**Appendix E1**

**General Assembly Manufacturing Requirements**

**55.01 Side Closures**

**Appendix E1 for eSOR**

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Systems Manufacturing Requirements

Some manufacturing requirements are specific to the Vehicle program and supersede the BOP requirements.

This document is sub-system based and as such, manufacturing requirements will not necessarily apply to all single component(s), it is up to the supplier to determine component specific impact relative to each manufacturing requirement. Questions should be directed to the Manufacturing Engineer. Any deviations to the following manufacturing requirements shall be forwarded to the manufacturing engineer for evaluation.

**GA551SC-483**: There shall not be GA applied lubrication (grease or other substance) to any component in the door hardware system. Latches, strikers, hinges, roller guides, drive units, release handles, etc.

**Body Weather-strips**

**GA551SC-1**: Where a crimp tool is required to meet insertion/extraction force targets, the weather-strip carrier and crimp tool shall be compatible (i.e., designed as a system).

**GA551SC-2**: The weather-strip shall be designed to remain in place on body flange prior to any subsequent crimping operations.

**GA551SC-3**: The specified nominal length and tolerance of weather-strip shall ensure no trimming in the assembly plant.

**GA551SC-4**: The weather-strip shall use part numbers to identify Parts. One-part number for LH/RH for (B and R) flange mounted weather-strips.

**GA551SC-5**: The weather-strip should use dots for installation aid.

**GA551SC-6**: The paint dot is always required to be on the inboard carrier leg, so it is visible to operator when seal is on rack (see Fig 2.1). If there is inadequate space to place a dot (due to large trim lip), the dot should be place on the inboard gripper lip (see Fig 2.2).

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**GA551SC-7**: Bodyside and rear closure weather-strips with trim lip design shall include an integral pull cord.

**GA551SC-8**: For bodyside and rear closure weather-strips with trim lip design, the integral pull cord shall have a starter lead for processing.

**GA551SC-9**: Weather-strip trim lips shall not require hand tools for the lacing operation.

**GA551SC-10**: Lacing of the weather-strip trim lip shall not require cutting/breaking of the pull cord.

**GA551SC-11**: For side door and, slide door openings, the weather-strip initial start location shall be identified on the weather-strip carrier in the upper B-pillar corners.

**GA551SC-12**: For rear closures, the weather-strip initial start location shall be identified on the weather-strip carrier in the upper middle of the carrier between the two hinges.

**GA551SC-13**: Excluding rear closures and mid-gate weather-strips , mastic, hot melt or other adhesives shall not be used in the weather-strip carrier.

**GA551SC-14**: Open loop weather-strip shall not require GA processing to mechanically join ends, i.e., install separate parts such as end plugs, metal clips, adhesive to join ends.

**GA551SC-15**: Weather-strip shall not require the use of heat lamps on the main line.

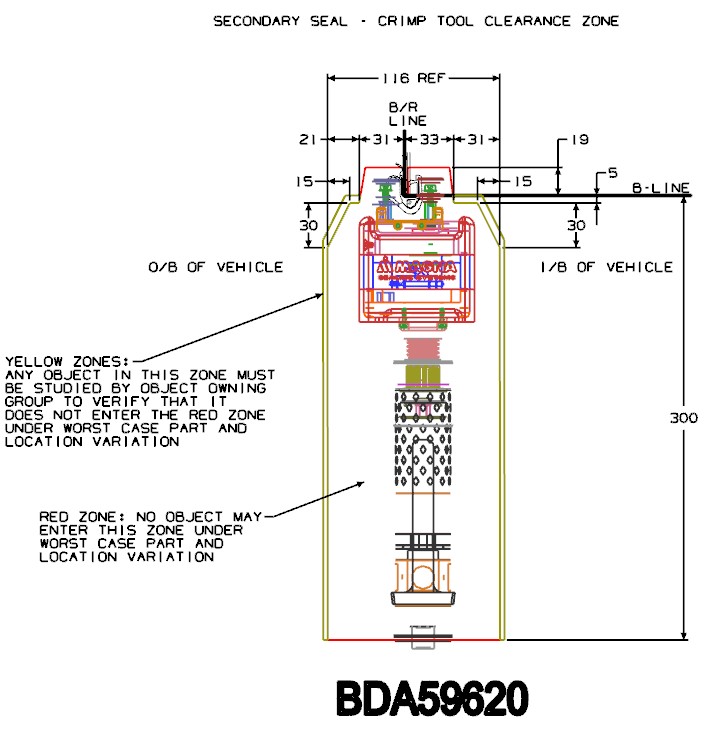
**GA551SC-16**: Off line repair weather-strips shall be shipped to the plants pre-crimped (service parts).

