

Assessor Task Guide

Digital Product Definition/Model Based Definition Checklist

D6-51991 Revision J

REVISED October 12, 2010

Notes

This Assessor Task Guide for the Digital Product Definition/Model Based Definition Checklist is intended to provide guidance and understanding of the questions of the check list to the Supplier that is undergoing a DPD assessment. It is also intended to provide the auditor with information for use during the execution of the assessment.

The task guide is split into 4 sections.

- Section A of the checklist is used to perform a basic Digital Product Definition (DPD) capability verification.
- Section B is used to perform Model Based Definition (MBD) capability verification.
- Section C is used for Coordinate Measurement System (CMS) capability verification.
- Section D is used to perform Plotter capability verification.

The checklists for Sections B, C & D are designed to build upon the basic DPD capability assessment from Section A, therefore, Section A must be performed prior to performing assessment for CMS or MBD. The MBD, CMS and Plotting sections may not be applicable if the supplier does not require these capabilities for tooling or production use.

The person performing the DPD assessment should review contract language for DPD, Tooling and Design requirements prior to performing assessment (some questions may not be applicable based on contract review). The review should be performed for all sites sending datasets to the supplier to ensure that all site requirements are identified.

Rapid change of equipment capabilities requires changing quality control practices. Guide questions/examples are not necessarily applicable to each supplier's manufacturing process.

Definitions

Authority Dataset

This is the engineering definition provided in a 3D representation of the product, viewable on a Computer Aided Design (CAD) system. In addition to the Authority dataset (aka CAD model), the entire product definition may typically include additional media such as parts lists, part coordination documents, material specifications, etc.

The Engineering definition may include:

- 1) The CAD model and fully dimensioned 2D drawing sheets.
- 2) The CAD model and simplified or reduced content 2D drawing sheets.
- 3) The 3D model and the engineering requirements displayed as text within the 3D viewing area of the model, as well as the remaining engineering requirements (in 2D form - notes list, part lists, etc.).

All three formats are considered Digital Product Definition (DPD). The second case is a reduced content format, and is sometimes labeled as Reduced Dimension Drawing (RDD) or Simplified Drawing (SD). The third is termed Model Based Definition (MBD).

The purpose of the DPD/MBD checklist is to verify that the supplier has processes to use any of these formats received from any Boeing site, to manufacture and inspect the product.

PRODUCT ACCEPTANCE SOFTWARE

This is software used during Product Realization that potentially affects product conformity where there is no further, downstream verification of the product. (E.g., CAD, LEV, CMS, data handling/analysis, and in some cases, NC)

COORDINATE MEASUREMENT SYSTEMS (CMS)

CMS devices check the 3D Features of products. Typical examples are the fixed Coordinate Measurement Machine (CMM), and several portable devices, Theodolite, Laser Tracker, Photogrammetry (includes Videogrammetry), and Portable CMM.

DATASET DERIVATIVE

The media created any time data is extracted from an Authority dataset for machine programming, visual aids, inspection aides, FAIs, tool fabrication/measurement, plotting mylars, or what have you. Derivative is data taken from its native environment and used in another CAD

CAM or CAI software system. The geometry is translated from one system to another using a neutral format translator or manual into some 2 D systems.

ENHANCED REFERENCE SYSTEM (ERS)

This is a documented permanent or temporary reference system used usually for large assembly tools, with a large number of digitally-defined, fixed target locations readable by coordinate measurement systems. It provides better repeatability than conventional tooling datum features.

IGES, STEP, DXF, PARASOLID

Standardized formats for CAD data that are readable by multiple systems.

LOW END VIEWER (LEV)

An entry level, visualization CAD system used to view, analyze, extract, and print dimensional and other required data from the DPD dataset. Currently, the only Boeing approved LEV's used with our Boeing's MBD datasets are Enovia DMU and VisView. These systems usually do not support neutral format output.

