



Appendix F

Engineering Design Requirements



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1.0 Scope

- 1.1 This Global Statement of Requirements (SOR) Appendix F document shall not be modified.
- 1.2 All GM Audiences is defined as GM PDT, Purchasing, Manufacturing, GM Design and GM CAE
- 1.3 Any component, system, program, commodity, or site-specific deviations required of Appendix F shall be made in Appendix F2.
- 1.4 Appendix F outlines Supplier's responsibilities for providing a complete and valid part in math.
- 1.5 Appendix F covers the GM Vehicle Program from Contract Award (CA) through Gate N. Gate N is defined as 90 days after Start of Production (SOP).
- 1.6 Continuous improvement and design services are included in the contract and run from CA through Gate N or until all launch issues are closed, whichever is later.
- 1.7 GM retains all rights, title, and interests to all math data, including part masters, developed data, as well as any GM proprietary productivity tools.

2.0 General Requirements

- 2.1 Supplier is responsible for keeping up to date with GM's Global Design infoBOOK documentation changes. The Global Design infoBOOK application can be accessed through GM SupplyPower.
- 2.2 If there is a discrepancy between Appendix F and the Global Design infoBOOK, always defer to the Global Design infoBOOK.
- 2.3 Supplier shall communicate the impacts of any cost, timing, manufacturability, or other issues with the design surface, point solutions, architecture sets, studies, packaging, and/or typical sections provided, to the GM Program Team prior to award of business.
- 2.4 Global Vehicle Development Process (GVDP)
 - 2.4.1 Supplier is responsible for the on-time delivery of all design work from any of Supplier's resources for the life of this SOR.
 - 2.4.2 The GVDP identifies four specific releases: Concept, Architectural Mule, Structure, and Integration that Supplier math shall support. Additional math deliveries may be required to support Virtual Assessment sync points or otherwise directed by the product development team (PDT).
 - 2.4.3 The requirements for acceptance, agreement, and completeness of criteria and other design work are defined as, but are not limited to, the items in this section.
 - 2.4.3.1 The GVDP Release Progression identifies requirements of the math data for various commodities at each stage of the program. Supplier shall submit criteria to assist in the GVDP deliverables.



- 2.4.3.2 Criteria shall be created according to the Decision Fixed Point (DFP) and delivered according to the Decision Progression Table (DPT) established for the vehicle program. The DFP process integrates the GM Design Studio, Portfolio, and Vehicle Architecture (VA) teams to develop vehicles that meet imperatives established by GM.
- 2.4.3.3 DFP math data deliverables include, but are not limited to, Point Solutions, Architecture Sets, Studies, Design Execution Sections, and Typical Sections starting at Pre-VPI (Vehicle Program Initiation) through IVBR. Zones and Limits (Z/L) are the boundary conditions that operate within the styled surfaces resulting in point solutions.
- 2.4.3.4 Supplier shall create and maintain the criteria and related design work without additional cost to GM until it is accepted and agreed to by GM Design Center and all other GM Audiences. Several iterations of the development of criteria will occur until the surfaces created by the GM program team are in agreement with the criteria developed by Supplier. To ensure the program meets scheduled releases, design work shall commence with criteria at least 2 months prior to the DFP date. Should the Supplier and GM Design Center and other audiences fail to reach agreement for the acceptance of the criteria or other design work, Supplier shall inform GM in writing at least 2 weeks prior to the established DFP Decision Progression Table. The GM Vehicle Architecture (VA) group is the exclusive channel to be used by Supplier for submitting any design work to the GM Design Center.
- 2.4.3.5 The GM program will be under development from CA until all components covered in the SOR have been successfully released for Verified Data Release (VDR), at which time surfaces shall be frozen with complete and validated surfaces, and successfully released for P2 production release date, at which time the design shall be frozen with complete detail.
- 2.4.3.6 Supplier may be required to provide math data at component or assembly Production Part Approval Process (PPAP). More information on the PPAP process may be found on GM SupplyPower.