**GA551SC-17**: Vehicle Body Designs and Weatherstrip Designs for all Crimp on Flange Seals shall provide clearances for the Global COF Tools (MAGNA). See TCAE File numbers below for math data. (Figure 2.3 in-line COF tools shown, Others are similar. Figure 2.5, Figure 2.6, Figure 2.7 Shows design clearances.)

Product Best Practice number = WSTRGEN - 10 <http://e2ks.gm.com:80/e2ks/jsp/ViewKpac.jsp?group_id=WSTRGEN&kpac_id=10&module_id=KPAC>

TCAE file numbers for the Global COF Tools (MAGNA).  
1. BDA59620 - COF Tool Primary (in line) - MAA38622-SB  
2. BDA59709 - COF Tool Decklid (right angle) - MAA38623-SB  
3. BDH10933- CT-V3-DB Shell - Battery COF tool - MAA41494S  
4. AME85400 - CT-V2 Pull On Flange Tool (right angle) - MAA41495S  
5. BDK44509 - CT-V3D-D90 Shell Clearance Zone

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**Door Sub Line - Film Appliques**

**GA551SC-18**: Film appliqués shall be released with wet out capabilities that prevent air bubbles forming during the installation process.

**GA551SC-219**: Film appliqués (blackout tape) shall have a locating feature that aligns with a Door-In-White locating fixture, for consistent and repeatable installation.

Note: the locating fixture is to be provided to each assembly plant by the part supplier.

**Door mounted Upper Reveal Molding (Bright Molding)**

**GA551SC-19**: Door mounted upper reveal molding shall attach with a snap in design.

**GA551SC-20**: No adhesive tape shall be used as the primary method to attach upper reveal molding to Door-In-White. Exception made for applied header Door-In-White construction where taped upper reveal molding is allowed.

**GA551SC-21**: On Frame Under Glass Door construction, there shall be a visual alignment feature or net locator on the Glass Run Channel to indicate the initial start location at upper B-Pillar corner for the door mounted upper reveal molding.

**Glass Run Channel**

**GA551SC-22**: Glass run channel shall not require the use of heat or lubricant for installation. Where an anti-friction agent is required to install glass run channel, it shall be a dry lubricant POA as received from the supplier.

**GA551SC-23**: For Frame Under Glass door construction, glass run channel shall have a locating feature to align part for/aft to the Door-In-White and a locating feature for appliqué up/down alignment to the glass run channel.

**GA551SC-24**: For Frame Under Glass door construction, glass run channel design shall allow for the following installation sequence:

1) Glass run channel header installation to Door-In-White prior to appliqué installation.

2) Glass run channel B-pillar leg to be installed after appliqué installation.

**GA551SC-25**: For Inlay door construction front door, a four-way locator shall be provided on the glass run channel to Door-In-White.

