubricate mechanisms as required. Hard to operate roof vents are usually the result of pulleys and damper rods in need of lubrication or the chains and cords not being on track. Check operating hardware and lubricate as needed.

Roof Curbs

Heavy vibration from a mechanical unit can cause water leakage around a roof curb. Should this occur, check the sealant and fasteners around the curb. Any loose fasteners should be tightened or replaced with the next larger size. Any sealant or mastic that has deteriorated should be removed and replaced with new. If possible, isolate the unit from the curb to minimize vibration to the curb. Look around all roof hatches and curbs. Debris from the mechanical repairmen must be removed from the roof. Check for seated fasteners and ponding water. Water must flow freely around all curbs. Never use tar or topically applied mastics on the surface of the panels. Topically applied sealants will only conceal the cause of a problem. You may want to consider some type of permanent work platform around those units that require constant maintenance. Condensate lines from air conditioner units expel water contaminated with lead or copper. This must not be allowed to come in contact with the roof panel. These must be piped to the building exterior. Iron pipes for gas lines and the like, structural steel framing for roof units, etc. must be painted to prevent rusting. Water run-off from rusted iron or steel will diminish the life of the panel. Lead or copper can not be used on the roof for any reason.

Pipe flashings & Pipe Boots

Inspect pipe flashings & pipe boots annually. Water should not be allowed to pond on the pipe flashings or pipe boots. Remove any algae growth found on the pipe flashing or pipe boot.

Louvers

The operating hardware within a louver occasionally needs to be cleaned and a new light coat of oil or grease applied. This will improve the ease of operation.

Translucent panels

Do not step or stand on the panel itself at any time. Inspect translucent panels annually for loose fasteners, missing or damaged mastic and caulking, etc.. Deterioration of the caulking may contribute to the long term integrity of the systems which could eventually cause leakage. If any mastic or caulking is found damaged or missing, remove old material and replace with new mastic or caulking, designed for that application. Translucent panels may be cleaned with a mild nonabrasive cleanser. Avoid using any cleanser that may cause hazing. Do not remove warning stickers. Never paint over a translucent panel.

Doors

Overhead Doors

Periodically check the attachment bolts around an overhead door and tighten as required. Call the door manufacturer or consult the door supplier should the door get out of alignment or the mechanical parts within the door become hard to operate.

Sliding Door

Periodically clean the sliding door tracks and lubricate the rollers to help assure ease of use. Call the door manufacturer or consult the door supplier should the door get out of alignment or the mechanical parts within the door become hard to operate.

Walk Doors

The following is intended to serve as a general guideline for maintenance activities required for hollow metal doors and frames. Maintenance will be for the most part associated with the accessories and hardware attached to the door and frame. Maintenance of any product is important and necessary to obtain the maximum benefits of product service and longevity. Hollow metal doors and frame assemblies are no exception. In fact, in some cases where the door and frame assembly are used as a "fire rated" fire barrier or a "leakage rated" smoke and draft barrier, proper maintenance is crucial. Basic maintenance is imperative and well worth the effort to provide for life safety.

Areas of inspection

The following items should be periodically checked. Since doors in different areas of a building experience different levels of traffic, the frequency of periodic inspections would occur with consideration of this.

Hinges

Check all hinges for loose screws, hinge pin wear, or other notable defects. Service the hinges or remove the defective parts and replace if necessary per the manufacturer's recommendation. The door should always swing freely and smoothly from open to latched (when latching device is used) position without obstruction.

Locksets, Panic Devices, Fire Exit Hardware

Check all locksets for loose screws, linkage arm wear, fluid leakage, hinge pin wear, or other notable defects. Service the lockset or remove defective parts and replace per the manufacturer's recommendation. The door should always latch freely and smoothly without obstruction. Self-latching should always function freely and smoothly as the door swings into the closed position. Additional force should not be needed to achieve latching. Worn or defective hardware should be repaired or replaced by a qualified technician.

Strike Plate

The strike plate should be adjusted to seat the door leaf firmly against the jamb. The plate should also be firmly attached to the frame or inactive leaf of a pair of doors. Check for loose screws and/or other notable defects. Service or remove strike plate if necessary.

Weather Stripping

Weather stripping should be adjusted to prevent air from leaking excessively around the door. Weather stripping should be cleaned periodically to assure a proper seal. Worn or damaged weather stripping should be replaced as required.