2.5 Design Schedules

- 2.5.1 Design required completion dates are managed by the PDT and issued by the timing and metric analyst (TMA). Design progress shall be reported to the TMA at the time of release. Supplier shall use and maintain the most current form of the GM design tracking tool available at the time of sourcing and shall participate in weekly report-outs. Various forms of scheduling tools may be used including PDT plans based on component-level tracking for initial release. Contact the commodity-specific PDT for the appropriate design schedule process.
- 2.5.2 On-time math and drawing releases to the published required completion date (RCD) is a requirement of this contract. Any preceding and required processes (checking, math data transfer, etc.) shall be factored into the delivery time to meet



the on-time delivery requirement. Math shall not be deemed complete until it has been delivered to GM according to the requirements in this document.

- 2.5.3 During work in progress (WIP), release stages of the program, and intervals required by the PDT, math data submitted to GM shall be consistent with GM1825 – Supplier Technology Information, which can be found on GM SupplyPower. The system management team (SMT) or Supplier, depending upon the level of supplier integration, shall evaluate the data and then submit the data to the VA group under the guidelines of this document. These files are used to populate the vehicle assembly structure (VAS) and have unique naming conventions that shall be followed when the data is submitted.
- 2.5.4 Design approval is required at Integration Vehicle Engineering Release (IVER) by the PDT.
- 2.5.5 Supplier shall deliver math at the intervals required by the PDT and program timing in addition to the 2-week minimum baseline update/data refresh requirement.
- 2.5.6 Supplier shall deliver math within one week for part number changes where the math has not changed.

3.0 Math Data

- 3.1 All math data shall be submitted in the NX data format using the latest GM-approved version. Note: The NX version in use at GM may not necessarily be the latest available on the market.
 - 3.1.1 Supplier shall provide NX part files which are GQS compliant and meet the DCS current Global Quality Sea/Check-Mate.
 - 3.1.2 All math shall be provided as a solid(s). Refer to GMW 16530 for requirements. Any exceptions to this requirements shall be agreed upon by the GM Audiences.
- 3.2 All drawings and/or math data shall indicate branding and part identification requirements. Refer to GMW 16331.
- 3.3 All parameters of an NX model shall be retained per GMW 16530, section 4.4.1.1.
- 3.4 For undefined features, the math model takes precedence. For dimensions and defined features, the drawing takes precedent.
- 3.5 For 100% carry-over (C/O) parts, the drawings are not changed. If a part is modified, new part numbers have to be assigned for C/O parts and new drawings shall be created according to the Drawing De-Content Process located in Global Design infoBOOK.
- 3.6 Supplier is responsible for producing and associating the alphanumeric installed and/or dynamic file(s) with the part as-manufactured file(s) where applicable. Refer to Alphanumeric Applications in Global Design infoBOOK for additional details.
 - 3.6.1 If the part as-manufactured shape is deformed by installation into the vehicle or by dynamic conditions, Supplier is responsible for producing the deformed part shape by use of appropriate finite element (FE) modeling (e.g., non-linear FE modeling for



plastic or rubber parts). This also applies to component models of saleable assemblies (e.g., rack and pinion steering gear's convoluted inner tie rod boots).