**GA551SC-26**: Door inner panel run channel division post attachment holes shall be slotted up/down.

**Non DIW Integrated below belt run channels**

**GA551SC-27**: Non DIW integrated below belt run channels shall attach with a maximum of 2 threaded fasteners.

**GA551SC-28**: Attachment brackets and seals shall be POA to the non-DIW integrated below belt run channel.

**GA551SC-29**: Non-DIW integrated below belt run channels shall have a designed in feature that retains the part to the door inner panel prior to fastener secure. (3rd hand feature)

**GA551SC-30**: Non-DIW integrated below belt run channel design shall allow for part installation prior to glass load.

**Window Regulator**

**GA551SC-31**: Window regulator design shall include POA clamps with a single POA threaded fastener securing each clamp or POA snap fit retainers for glass secure.

**GA551SC-32**: Window regulator shall be received by the assembly plant with the glass retainer features at a height ready to accommodate glass load and to allow 75 mm of door glass exposed above belt line opening.

**GA551SC-33**: Window regulator glass retainer shall not require lubrication in the assembly plant.

**GA551SC-34**: If isolation/anti rattle features are required, they shall be POA from supplier.

**GA551SC-35**: Power window regulators shall attach to the door inner panel with a maximum of five (5) bolts or studs for the front door and four (4) bolts or studs for the rear door.

**GA551SC-36**: Manual window regulators shall attach to the door inner panel with a maximum of seven (7) bolts for the front door and six (6) bolts for the rear door.

**GA551SC-37**: Studs shall be used to attach regulator guide channels to the door inner panel. The upper attachments shall be net holes and the lower attachments shall have one net fore/aft slot per channel. Secondary lower attachments and the motor attachment shall be oversized holes. The attachment at the Motor / Crank plate can be a bolt or a stud. A bolt is prefered to enable the load of the regulator assembly into the door.

**GA551SC-39**: Rivets shall not be used to attach the window regulator to the door inner panel.

**GA551SC-40**: Rivets shall not be used to attach interfacing components to the window regulator (e.g., window glass).

**GA551SC-41**: Window regulator design shall allow for part installation prior to door glass load, per BOP build sequence.

**GA551SC-481**: Side door window module fasteners are to be POA module.

**GA551SC-482**: All window module fasteners require a quarter turn style locking fastener that has a matching alignment mark either molded into the module structure or embossed feature on the Door-in-White to visually indicate when the fastener has been fully rotated to the secured position.

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| Quarter turn fasteners with markings to show final position. |

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| **GA551SC-481**: Side door window module fasteners are to be POA module.    **GA551SC-482**: All window module fasteners require a quarter turn style locking fastener that has a matching alignment mark either molded into the module structure or embossed feature on the Door-in-White to visually indicate when the fastener has been fully rotated to the secured position.     |  | | --- | |  | | Quarter turn fasteners with markings to show final position. |  |  | | --- | |  | | Quarter turn fasteners with markings to show final position. | |

**Primary Door Glass**

**GA551SC-42**: Primary door glass shall be delivered to the assembly plant in the car position (i.e., not flat/horizontal).

**GA551SC-43**: Primary door glass shall load with the operator standing on the inboard side of the door.

**GA551SC-44**: The primary door glass shall be secured to the regulator clamps with the regulator in the full up position, access holes / slots must be provided in the door inner panel for enabling operator vision and access to secure clamp bolts. Note: This MR does not apply to door glass / regulator systems with POA snap fit retainers for glass secure. These specific access holes in the door inner are not required for snap fit.

**GA551SC-45**: Primary door glass shall not require tools for loading (e.g., suction cups).

**GA551SC-46**: Primary door glass design shall allow for part load after window regulator has been installed and secured, per BOP sequence.

**Water Deflector**

**GA551SC-47**: Water deflector design for any specific vehicle program shall be common regardless of option content (e.g., manual/power windows).

**GA551SC-48**: Water deflector design shall provide two (2) positive (go/no go) alignment features at the top corners with matching features in DIW.

**GA551SC-49**: Adhesive used to attach the water deflector to door inner panel shall be POA from the supplier.

**GA551SC-50**: Non-rigid Family 2 water deflectors shall be transparent or translucent construction, to ensure operator can visually verify wet-out of the adhesive.