Closing Devices

Check all closing devices for loose screws, linkage arm and pin wear, fluid leakage, or other notable defects. Service the device or remove defective parts and replace as needed. The primary and secondary closing speed adjustments should also be set and maintained in accordance with the manufacturer's recommendations. The device should allow the door to operate freely and smoothly throughout its entire swing and positively latch (if so equipped) or remain in the closed position**.**

Surface Bolts/Flush bolts

Check all surface bolts or flush bolts for loose screws, rod bolt adjustment, and strike plate (on both door and frame if so equipped) attachment. Service the device or remove defective parts and replace as needed. The rod bolts should retract, extend, and engage the strike or keeper hole freely and smoothly for both manually and/or automatic flush bolts.

Glass Lites

The glazing material should be checked for cracks and/or missing pieces of glazing. The glazing mounting frame should be checked to assure screws (if used) are tight and the unit is securely attached to the door. Service the glass lite or remove defective parts and replace as needed. Also be sure to use approved safety glass in appropriate applications/ locations, or fire rated glass and glazing in fire doors, windows or lites.

Door and Frame Finish

A general visual inspection of the door and frame finish is appropriate. Any excessive finish defects should be repaired and repainted. Adequate protection is needed to prevent the product from rusting and shortening its service life.

Door and Frame Finish

A general visual inspection of the door and frame finish is appropriate. Any excessive finish defects should be repaired and repainted. Adequate protection is needed to prevent the product from rusting and shortening its service life.

Windows

The following is intended to serve as a general guide line of maintenance activities required for aluminum windows and frames. Maintenance will be for the most part associated with the accessories and hardware attached to the window and frame. Maintenance of any product is important and necessary to obtain the maximum benefits of product service and longevity. Aluminum windows and frame assemblies are no exception. Basic maintenance to ensure the proper functioning of the assembly is imperative and well worth the effort to provide for life safety.

Caulking in windows will deteriorate in time, usually resulting in window leakage. If this happens remove the old caulk and apply new caulk in its place. Windows that become hard to slide should have the track area thoroughly cleaned and a light coat of lubricant applied to the tracks.

Areas of inspection
The following items should be periodically checked. Since windows in different areas of a building experience different frequency of use, periodic inspections would occur with this in mind.

Hinges
Check all hinges for loose screws, hinge pin wear, or other notable defects. Service the hinges or remove the defective parts and replace if necessary per the manufacturer's recommendation. The window should always move freely and smoothly without obstruction from open to latched (when latching device is used) positions.

Locksets, Fire Exit Hardware
Check all locksets for loose screws, hinge pin wear, or other notable defects. Service the lockset or remove defective parts and replace per the manufacturer's recommendation. The window should always latch freely and smoothly, without obstruction.

Glass Lites
The glazing material should be checked for cracks and/or missing pieces of glazing. The glazing mounting frame should be checked to assure attaching screws (if used) are tight and the unit is securely attached to the window.
Service the glass lite or remove defective parts and replace as needed. Also be sure to use approved safety glass in appropriate applications / locations.

Window and Frame Finish
A general visual inspection of the window and frame finish is appropriate. Any excessive finish defects should be repaired.

This publication has been prepared to assist the owner in understanding and dealing with condensation. Its contents are based on information believed to be reliable. However, the prevention and elimination of condensation depend on the total design and construction of the building, which is beyond the responsibility of NBG. Accordingly, information herein should not be regarded as a recommendation concerning metal building design and construction.
Construction is fast paced. In our business, we provide sheltered space. Without careful thought to the mechanical systems, the insulation system, and our methods of construction, the presence of condensation becomes a possibility. The effects of condensation can be devastating.

Dew Point

The air we breathe is filled with many gases including water vapor. The amount of water the air can hold is proportional to the temperature. "Dew point" is described as the temperature at which air can no longer hold water vapor. That is the temperature when condensation occurs. Condensation will occur on any surface that is at or below the dew point temperature.

During Construction

Huge amounts of moisture can be introduced into the air during the construction stage. Excavated earth can introduce large amounts of water to the air. Often, the contractor will fully erect the framing, roof, walls, and insulation so it becomes easier to pour concrete inside. Heat may also be added to keep the concrete warm. Under these circumstances, the interior of the building is literally flooded with moisture. As the air becomes saturated, condensation may occur on the steel, the insulation, or any other surface. The result is often disastrous.