- 3.6.2 For more details regarding specific requirements for coil springs including envelopes and centerlines, refer to Global Design infoBOOK.
- 3.7 Design must conform to the interface control documents (ICDs) for all interfacing parts.
- 3.8 Math data shall encompass and be compliant to GM's best practices including, but not limited to the following: human factors, ergonomics, Federal Motor Vehicle Safety Standards (FMVSS), export, manufacturing, and squeak and rattle. Refer to Global Design infoBOOK for specifics.
- 3.8.1 During design development, deviations and alternatives to the best practices and lessons learned shall be reviewed and agreed upon using the peer review process.
- 3.8.2 Supplier's design alternatives shall meet or exceed the program imperatives and be agreed to by the GM Audiences, and be captured for closed-loop learnings by GM DRE.
- 3.9 Once an engineering work order (EWO) is approved to start, the supplier has 10 days to release their math data in Teamcenter for launch- and safety-related EWOs and 42 days for all other EWOs, unless directed differently by the DRE or Program Team. If these dates are not met, the supplier may receive a Supplier Practical Problem Solving (SPPS).
- 3.9.1 If the Supplier is Level 2-4 Integration responsible (Engineering Design and Development), then the Supplier is responsible to develop and release the production GD&T on time and with quality or they will be subject to an escalation process that could result in the issuance of a SPPS, to drive irreversible corrective action.
- 3.10 Supplier shall provide notification via email to GM design release engineer (DRE), Design Leader Technical (DLT), and design group manager (DGM) at each baseline and hard release.
- 3.11 Math File Quality Audits
- 3.11.1 Math file quality audits will occur on all vehicle programs. Several meetings and audits are required throughout the Global Vehicle Development Process (GVDP) program timing cycle to assure requirements are met for various GVDP events. Additional details regarding math planning meetings can be found in Global Design infoBOOK. Information on the sync process and issues management is also located in Global Design infoBOOK.
- 3.11.2 Audit Timing
- Initial meeting occurs at supplier award. This includes a general review of GM standards, audit schedule, and basic expectations.
 - 1st audit: 2 weeks prior to the Virtual Concept Vehicle Assessment (VCVA) Sync Point



- 2nd audit: 2 weeks prior to the Virtual Structure Vehicle Assessment (VSVA) Sync Point
- 3rd audit: 2 weeks prior to Virtual Integration Vehicle Assessment (VIVA) Sync Point
- 4th audit: 4 weeks prior to P2 release
- 5th audit and after: quarterly from P2 through 6 weeks prior to Gate N

3.11.3 Audit Content

3.11.3.1 Audit will check NX math data files released/baselined in GM's Teamcenter database. Files shall be launched in NX to see if they comply with GM standards as defined by Global Design infoBOOK.

3.11.3.2 Audits shall be performed on assembly and component files through the Vehicle Assembly Structure (VAS) using the Product Structure Editor (PSE) to ensure that they are correctly linked to their installation assemblies (IAs) and Vehicle Partitioning and Product Structure (VPPS) Level 2.

3.11.4 Audit Responsibilities

3.11.4.1 GM Design Group Manager (DGM) to request audit.

3.11.4.2 Supplier to schedule and host audit.

3.11.4.3 Suggested attendees:

- 1) GM Design Group Manager (DGM) and knowledgeable Design Leader – Technical (DLT)/ designer, and GM DRE
- 2) Supplier's design manager/supervisor and designer/design leader to present NX files.

3.12 GM may issue a SSPS for not providing quality math.

3.12.1 Supplier is responsible for all consequences, financial and otherwise, related to their failure to properly deliver validated criteria or other design work. Liability for such failure shall include Supplier modifying their components or systems to match the surfaces created by GM Design Center at no additional cost to GM.

3.12.2 Failure to deliver accepted and agreed upon criteria or other math data according to the scheduled program dates shall be considered a failure of Supplier to fulfill the contract.

3.12.3 Improper interpretation of any design procedure will be the responsibility of Supplier and will be considered a failure of Supplier to fulfill the contract.

3.13 Math Data Workflow in Teamcenter.

Refer to GM1825 for up to date Teamcenter Math Data Workflow specifications.

4.0 Vehicle Assembly Structure (VAS)



GLOBAL STATEMENT OF REQUIREMENTS

APPENDIX F

- 4.1 Supplier's suppliers must meet the Supplier Integration (SI) Level 4 responsibilities for IAs related to their up-level assemblies.
- 4.2 For fully-integrated Supplier designers, use Level 4 requirements in the VAS responsibility chart.
- 4.3 Requirements may be unique to support Global Repeatable Digital Validation (GRDV). Consult with GM design prior to sourcing.
- 4.4 The following chart shows the details of the responsibility for IAs and the VAS based on level of supplier integration and supplier collaboration. More information regarding the VAS process can be found in Global Design infoBOOK.