**GA551SC-51**: For water deflectors that incorporate acoustic designs, the adhesive path shall be indicated on the water deflector so that the operator will know where to wet out the adhesive. Example of an indicator may be a worm line, painted line, raised or depressed surface.

**GA551SC-52**: Non-rigid Water deflector shall attach to a minimum 18 mm flat surface on the inner door panel, all in the same plane. Rigid Water deflector shall attach to a minimum of 12 mm flat surface on the inner door panel, all in the same plane.

**GA551SC-53**: Water deflector shall not require removal and discard of separators or backing paper in assembly plants. Note: This excludes the last water deflector in a package.

Note: Exceptions are made for Low cost Polypropylene and Light weight Foam deflectors.

**GA551SC-54**: Water deflectors shall have markings on the part to identify Model, Left, Right, Front or Rear.

**GA551SC-55**: Water deflector design shall allow for part installation prior to door speaker install, per BOP build sequence.

**Door Garnish Moldings**

**GA551SC-56**: All components/subassemblies within the Side Closures Window Garnish Moldings shall net locate without requiring any fixture setting.

**GA551SC-57**: Side Closures Window Garnish Moldings will not require additional in-plant assembly, rework, or finesse operations before or after installation to the Door-In-White.

**GA551SC-58**: Side Closures Window Garnish Moldings shall install without the use of heat lamps, lubricants, or tools to aid installation, for example, assist arms, mallets, hammers, door pad pushers, etc. will not be allowed.

**GA551SC-59**: Side Closures Window Garnish Moldings shall not require rework for specific options in the assembly plant.

**GA551SC-60**: The Moldings shall install to the door in the sequence outlined in the Door Line Assembly Sequence (GADOORS-13), after door inner belt weather strip and before door primary seal. See link to download door build process file in GADOORS-13.

**Door Opening Module**

**GA551SC-62**: There shall be a 6 mm clearance between the door power opening/closing modules and the surrounding components during loading (impact beam, door outer and inner panel, grommets and harness, window regulator).

**GA551SC-68**: For power opening door option, the link arm protruding outside of the door shall allow to be secured on the hinge pillar bracket after Doors on. To accomplish that, the link arm protruding shall be able to move outboard and inboard prior to the attachment and have a retaining feature (threaded or ball stud, for example).

**Body Mounted OSRVM**

**GA551SC-63**: If a Body mounted OSRVM is released, it shall meet at least one of the following requirements:

1 - Be foldable to allow door loading;

2 - Provide 25mm clearance to the door on the loading angle according to GADOORS-3;

**GA551SC-111**: The mirror attachment strategy shall be to drive the fasteners from the inside of the door (not from the outside) and shall allow for installation using a pistol grip power tool.

**Check Link interface to Body**

**GA551SC-70**: A hinge system in compliance with GM Closures Council hinge and hang selection tree shall be used. All side closure hinge to door attachments shall be secured with a common bolt (same part number and torque for all applications) Refer to Application Specific Fastener page for hinge to door in the GM Global Fastener Catalog for part number and torque specification. (Refer to Figure 2.0, Common Door Hinge).

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**GA551SC-73**: The hinged side closure system design shall provide a minimum of 5mm of clearance between the power tool and its protective cover (1.5 mm thick) to the surrounding components in the hinge area when removing &amp; reinstalling door bolts. The primary door seal (B&R flange mounted seal) with its carrier will be exempt from this requirement. Minor contact between the crows-foot and the seal is permissible including flattening the bulb as long as it doesn’t damage the seal. This requirement applies for the entire path of installing and removing the attachment bolts. When performing the simulation for determining this clearance, make sure to use the full range of the nut plates tolerance and the doors minimum opening angle so it reflects the doors worst position which has the biggest impact on tools accessibility.