What Can Happen?

If condensation collects on the interior of the building, rust literally covers the frames and purlins. Sometimes the insulation becomes saturated, convincing the owner that the roof is defective. In colder conditions, ice forms on any surface where moist air comes in contact with a thermal break. Ice may form on purlins, door knobs, window cranks, or even the seams in the insulation. To prevent this, the moisture in the building must be removed with the use of fans or other means. By replacing moist, inside air with less humid outside air, the conditions inside become more balanced and condensation can be prevented.

The Construction Stage

During construction, proper planning is essential for the control of condensation. Ventilation of the slab and foundation work is critical. Proper installation and design of the vapor retarder is also important. Remember, ample consideration to each area of construction is important to the success of the project.

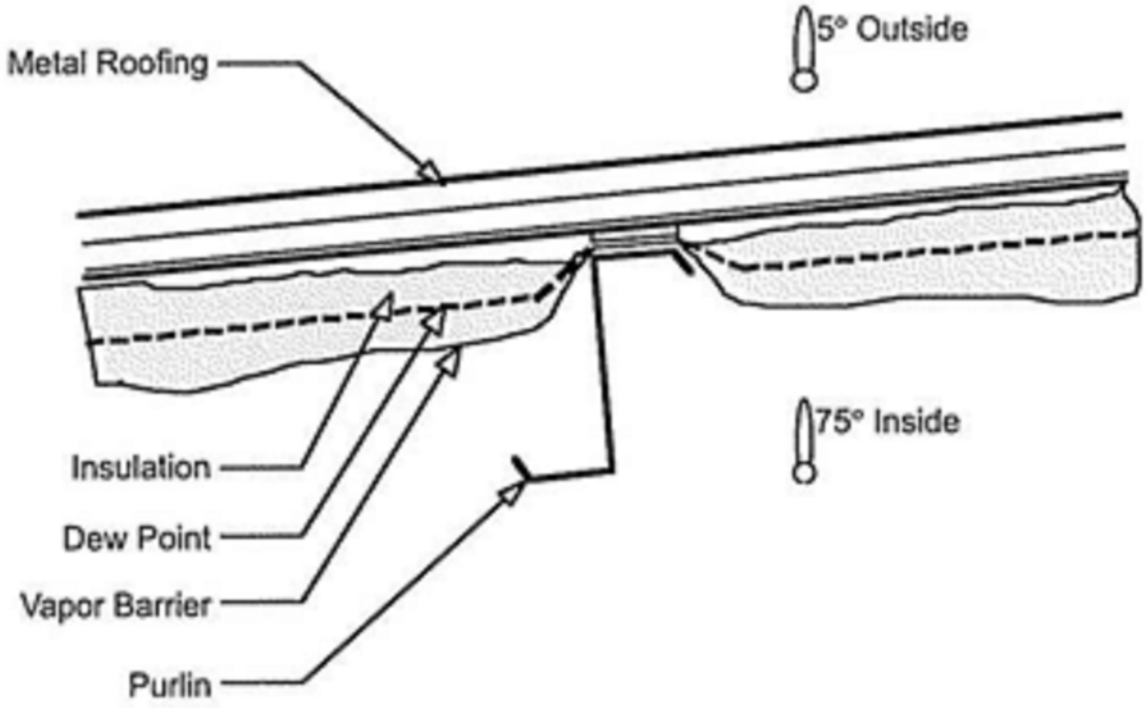
Proper Design and Planning

Careful planning with regards to mechanical systems, methods of construction, insulation systems, and end use will insure that the owner's expectations are met.

Roof Section

The warm, moist air inside a building must be kept at a relative humidity level below the dew point. A vapor

retarder alone cannot prevent condensation. The insulation design of the building, along with the construction techniques and the design of the air handling systems, work together to prevent damage due to condensation. At some point in the range between indoor temperature and outdoor temperature the dew point is reached. The vapor retarder helps prevent warm, moist, inside air from condensing on the insulation.



Inspect the exterior of your building for exposed insulation and call your contractor immediately if found. Exposed insulation will wick and hold water against the ends and back side of the panels, causing rust to occur.