	Create IA	Add IA to VAS	Add Component/Asm IR to IA	Release of IA in Teamcenter
SI Level 1				
All Collaboration Levels	GM Design	VAS Designer	GM Design	GM Design
SI Level 2				
All Collaboration Levels	GM Design	VAS Designer	GM Design	GM Design
SI Level 3				
Non-Collaborative	Not Supported	Not Supported	Not Supported	Not Supported
Semi-Collaborative	GM Design	VAS Designer	GM Design/Supplier	GM Design/Supplier
Fully Collaborative	GM Design	VAS Designer	GM Design/Supplier	GM Design/Supplier
Multi-site	GM Design	VAS Designer	GM Design/Supplier	GM Design/Supplier
SI Level 4				
Non-Collaborative	Not Supported	Not Supported	Not Supported	Not Supported
Semi-Collaborative	Supplier	VAS Designer	Supplier	Supplier
Fully Collaborative	Supplier	VAS Designer	Supplier	Supplier
Multi-site	GM Design (first time only)/ Supplier	VAS Designer	Supplier	Supplier

5.0 Commodity-Specific Requirements

Any Supporting Math Files referenced in this section, including dynamic, alphanumeric, as installed and as manufactured files, must be released in Teamcenter at the sync point along with the corresponding Part Files. All supporting math files must be referenced with the 8 Digit math release.

5.1 Chassis/HVAC

5.1.1 Steering Systems

- 5.1.1.1 Steering column supplier is responsible for producing and associating the following alphanumeric dynamic files with the part as-manufactured file per the following table (example numbers).



ABC12345/001.0001-COLUMN ASM, STEERING
ABC00001/001.0001-DYNAMIC-ABC12345 COLLAPSED
ABC00002/001/0001-DYNAMIC-ABC12345 RAKE NOM TELE IN
ABC00003/001/0001-DYNAMIC-ABC12345 RAKE NOM TELE OUT
ABC00004/001/0001-DYNAMIC-ABC12345 RAKE UP TELE NOM
ABC00005/001/0001-DYNAMIC-ABC12345 RAKE UP TELE IN
ABC00006/001/0001-DYNAMIC-ABC12345 RAKE UP TELE OUT
ABC00007/001/0001-DYNAMIC-ABC12345 RAKE DOWN TELE NOM
ABC00008/001/0001-DYNAMIC-ABC12345 RAKE DOWN TELE IN
ABC00009/001/0001-DYNAMIC-ABC12345 RAKE DOWN TELE OUT
ABC00010/001/0001-DYNAMIC-ABC12345 COLUMN SHIFT LEVER ALL POSITIONS
ABC00011/001/0001-DYNAMIC-ABC12345 ADJUSTMENT LEVER ALL POSITIONS

5.1.1.2 Rack and pinion steering gear supplier is responsible for producing and associating any applicable alphanumeric dynamic files with the part as-manufactured file per the following table. The example files may be supplemented, as required, by GM Engineering.

ABC12345/001.0001-GEAR ASM, STEERING
ABC00001/001.0001-DYNAMIC-ABC12345 JOUNCE ON CENTER
ABC00002/001/0001-DYNAMIC-ABC12345 JOUNCE LEFT TURN
ABC00003/001/0001-DYNAMIC-ABC12345 JOUNCE RIGHT TURN
ABC00004/001/0001-DYNAMIC-ABC12345 REBOUND ON CENTER
ABC00005/001/0001-DYNAMIC-ABC12345 REBOUND LEFT TURN
ABC00006/001/0001-DYNAMIC-ABC12345 REBOUND RIGHT TURN

5.1.1.3 The centerline coordinates of the inner tie rod ball centers and the outer tie rod ball centers shall be provided by GM Engineering for these and any other desired dynamic condition.

5.1.2 **Braking Systems**

5.1.2.1 The brake rotors are released as an assembly in E-Squared (E²) for traceability reasons only. The casting, machined, and coated brake rotors shall be released as stand-alone parts in Teamcenter. Refer to Global Design infoBOOK for additional details.