Note: Refer to Figures 1.3 and 1.4

Note: The gun is to be positioned horizontally while checking driver clearance requirements for each bolt. See Figure 1.4. Note: An exception of the 5mm clearance zone to the BOP crowfoot head will be made for rear door upper hinges part numbers 13501713 &amp; 13501714. This close condition exists on many vehicles in current production without an issue.

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**GA551SC-77**: The door to body interface shall be designed to provide access for installing the non-net hinge bolts after the check link has been secured to the bodyside.

Note: See Figure 1.4 Step 3

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**GA551SC-85**: Installation of the check link to body shall not require a fixture (e.g., anti-rotation).

**Door to Body Electrical Interface**

**GA551SC-82**: The interface between the door and body electrical harness shall allow for a fully trimmed door to be installed to a fully trimmed vehicle.

Note: For proper electrical interface and connector design between the door and the body refer to the Electrical BOP for requirements.

**GA551SC-88**: The door electrical connection to Body shall meet all GM ergonomic requirements for hand clearance, reach and effort.

Note: Refer to: Best Practice # MFGERGO-18 Manufacturing Ergonomics Criteria for Power and Signal Distribution Systems - Globally Approved. Follow link found in "Support Documents" section of this KPAC

**Striker and anchor plate**

**GA551SC-90**: The anchor plate design shall allow for net installation of the striker to the door ring (Refer to Figure 2.2, Door Striker).

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**GA551SC-93**: Latch Striker plate covers shall be symmetrical so that one part number can be used for all doors in a vehicle (Coupe or Sedan style vehicle).

**GA551SC-96**: Secure all door strikers with a common bolt and to a common torque. Refer to Application Specific Fastener page for door strikers in the GM Global Fastener Catalog for part number and torque specification.

Note: This is true for Gen 1 and Gen 2 CCC Global latch Strikers.

**GA551SC-98**: Same door striker shall be used for all applications. If different door strikers are necessary, striker shall be error proofed by design, e.g. different distance between attachment holes.

Note: The Gen 1 and Gen 2 strikers have different bolt spacing (40 mm and 36 mm respectively). The global striker is 40 mm but there is also an offset pattern.

**GA551SC-101**: Latch Striker plate covers shall have a feature to self-retain and provide feedback to the operator once is secured.

**Check Link**

**GA551SC-103**: The check link design shall be a common part for left and right hand side. Front doors, rear doors shall be unique but common to each other.

**GA551SC-105**: To differentiate between different models in the same assembly plant, the last four digits of the part number and “FRT or RR” (front or rear) shall be clearly printed on the check link base. An L or R (left or Right) shall be molded into the upward facing side of the check link arm. See example on figure 2.4.

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**GA551SC-107**: The check link shall be received by the plant in the fully extended detent position.

**GA551SC-485**: Check links requiring seals are to be POA check link

**Outside Handle**

**GA551SC-113**: The outside handle bracket design shall incorporate error proofing features for installation of the handle rods and lock rods (or cables).

**GA551SC-115**: The product design shall allow lock cylinder to outside handle bracket installation without the use of tools, except where a threaded fastener is required by regional regulations.

**GA551SC-117**: The lock cylinder shall not require a key to complete the outside handle assembly process.

**GA551SC-119**: The lock cylinder shall have an alignment feature for positioning into the outside handle bracket.

**GA551SC-121**: The outside handle bracket shall have an integral retainer for the lock cylinder.

**GA551SC-123**: The outside handle design shall be self-retaining during installation

**GA551SC-125**: The outside handle shall secure to the door with a maximum of (2) two POA threaded fasteners.

**GA551SC-127**: The outside handle bracket shall provide features to route and attach outside handle cable.

**GA551SC-129**: The outside handle cable shall be common right side to left side (non-handed)

**GA551SC-131**: Where push-in fasteners are required to attach outside handle cable to outside handle bracket, these push-in fasteners shall be POA to the outside handle bracket.