Insulation Facings

Insulation facings should be monitored continuously and a thorough inspection made once a year. Any holes or tears in the facing should be repaired with patch tape as supplied by the insulation supplier. Remember, even a perfectly installed retarder is not a perfect vapor retarder.

Condensation
If your building is experiencing excessive condensation, consult your HVAC contractor to assure that humidity levels and air movement are as projected. Also, have your building contractor check to make sure there are no obvious openings in the insulation splices. The unfaced surface of your insulation should always be in full contact with the exterior steel sheets.

Loose Insulation
Insulation tearing loose at various locations within the building (particularly at the eave or base) might not be the result of poor insulation, but rather a strong negative pressure inside the building resulting from improperly balanced HVAC system or an extra exhaust fan added after the erection of the structure. This, combined with a strong wind outside the building will often result in the insulation coming loose in these areas. The unfaced surface of your insulation should always be in full contact with the exterior steel sheets.

Roof Leaks
Should you observe evidence of a roof leak, such as water on the floor, stained ceiling tiles or a bubble in the insulation vapor retarder, contact your building contractor immediately. After the leak has been repaired, have your contractor cut the vapor retarder where the water has collected to allow the wet insulation to drain. Once the insulation has thoroughly dried, repair the vapor retarder with patch tape available from the insulation supplier. Ensure that the insulation is in full contact with the steel sheet. There are various reasons a roof leak might occur, such as:

- Improper Installation
- A lack of routine maintenance
- Damage to a component
- Deterioration of a component
- Insulation air space void that creates condensation

It is also possible that a leak might not be the result of the above referenced conditions, but rather the result of a strong negative pressure inside the building from an improperly balanced HVAC system. If you have any questions or concerns regarding specific roof leaks on your building, contact your local Builder. If your Builder is not available, contact your NBG Construction Services Representative for additional service. To locate your local representative please visit our website www.nucorbuildingsgroup.com or call your local NBG plant for assistance.

Negative Pressure
Negative air pressure is force that can compromise sealants and affect the weathertightness of a building system. If sealants become compromised then it is entirely possible for a leak to develop over time. If a leak is left unaddressed, it can lead to potential water-infiltration into the insulation cavity. Over time this can create a wide range of issues from annoying leaks, to mold & mildew, to sagging insulation, and to potential premature corrosion of the panels, trims and structural's in the affected area. The phenomenon of negative air pressure is basically a condition of unbalanced air pressure between the inside air pressure and outside air pressure of the structure. When a condition exists with too much outgoing or exhausting air combined with a lack of

incoming air, then a vacuum is created. When the vacuum is created, it naturally wants to pull outside air into the structure. When the pressures are high enough, they also begin to pull any potential standing water into the structure as well. In order to restore the balance and equalize the pressure, additional incoming air supply is required. This is typically accomplished with the addition of Make Up Air units added to the structure. Proper measuring and evaluation of needed Make Up Air supply requirements is typically provided by a qualified mechanical engineer or contractor. Negative pressure can be a concern and primary source for water-penetrations. The building owner should have a qualified mechanical engineer or contractor retained for proper testing of existing conditions to address the negative pressure. If negative pressure is evident on a project, then it needs to be addressed in full before attempting to address any additional pursuant leaks.

Snow Removal

Roof snow accumulations in excess of specified project design loading criteria can cause significant distress to your building structural system. Snow will build up in areas around firewalls, parapet walls, valleys, dormers, and on lower roof levels where a roof step occurs. Since the density of snow varies depending on weather conditions during and after a snow fall, it is not possible to determine a single value for the allowable height of snow that a building can safely support.

The underlying snow density increases due to melting from the building heat loss and as water is absorbed from the melting snow above. As weather and temperature changes continue, ice may build up under the snow layers, further increasing the building roof loading intensity. This ice build up also causes additional water back-up on the roof deck. The most severe condition occurs when rain falls on a roof system already loaded by snow. In this case, the snow absorbs the rain water, and loads can approach the weight of water (62.4 pounds per cubic foot, or 5.2 pounds per inch of depth). This condition must be monitored with extreme caution.