5.1.3 **HVAC**

5.1.3.1 The Heating/Ventilation/Air Conditioning (HVAC) outlet supplier shall submit, at Styling Freeze (SF) +1 week, math data showing the open and closed position of the vents (up-down and/or side-to-side) including pivot point and degree of



rotation. The math data shall be updated and resubmitted to GM as changes occur. This requirement will be used to assist in the Class A surfacing of the outlets which will be supplied to the HVAC supplier by GM at VDR unless otherwise directed by the PDT.

5.2 Exteriors

- 5.2.1 Supplier shall include the math for the inside surface or sheet body of the rear glass for field-of-view (FOV) studies to support all global inside rear view mirrors. Rear glass FOV is defined as the area on the rear glass inner surface in a fixed or rear closure condition. This is the area which the driver sees out of, excluding the dot-matrix/black-out areas.
- 5.2.2 Economic Commission for Europe (ECE) requires a minimum of a 2.65mm radius on the surface of the exterior.
- 5.2.3 Flanging Requirements
 - 5.2.3.1 Supplier shall develop the First Leg flange data for all the parts for which they are design-responsible.
 - 5.2.3.2 The design plan for the First Leg of flange will initially be defined in the Criteria Typical Sections and Design Execution Sections. This data shall be used in the development of the First Leg of flange surfaces.
 - 5.2.3.3 The First Leg of flange surfaces shall be completed and transferred to GM Design Center three weeks prior to the Initial Design Release (IDR) release date so this data can be included in the IDR release.
 - 5.2.3.4 Parts interfacing with First Leg flanges are to meet the program requirements in the Vehicle Technical Specifications (VTS) and Dimensional Technical Specifications (DTS).
 - 5.2.3.5 The component supplier, if different from the manufacturing supplier, must be consulted for their manufacturing input in the development of the First Leg flange to ensure manufacturability requirements are met.
 - 5.2.3.6 The supplier shall add first flanging to the Contract Sign-off (CSO) or later surfaces, while maintaining DTS required gap and flushness and showing proper draft.
 - 5.2.3.7 Radii requirements on the component shall also be included in the development of first flanging. This deliverable must be completed and baseline data-banked back into the VAS by Supplier.
 - 5.2.3.8 The coarse-to-fine math data development process shall continue until the first flange and any non-Studio styled radii are deemed complete by the Design Studios and/or the SMT design manager and stored into the production versions of the math data in the VAS.
 - 5.2.3.9 The First Leg of flange data shall also be approved by the Perceived Quality (PQ) group prior to VDR in order to be considered complete.



5.3 Interiors

- 5.3.1 One designer or design liaison minimum from each partition source shall be co-located on site at the fully-integrated Supplier. The designer is to remain on site at the integrated Supplier from VDR through Gate N + 90 days.
- 5.3.2 Suppliers of plastic parts must follow the Global Plastic Part Design Review Process and use the checklist and templates provided in Global Design infoBOOK.
- 5.3.3 Economic Commission for Europe (ECE) requires a minimum radius on the surface of interior subsystems and components within head impact zones. In order to use the interior subsystem or component in any sales region, all surfaces within the head impact zones shall comply with the minimum radius requirement regardless of the sales region the subsystem or component has been designated for. The responsible designer (GM or Supplier) must ensure compliance with all applicable regulations.
- 5.3.4 Grains that are 0.25mm or deeper require an additional offset surface.
- 5.3.5 Interior secondary appearance surfaces shall consist of all interior components hidden or concealed by a compartment door or covered by other components (e.g., armrest) such as glovebox bins, inner door liner, floor console bins and lids, seat armrest bins and lids, garnish trim storage bins and lids, compartment mats, etc.
- 5.3.6 The development of the engineered surfaces shall be completed by Supplier with direction from GM Design Center, for release at Integration Virtual Build Release (IVBR) and later events. This also includes components in extreme low-visibility areas such as instrument panels (I/Ps), hush panels, etc.
- 5.3.7 IVBR engineering design deliverables shall also include engineering surface changes to ensure the IVBR part most accurately represents the final P2 production intent.
- 5.3.8 Roof Trim System
- 5.3.8.1 The roof trim substrate (headliner) and countermeasure design supplier shall also be the roof trim system integrator.
- 5.3.8.2 In addition to the math and Geometric Dimensioning and Tolerancing (GD&T) drawings required for the headliner substrate and countermeasure per Appendix F2 and Appendix B (part definition), math and drawings shall be required for the overall roof trim system. The number of assembly drawings required shall be based on program content as shown in Appendix B and further defined in the Bill of Materials (BOM) and assembly breakdowns. This may consist of 5 or more GD&T chart drawings and up to 70 or more roof trim assemblies based on program content.
- 5.3.8.3 The roof trim system as shipped will most likely consist of the following:
- Overhead (O/H) console (as designed by O/H console supplier)
 - Corporate common components (CCC) such as assist grips, lamps, coat hooks, visor, dome lamp, etc., as designed and located in Teamcenter