**Door Latch**

**GA551SC-135**: Door latch fasteners shall be anti-cross-threading (e.g., MAT thread).

**GA551SC-137**: The Side Closure Latch Part Identification method shall be a Broadcast Code label with bar code affixed to the housing of the latch. (see Figure 2.1)

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**GA551SC-139**: The Door Latch shall be net located and attach to the door shut face with a maximum of 3 bolts..

Note: The Global CCC Gen 2 Latch also has a fourth bolt that is used as a third hand feature to position the latch. This bolt must be driven last.

**GA551SC-142**: The Door Latch Inside and Outside Handle Cable part identification strategy is:

1. To differentiate front door cable from rear door cable use white color for Front door and black color for Rear door on handle side Abutment (Both I/S and O/S handle cables).

2. To differentiate vehicle programs a different color for each will be used on the Latch side Abutment (Same color for all I/S and O/S handle cables for a specific program).

Note: The BFO has a matrix of which colors are used and will assist on choosing a color for a program.

**Cinching Module**

**GA551SC-143**: When a cinching module is required due to power door feature, a minimum clearance of 6 mm to all surrounding components is required (bumper beam, door harness, window regulator). 3rd hand feature and locating features are also required.

**Lock Rods**

**GA551SC-144**: Lock Rod Part Identification - Left Hand Knob / Rod assembly will have a red paint stripe at the latch end. Right Hand Knob / Rod assembly will have a green stripe at the latch end. Left Hand Key cylinder rod will have a red stripe at the latch end.

**GA551SC-146**: Outside Handle Lock Rod attachment clips shall be POA to the Latch as delivered to the plant.

**Theft Deterrent Plates**

**GA551SC-148**: No subassembly shall be required to the Theft Safety plate in the vehicle assembly plant

**GA551SC-151**: The Theft Safety plate shall be self-locating and not require fixtures for installation.

**Outer Belt Molding**

**GA551SC-159**: Where a fastener is used to secure outer belt molding to door interface, it shall not exceed quantity of two (2), it shall be a common threaded fastener across all GM vehicles and require common torque.

Note: Refer to: Best Practice # WSTRGLS -1 by using the Hyperlink in "Support Documents" section of this KPAC.

**GA551SC-162**: Location of the outer belt molding to the door shall be achieved as follows: Locate front door molding at rear of front door.

Locate rear door molding at front of rear door.

**GA551SC-164**: The outer belt moldings shall not require use of heat lamps, lubricants, or mallets to aid installation.

**Inner Belt Seal**

**GA551SC-167**: The inner belt seal shall not attach with mechanical fasteners (e.g., screws, rivets, etc.)

Note: Refer to: Best Practice # WSTRGLS -11 by using the Hyperlink in "Support documents section of this KPAC.

**GA551SC-170**: The inner belt seal shall not require use of heat lamps, lubricants, or mallets to aid installation.

**GA551SC-172**: The inner belt seal part identification will be paint dots for LH/RH and Front / Rear as Follows:

Front Door Right Hand Side = one Green dot.

Front Door Left Hand Side = one Red dot.

Rear Door Right Hand Side = two Green dots.

Rear Door Left Hand Side = two Red dots.

**Door Mounted Primary Seal**

**GA551SC-175**: Push-in fasteners shall be used to attach the door mounted primary weather strip to Door-In-White. Push - in fasteners shall be POA the weather strip assembly.

Note: This MR applies to Frame Under Glass, Inlay Doors &amp; Applied Header door construction.

Note: An exception will be made for door header construction styles that require a C channel along the door header for packaging purposes, push pins are to be used outside of the C channel.

**GA551SC-178**: No adhesive shall be used to attach door mounted weather strip to Door-In-White.

**GA551SC-180**: Door mounted primary weather strip part identification strategy is as follows: A white dot shall identify the operator start location at the upper B pillar. Different color pins are to be used to differentiate Left / Right &amp; Front / Rear and also to differentiate one specific vehicle model from another. Refer to Best Practice # WSTPRIM 10 for details.