The following procedure may be used as a guideline for responding to roof overload conditions due to extreme snow and ice build up conditions:

1. Visually inspect the roof system to identify unusual deflections of frames, purlins, or joists. Starting in this area, remove approximately one-half of the snow depth in a pattern that does not cause an unbalanced loading condition on the frames or purlins.
2. In general, the shoveling pattern should progress from each endwall of the building towards the center. On larger roof areas, additional people working from the center of the building to the ends is recommended.
3. Along the building width, remove snow from the eave towards the ridge, sliding the snow off the roof over the gutter. On gabled buildings, remove the snow on both sides of the ridge at the same time.
4. Remove the remaining half of the snow depth in the same manner as described above.
5. Never use metal shovels or “scrape” the roof down to the surface of the panel. Remember, the objective is to relieve the excess loading condition due to the weight of the snow, not to completely clear the roof panel of all snow and ice. Attempting to scrape the roof will result in broken fasteners creating roof leaks.
6. Keep gutters, downspouts and roof drains open and free flowing to prevent water back up and ice build up on the roof system. Ice damming conditions are especially likely on the north side of a building and in shaded areas. Installing heat tape in gutters and downspouts can also be used as a precaution, however, heat tapes may not be 100% effective in extremely low temperatures and should be checked regularly.
7. Watch for extreme deflections and listen for unusual noises when snow and ice build up conditions exist.

Safety Guidelines

1. Always provide proper safety precautions when working on the roof.
2. Pay special attention to and be aware of Translucent Roof Panel locations. These panels are not intended to support roof foot traffic loads.
3. Be cautious of snow or ice breaking away and sliding down the roof, even on low slope buildings. Metal roof systems are extremely slippery when wet. It may be necessary to locate ladders at the end

of the building to avoid sliding snow.

4. Use extreme care when working along the edge of the roof.
5. Never send one person alone on a roof to remove snow. NBG does not make any recommendation on when to remove snow from roofs. It is up to the individual property owner to consider the benefits and dangers of snow removal and decide their own course of action. Remember to consider the depth and relative moisture content of your snow and the capacity of your roof structure in making your decision to remove snow or not.

For additional information , it is also recommended to review the “Snow Removal” section of the Metal Building Systems Manual, current version.
Additional suggested information regarding maintenance is also in sections titled ‘Gutter & Downspout Maintenance’ & ‘Ice Damming’.

The best preventative maintenance that one can do is to perform scheduled annual inspections to identify and solve problems as they occur. This will help to optimize the service life of the building, keep the building aesthetically pleasing, functional, and virtually weather tight to protect your products, your facilities, and your personnel. This inspection will require a critical examination of both the interior and exterior components of existing assemblies, cladding, doors, windows, cranes, and flashings. Keeping a log of your maintenance work will help you maintain a good schedule as well as document what steps were taken, and when. Any preventive or corrective maintenance procedures should be designed to keep the building in a virtually weatherproof condition. Any modifications found to the structural systems during your inspection must be reported to NBG's Quality Services Representative. By making field modifications before consulting NBG you may unknowingly void warranties and cause the structure to become unsafe. You have also assumed all costs involved in the process.

If a manufacturer's or contractor's warranty is obtained for a roof assembly, one of the most important things a building owner can do is read and understand the terms and conditions of all warranties. The manufacturer's or contractor's warranty is a legal contract, and the warranty, for a variety of reasons, can be voided like any other contract. These reasons may include but are not limited to the following:

- Neglect by not performing inspections, repairs and routine maintenance in a timely manner.
- Failure by a building owner to notify the warrantor of leaks in the roof assembly.
- Failure by an owner to notify the warrantor before installing new rooftop equipment and penetrations or making any other modifications to the building system.
- Failure to have permanent repairs or maintenance performed in accordance with the warranty or instructions, such as:
    - Using material not manufactured or approved by the warrantor or using an incompatible material for a repair.
    - Work performed by a contractor not approved or authorized by the roof assembly manufacturer or warrantor.
    - A change in the use of the building unless approved by the warrantor.
    - A change in ownership of the building; many warranties are nontransferable.

Building owners should maintain historical records of these inspections. A historical record should also be kept to provide the owner with data concerning the original erection of the building, whom the erector was, the contractor, building manufacturer, warranty information, any special conditions, or any known contaminants that may be discharged onto the building surfaces. An owner should also use the historical record to document all subsequent inspections, maintenance and repairs performed on the building.