- Wiring harness and attachments including wire harness routing, clips, connectors, etc., as designed by the electrical supplier
- 5.3.8.4 Supplier is responsible for subsystem integration (i.e., manage math file fit interface between all components, ensure files are updated, etc.) which includes working with all component suppliers to remain up to date with math changes.
- 5.3.8.5 Supplier is responsible for creating all up-assembly O/H system math assembly files and drawings (GD&T 11X17) and any subassembly files and drawings that may be required for the purpose of roof trim integration.
- 5.3.8.6 Supplier must perform the role of GM Dimensional System Engineer for the complete roof trim system as shipped and work with component suppliers as necessary to ensure the overall GD&T requirements are met.
- 5.3.9 Seats
- 5.3.9.1 Each 8-digit seat component is stored in a separate file using the Component Base Release (CBR) process. The files are saved in the appropriate subcomponent IA.
- 5.3.9.2 At a minimum, the seat IAs, should be broken down into the following separate subcomponent IAs:

Seat Program

IA – Program Name

Seat Row

IA – Row 1 Seats

Seat Position

- IA – Driver Seat (Powered)
- IA – Passenger Seat (Powered)
- IA – Driver Seat (Manual)
- IA – Passenger Seat (Manual)
- IA – Passenger Seat (Hybrid)
- IA – 20% Seat

Seat Row

IA – Row 2, 3, 4, 5, etc. Seats

Seat Position

- IA – 60% Seat
- IA – 40% Seat



IA – 100% Seat Cushion
20% Seat Back/Seat Cushion
100% Seat Back
General Assembly (GA) Seat Hardware

Subgroup

Frames
Trim Covers & Pads, Head Restraint Covers & Pads
Plastic Covers
Head Restraint Frames & Guides
Electrical Control – Harness, Module, Switch, Heat, Vent
Just-in-Time (JIT) Components, Fasteners, Hardware
Restraint – Airbag, Belts, Pretensioner
Corporate Common Components (CCC)
General Assembly (GA) Seat Hardware

- 5.3.9.3 The GM design manager and DLT assigned to the program reserve the right to request further breakdown of the IA if deemed necessary. The GM design manager is the final approver of Supplier's seat math data and should be consulted regularly throughout the GVDP process in order to fully comply with the final math data deliverables for the program.
- 5.3.9.4 To facilitate supplier motion studies, separate part files are required for any and all components that move independently of each other.
- 5.3.9.5 All seat components will be located and approved by the seat JIT supplier with the component suppliers' input. Supplier is responsible for subsystem integration (i.e., manage math file fit interface between all components, ensure files are updated, etc.) which includes working with all component suppliers to remain up to date with math changes. The component supplier is responsible for ensuring the correct location of the part by working directly with the JIT supplier.
- 5.3.9.6 The seat and seatback math is required to be released in the nominal design position with the headrest shown tangent to the seatback.
- 5.3.9.7 The frame supplier is responsible for integrating the frame to the floor structure. All travel boxes are stored by the frame supplier with the cushion frame.
- 5.3.9.8 For wire routings, the directed component supplier (e.g., buckle, airbag, or pigtail on a component) provides a suggested routing. The seat JIT supplier must suggest changes to the routing if required and the directed component supplier to finalize routing. The seat JIT supplier to release wires in design position in Teamcenter.