Note: This MR applies to Frame Under Glass, Inlay Doors &amp; Applied Header door construction.

Note: The BFO has a matrix that is shown in the Best Practice that tracks the colors being used to differentiate one model from another in a specific assembly plant.

**GA551SC-182**: Door mounted primary weather strip shall not require fixtures for positioning or installation.

**GA551SC-184**: Door mounted primary weather strip shall not require heat or use of lubricant for installation.

Note: The C channel portion of an Inlay style door primary door weather strip will be lubricated and slid into the channel from one end to the other.

**GA551SC-186**: Door mounted primary weather strip design shall allow for part installation after Glass Run Channel and Garnish Molding parts have been installed, per door line build sequence.

Note: This MR applies to Frame Under Glass, Inlay Doors &amp; Applied Header door construction.

**Below Belt Cutline Seals**

**GA551SC-188**: Push-in fasteners shall be used to attach below belt cutline seal. Push in fasteners shall be POA the weather strip assembly.

**GA551SC-190**: Below belt cutline seal shall not have push-in fastener in the area of the door carrier front detail. (Refer to Figure 2.3 Below Belt Cutline Seal). The clearance zone shall be 75mm above and 75mm below the upper hinge lower bolt hole.

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**GA551SC-192**: No adhesive shall be used to attach below belt cutline seal

**GA551SC-194**: Below belt cutline seal shall not require fixtures for positioning or installation.

**Door Mounted Rocker and Wheelhouse Seals**

**GA551SC-196**: Push-in fasteners shall be used to attach door mounted rocker seal and wheelhouse seals. Push in Fasteners shall be POA the seal assembly.

**GA551SC-199**: No adhesive shall be used to attach door mounted rocker seal or Wheelhouse seals.

**GA551SC-201**: Front end of door (Front and Rear doors) shall be the starting point for door mounted rocker seal installation.

**GA551SC-204**: Door mounted rocker seal shall not require fixtures for positioning or installation.

**Rigid Appliques**

**GA551SC-206**: The appliqué design shall provide an integral feature for temporary hands-free attachment.

**GA551SC-208**: The appliqué design shall provide a feature for net locating up/down and fore/aft.

**GA551SC-211**: The appliqué shall secure to the door with a maximum of three fasteners and secure to common torque.

**GA551SC-213**: No adhesive tape shall be used to attach rigid appliqué to Door-In-White. Exception made for applied header Door-In-White construction where taped appliqués are allowed.

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**GA551SC-215**: For Frame Under Glass door construction, appliqué design shall allow for part installation after Glass Run Channel header portion has been completely installed.

**GA551SC-217**: For Inlay and Applied Header door construction, appliqué design shall allow for part installation before Glass Run Channel is installed.

**Rear Door Glass Run Channel**

**GA551SC-221**: Rear door glass run channel with stationary glass shall include the stationary glass as POA from supplier.

**GA551SC-223**: Rear door glass run channel division post shall attach to door inner panel with a maximum of two threaded fasteners.

**Swing Out Glass, Latches and Hinges**

**GA551SC-469**: Swing out glass shall consist of the following (See Figure 2.18):

1) Glass

2) Latches/Actuator

3) Hinges

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**GA551SC-470**: Each window side swing out glass latch shall require no more than one fastener.

**GA551SC-471**: Swing out glass latches shall use one M point fastener part number.

**GA551SC-472**: Swing out glass latches shall not require additional sealer to be dispensed at the assembly plant.

**Interior Door Trim \_ Arm Rest Bracket**

**GA551SC-473**: If required, arm rest hanger bracket design shall include a maximum of two threaded fasteners to attach to the Door-In-White inner panel.

**GA551SC-474**: Rivets shall not be used to attach the arm rest hanger bracket.

**Requirement**

**GA551SC-483**: There shall not be GA applied lubrication (grease or other substance) to any component in the door hardware system. Latches, strikers, hinges, roller guides, drive units, release handles, etc.