Before the inspection takes place, please refresh your knowledge by reading through the Preventive Maintenance Manual. The manual is a good reference and will go into more detail and explanation to help you complete a thorough inspection.

As always, apply all safety precautions and requirements as mandated by state and local requirements as well as rules of good common sense while during your inspections.

Date of inspection:		**Condition Severity:**	**Action Taken:**
Inspection performed by:		**G = Good - No Action Req'd**	**Y = Yes**
Title or postion:		**F = Fair - Monitor Periodically**	**N = No**
		P = Poor - Immediate Action	
Weather Conditions:			
Temperature:			
Sun /Clouds:			

STRUCTURAL FRAMING	ITEM	G	F	P	Y	N	ACTIONS TAKEN OR RECOMMENDED
Main Frames and Rafters	Any modifications to shape						
	Any additional collateral loads						
	Check the primer						
	Loose bolts						
	Other						
Secondary Framing	Any modifications to shape						
	Any additional collateral loads						
	Check the primer						
	Loose Bolts						
	Other						
Crane System (if applicable)	Check crane operators manual						
Wind Bracing	Check tension of rods/cables						
	Any bracing removed/altered						
	Other						
Building Evolution	Any openings added/removed						
	Any bracing relocated/modified						
	Any secondary framing been altered						
	Any additions to existing building						
	Other						
General	Contaminants						
	Corroded metal						
	Other						

WALLS	ITEM	G	F	P	Y	N	ACTIONS TAKEN OR RECOMMENDED
Finish	Dirty or appear discolored						
	Seams/Joints						
	Appearance of paint						
	Loose panels						
	Worn panels						
	Damaged panels						
	Drill or other metal shavings						
	Fasteners						
	Fastener holes						
	Exposed or corroded metal						
	Adhesion						
	Cracks						
	Pinholes						
	Other						
Wall Flashings	Roof to wall flashings						
	Base flashing						
	Counter flashing						
	Other						
General	Contaminants						
	Other						

ROOF	ITEM	G	F	P	Y	N	ACTIONS TAKEN OR RECOMMENDED
Eaves	Roof drains properly						
	Scuppers						
	Gutters						
	Downspouts not damaged						
	Downspouts not blocked or clogged						
	Displaced or loose joints						
	Any ponding						
	Any debris/vegetation growth						
	Fasteners/rivets						
	Corrosion of metal						
	Sealants displaying signs of cracking						
	Elbows/miters are open						
	Loose or displaced closures						
	Other						
CFR, SSII, SS360 or Loc Seam Panel Endlaps	Fasteners						
	Engaged back-up plate						
	Other						
R-Panel Roof Panel Endlaps	Fasteners						
	Other						
Ridge	Any ponding						
	Any debris/vegetation growth						
	Fasteners						
	Loose or displaced closures						
	Damage from foot traffic						
	Other						
High Eave	Fasteners						
	Any ponding						
	Any debris/vegetation growth						
	Loose or displaced closures						
	Other						
Expansion Joints	Flashing joints						
	Fasteners						
	Any ponding						
	Any debris/vegetation growth						
	Other						

ROOF	ITEM	G	F	P	Y	N	ACTIONS TAKEN OR RECOMMENDED
Step-down or Parapet Conditions	Flashing joints						
	Fasteners						
	Any ponding						
	Any debris/vegetation growth						
	Displaced or loose joints						
	Sealants displaying signs of cracking						
	Loose or displaced closures						
	Other						
General	Seams/Joints						
	Loose panels						
	Worn panels						
	Damaged panels						
	Fasteners and washers						
	Fastener holes						
	Contaminants						
	Any active roof leaks apparent						
	Adhesion						
	Exposed or corroded metal						
	Dirty or appear discolored						
	Appearance of paint						
	Drill or other metal shavings						
	Cracks						
	Pinholes						
	Missing or displaced metal						
	Damage from expansion/contraction						
	Other						
Roof Curbs and Hatches	Any debris/vegetation growth						
	Fasteners						
	Any ponding						
	Condensation lines						
	Loose or displaced closures						
	Sealants displaying signs of cracking						
	Other						

ROOF	ITEM	G	F	P	Y	N	ACTIONS TAKEN OR RECOMMENDED
Other Roof Penetrations	Flashed properly						
	Weathertight seal						
	Secured and not prone to movement						
	Deterioration of skylites/panels						
	Sealants displaying signs of cracking						
	Does not impede the flow of water						
	Other						
Flashings	Roof to wall flashings						
	Counter flashing						
	Coping						
	Ridge Caps						
	Hip Caps						