- 5.3.9.9 For purchased wire harnesses, the routings and release are responsibility of the seat JIT supplier.
- 5.3.9.10 Master wire routings are the responsibility of the electrical SMT with input from the seat JIT supplier.
- 5.3.9.11 Seat total zone envelope(s), seat articulation, and any motion studies performed in NX using the motion tool are to be included as a deliverable a minimum of every 4 weeks or as required in the design reviews.
- 5.3.9.12 Seat clash/clearance checks are to be performed through the entire seat articulation to ensure best practices are met on all components. The studies are to be conducted a minimum of every 4 weeks or as required.
- 5.3.9.13 Supplier must provide all math representations illustrating seat positioning for all cargo loading or cargo stowage conditions. If the headrests are to be removed to achieve any of the cargo loading or stowage conditions, this must be noted in the released math file (file log) that depicts the loading or stowed seat condition. A finalized manufacturer seat travel window is also required as release documentation. This math is a requirement for all production documentation and will be furnished to GM's marketing team for reportable and published cargo volumes.
- 5.3.10 Rendering / Immersive (Virtual Reality) Requirements
 - 5.3.10.1 The solids within a purchased assembly shall not be united with other solids in that same assembly (e.g., radio buttons united with the body of the radio). It is required that, for components visible to the customer, the component is broken out into its own part file and attached to the purchased assembly.)
 - 5.3.10.1.1 Internal part data must be handled in accordance with Appendix G as the primary set of requirements
 - 5.3.10.1.2 All internal parts not covered under Appendix G: If part data cannot be seen from a customer's view, it can be contained in a separate, single bulk component (a single file with multiple parts (solid bodies) in it – used for mass and density calculations). Customer's view definition: walking around exterior, sitting anywhere within an interior, the under hood with hood up, the trunk or liftgate when open.
 - 5.3.10.2 Components of a purchased assembly that have the same material shall all be the same color (or NX color number). Different colors (or NX color numbers) must be used for each different material. Choice of this color is at the suppliers' discretion (except white, which is only used for ISO symbols).
 - 5.3.10.3 ISO symbols shall not be curve/line data. These symbols shall have divided faces in the solid of the symbol and those faces shall be colored white. If the ISO symbol is part of the solid (such as a molded in, raised face), those faces representing the ISO must be colored white.
 - 5.3.10.4 When areas of a solid have different grain, gloss and/or color requirements, those faces are required to be divided at the grain transition and assigned a



different color from the rest of the solid. Components should be added to assemblies using "original layer" to maintain original face color (or NX color number) designation in assembly context.

6.0 Regional Requirements

6.1 North America

6.1.1 Design Resources

6.1.1.1 Supplier shall provide all necessary design resources to demonstrate acceptable packaging of the components or systems at each release of a new surface from GM, scheduled or not (where applicable), and to complete all design work initiated with an EWO or similar document. A specific design resource plan shall be provided to GM at the technical review. The plan shall include the length of time Supplier's resource(s) will be located at the GM facility as well as the length of time at Supplier's site.

6.1.1.2 The skill level of each designer, supervisor, or other agent of Supplier and their position within Supplier's organization (hourly, salaried, contract) shall be communicated to GM Buyer via résumés at the technical reviews prior to sourcing.

6.1.1.3 For the following items, the term "resource(s)" shall be defined as the person(s) who will operate the NX/Teamcenter design systems at the design work facility where access is controlled by GM or their agent. Operating the NX/Teamcenter design systems includes, but is not limited to, the creation, revision, manipulation, visualization, or transfer of math and drawing data files.

6.1.1.3.1 The Supplier shall not share, hire, or contract any resources within or outside of their organization currently working on or assigned to a GM program in any capacity including, but not limited to, GM, Tier I, or Tier II sources. The purpose of this policy is to allow for the movement of resources while minimizing disruptions to GM programs.

6.1.1.3.1.1 Exceptions will be permitted only after Supplier obtains a written release from GM fully or partially relinquishing the resource, prior to the actual transfer of any such resource.