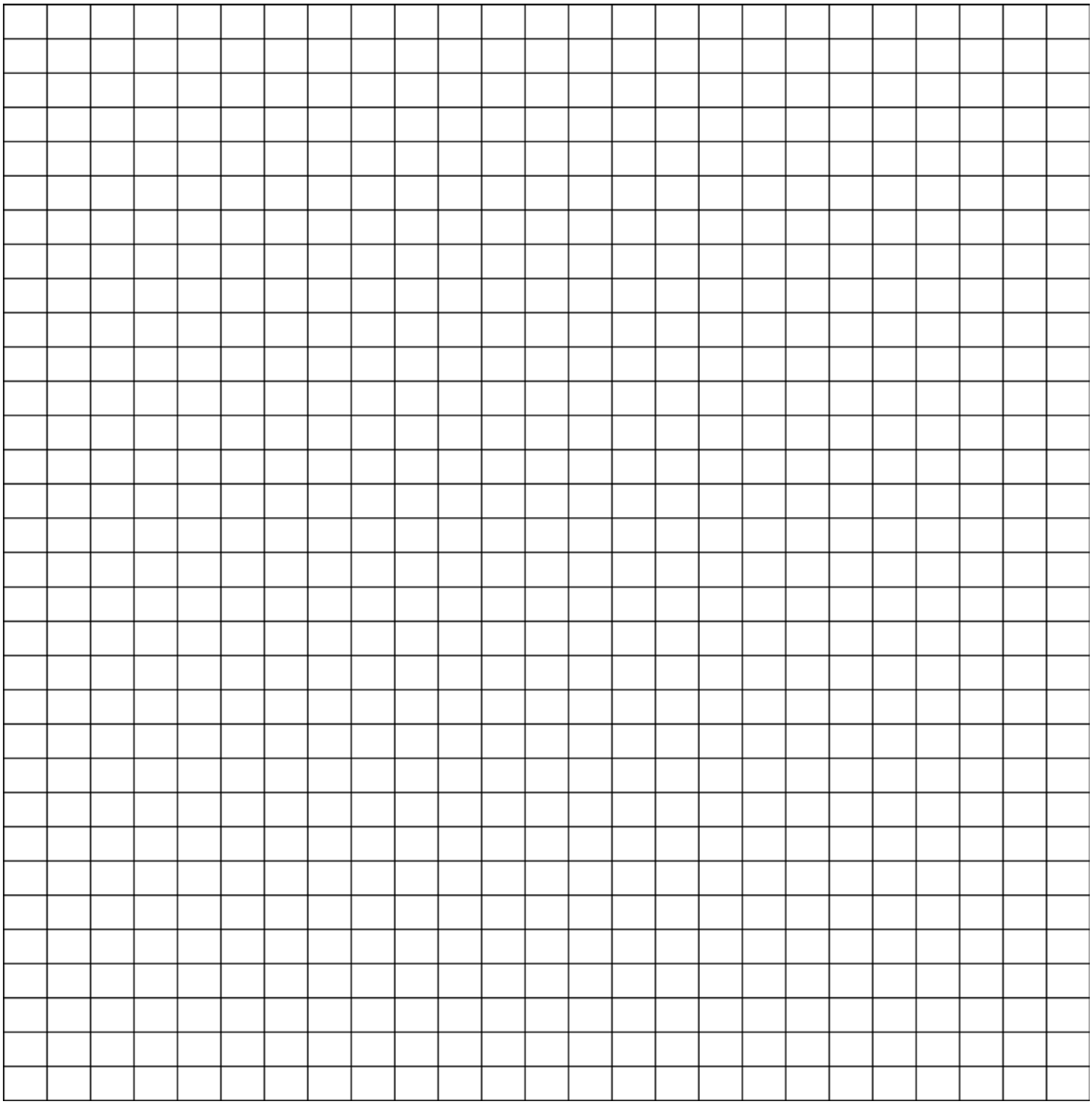
ROOF	ITEM	G	F	P	Y	N	ACTIONS TAKEN OR RECOMMENDED
HVAC/CLIMATE	Consult your supplier						
Snow and ice removal	Drainage						
	Do not pile against building						
	Do not allow salt to remain in contact with building						
Other							

General Remarks:

Do you see any chance for the roof to leak? Note areas of concern and indicated on sketch below.

Additional notes:

Roof Plan Sketch:
Sketch roof plan below and indicate areas requiring corrective measures.



GLOSSARY

Backup plates	On NBG's standing seam roof systems, the plate is seated beneath the lower panel at an endlap.
Bar Joist	A name commonly used for “open web steel joists” used as roof system supports.
Black rust	Also referred to as wet storage staining. A gray or black stain that occurs on Galvalume® material when water is introduced between tightly-stacked sheets. It is a fast developing corrosion that occurs due to the lack of an inhibiting oxide film. (see also White rust)
Builder	A party who, as a routine part of his business, buys metal building systems from a manufacturer for the purpose of resale.
CFR	Concealed fastener roof, A NBG trapezoidal standing seam system.
Chalking	Formation of a fine powder on the surface of a paint film during normal weathering. It normally results in color fading.
Collateral loads	The weight of additional permanent materials other than the building system, such as sprinklers, mechanical and electrical systems, partitions, or ceilings.
Crane	A machine designed to move material by means of a hoist.
Deflection	The displacement of a structural member or system under load.
Dektites	A commonly-used trade name referring to a rubber pipe flashing used at round roof penetrations.
Eave	The point at which a side wall meets a roof plane. See also High Eave.
Endlaps	The lap of two separate roof panels as they provide coverage down the slope of a roof. An endlap occurs when a roof width is greater than the available length of roof panels.
Erector	A party who assembles or erects a metal building system.
Expansion joint	A break or space in construction to allow for thermal expansion and contraction of the materials used in the structures.
Flange bracing	Angles attached at inner flanges of columns or rafters. Used to shorten the design unbraced length of the column or rafter, thereby making the member design more economical.

Framed opening	Framing members and flashing which surround an opening.
Girts	Cold formed secondary horizontal structural used as wall system supports.
Header	The horizontal structural member located at the top of a framed opening.
High eave	On a single slope building, the point at which the high side wall meets a roof plane.
Insulation	Any material used in building construction to reduce heat transfer.
Lean-to	A structure having only one slope and depending upon another structure for partial support.
Loc Seam	Concealed fastener roof, A NBG vertical rib standing seam system.
Longitudinal	The direction parallel to the ridge or sidewall of a building. Commonly, the direction referred to as the building length.
Manufacturer	A party who designs and fabricates a metal building system. The manufacturer converts raw material into finished metal building system components.
Manufacturer's Engineer	An engineer employed by a manufacturer who is in responsible charge of the structural design of a metal building system fabricated by the manufacturer.
Metal building	A complete integrated set of mutually dependent components and system assemblies that form a building including primary and secondary framing, covering and accessories, and are manufactured to permit inspection on site prior to assembly or erection.
Mezzanine	An intermediate level between floor and ceiling occupying a partial area of the floor space.
Part mark	A number given to each separate part of the building for identification. Also called a mark number and part number.
Peak	The uppermost point of a gable.
Ponding	The accumulation of water at low or irregular roof areas; also used to refer to the progressive accumulation of water from roof deflection due to rain loads.
Purlin	Cold formed secondary structural used as roof system supports.
Rafter	The main beam supporting the roof system.

Ridge	The highest line of a gabled roof; on a gabled roof system, the ridge is where the uppermost roof slopes converge.
SSII	Concealed fastener roof, A NBG trapezoidal standing seam system.
SS360	Concealed fastener roof, A NBG trapezoidal standing seam system.
Standing seam	A roof system designed to be fastened to roof structural members through the use of clips rather than by through-fastening. Standing seam roof systems allow for thermal expansion and contraction and reduce the number of panel penetrations on roof systems.
Transverse	The direction parallel to the endwall of a building. Commonly, the direction referred to as the building width.
White Rust	Normally zinc oxide or aluminum oxide formed as the result of Galvalume® weathering; it is this property of Galvalume® which helps to protect the steel substrate beneath.
Wind bracing	Bracing members in the roof and sidewall planes, normally cables or rods, which provide structural stability to the building system in resisting endwall wind loading. Also commonly referred to as X bracing.

Disclaimer

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