6.1.1.3.1.2 Failure to obtain and communicate the release to GM prior to sharing, hiring, or contracting the resource will result in the following actions:

- GM shall not permit the resource to enter any GM facility for 30 days. The 30-day restriction starts when either of the two following conditions are met:
 - 1) The resource stops work on, quits, or is removed from the GM program where the release should have been obtained.



- 2) The resource is discovered working on a GM program without having acquired and communicated a release from the previous GM design activity as detailed above. The 30-day restriction can be applied retroactively allowing the removal of people in current or newly created assignments.
- GM shall offset against or charge to Supplier all costs, actual or estimated, associated with obtaining new, additional, or replacement resources while the 30-day rule is in effect regardless of whether it is applied retroactively by GM or not. Such costs shall not exceed \$25,000.
 - Depending on the limited availability of physical resources, GM may revise Supplier's scheduled work time and location without notice.

6.2 Asia

6.2.1 China/Korea

- 6.2.1.1 Global Repeatable Digital Validation (GRDV), deployed on vehicle programs identified by the PDT, requires the use of specific workflow processes within GRDV/Digital Mock-up (DMU) to assign the IA, and a VAS coordinator to update and sign-off. The GM design manager will determine Supplier's responsibility to the workflow process.



7.0 Acronyms

7.1 Acronyms used in this document

BOM	Bill of Materials
CA	Contract Award
CBR	Component Base Release
CCC	Corporate Common Components
C/O	Carryy-over
CSO	Contract Sign-off
DCS	Data Creation Standards
DFP	Decision Fixed Point
DGM	Design Group Manager
DLT	Design Leader – Technical
DMU	Digital Mock-up
DPT	Decision Progression Table
DRE	Design Release Engineer
DTS	Dimensional Technical Specifications
E²	E-Squared
ECE	Economic Commission for Europe
EWO	Engineering Work Order
FE	Finite Element
FMVSS	Federal Motor Vehicle Safety Standards
FOV	Field of View
GA	General Assembly
GD&T	Geometric Dimensioning and Tolerancing
GM	General Motors
GRDV	Global Repeatable Digital Validation
GVDP	Global Vehicle Development Process
HVAC	Heating, Ventilation, Air Conditioning
IA	Installation Assembly
ICD	Interface Control Document
IDR	Initial Design Release
I/P	Instrument Panel
IR	Item Revision
IVBR	Integration Vehicle Build Release
IVER	Integrated Vehicle Engineering Release
JIT	Just-in-Time
O/H	Overhead
P2	Production Release
PDT	Product Development Team
PPAP	Production Part Approval Process
PQ	Perceived Quality
PSE	Product Structure Editor
RCD	Required Completion Date
SI	Supplier Integration



SMT	System Management Team
SOP	Start of Production
SOR	Statement of Requirements
SSPS	Supplier Practical Problem Solving
TMA	Timing and Metric Analyst
VA	Vehicle Architecture
VAS	Vehicle Assembly Structure
VCVA	Virtual Concept Vehicle Assessment
VDR	Verified Data Release
VIVA	Virtual Integration Vehicle Assessment
VPI	Vehicle Program Initiation
VPPS	Vehicle Partitioning and Product Structure
VSVA	Virtual Structure Vehicle Assessment
VTs	Vehicle Technical Specifications
WIP	Work in Progress
Z/L	Zones and Limits

7.2 Other acronyms for reference

ADV	Analysis/Development/Validation
AE	Appearance Engineer
CAD	Computer-aided Design
BIW	Body-in-White
DCL	Dimensional Criteria List
DFA	Design for Assembly
DFM	Design for Manufacturing
DOM	Degree of Motion
GMUTS	General Motors Uniform Test Specification
GPS	Global Propulsion Systems
ILM	Information Lifecycle Management
IT	Information Technology
IVED	Integrated Vehicle Electrical Design
LAAM	Latin America, Africa, Middle East
MIC	Molded in Color
PAD	Product Assembly Document
WCS	Work Coordinate System