Checklist Question	What to look for...
<p>A. Digital Product Definition:</p>	
<p>1. Are there DPD documented processes or procedures that address all sections of D6-51991?</p> <p>Requirements D6-51991, Sec 1.1</p>	<ul style="list-style-type: none"> • Documented processes that control Boeing release authority dataset and other DPD/MBD derivatives (i.e. NC programs, Inspection plans, Tooling, etc.) from the point when the Boeing authority dataset is received, through derivative creation, performed programming, manufacturing planning (visual aids, in-process inspection, final inspection), first article inspection and any other process that is applicable. • There must be a process to ensure the original authority datasets are secure, backed up and can not be altered, and only the appropriate people have write access to part programs and inspection datasets. • Must have trained system administrator(s) with sole access to retrieve and store incoming customer datasets. • A process for the supplier to check dataset integrity upon receipt. • Segregation of datasets by status — (e.g., release, in-work and obsolete are minimum requirements) • Security – (Password and access protection, regular back up for disaster recovery and archive storage). • Documented processes that address all sections of the D6-51991.
<p>2. Is there a flow diagram of the complete documented DPD processes?</p> <p>Requirements D6-51991, Sec 1.2</p>	<ul style="list-style-type: none"> • There must be a flow diagram that documents the complete DPD processes and identifies the applicable procedure references. • Flow chart should include reference to affected organizations such as (engineering, manufacturing planning, tooling, inspection and procurement).
<p>3. Is there a requirement in the suppliers documented processes to notify customer within 30 days of any changes or at a minimum annually if no changes occur.</p> <p>Requirements D6-51991, Sec 1.3</p>	<ul style="list-style-type: none"> • The supplier must have a process that notifies the customer when changes are incorporated into their DPD process and impacts the customer (simple typographic errors need not apply) • The process should include notification within 30 days of any change along with an annual notification regardless of changes. • The future process will require suppliers to update their profile online. This will be known as the Integrated Supplier Information System (ISIS).
<p>4. Are documented DPD processes implemented with defined authority for change control & maintenance?</p> <p>Requirements D6-51991, Sec 1.3</p>	<ul style="list-style-type: none"> • Look for approval or signature page and a document control procedure • Notification to affected personnel and sub-tier suppliers when changes occur. • Processes should be under document control • Definition in the procedure as to who is responsible for this document. (Maintenance along with ownership)

Checklist Question	What to look for...
A. Digital Product Definition:	
<p>5. Is there a process to ensure integrity and security of datasets from receipt throughout the manufacturing and acceptance processes?</p> <p>Requirements D6-51991, Sec 2.1</p>	<ul style="list-style-type: none"> • Storage of Boeing provided DPD and supplier created derivatives • Archiving old revisions • Encryption during send/receive • Backup system with including remote storage and disaster recovery • Access control with permission and/or password protection (read/write) to ensure Boeing provided datasets will not be inadvertently modified.
<p>6. Does the supplier have a process to control configuration of dataset derivative media?</p> <p>Requirements D6-51991, Sec 2.2</p>	<ul style="list-style-type: none"> • The derivatives/media must have a revision level process to keep the derivatives/media current with authority dataset revisions that affects its configuration. As an example look for these indicators: <ul style="list-style-type: none"> • Creator/Date • Sketch Revision Level • Authority Dataset(s) Name, Location, Revision Level • Other Derivative Dataset(s) Name, Location, Revision Level • Feature Requirement(s) Identifier (e.g., GDT frame ID) • Product identification <p>Note: Derivatives are modified copies or extracted data from the original authority dataset. NC/CNC type programs and the geometry used to create them, visual aides, Mylars, digital tool designs and tools, inspection datasets, FAI datasets, etc.</p>
<p>7. Are dataset derivatives traceable back to the current authority dataset?</p> <p>Requirements D6-51991, Sec 2.2.1</p>	<ul style="list-style-type: none"> • Traceability is looking at whether or not the derivative can be clearly identified and tied back to its Authority dataset, such as when visual aides or screen-prints are being used, they need to be traceable back to the current Authority dataset. • Make sure you can trace all derivative back to the authority data. This may be by revision letter, number or even date and time stamps for N/C processed data. • All must include reference to the Digital data nomenclature. Look for some sort of history of change. • Make sure that this traceability covers SCDs when suppliers create designs.
<p>8. Does the planning package identify traceability to the current authority dataset?</p> <p>Requirements D6-51991, Sec 2.2.2</p>	<ul style="list-style-type: none"> • The supplier needs to have a documented process to ensure the planning is traceable to the correct authority dataset. • Planning used for route sheets, travelers, work instructions, NC programs, inspection, etc. will be traceable to the authority dataset that controls the configuration being built. Any items used in FAI, Tool buyoff or conformity shall be traceable.
<p>9. Does the supplier have a change control process for dataset derivative media?</p> <p>Requirements D6-51991, Sec 2.2.3</p>	<ul style="list-style-type: none"> • Verify there is a change control process that updates all derivative dataset elements when the authority dataset is revised. • Change control process includes review for: <ul style="list-style-type: none"> • Tooling • NC and CMM program • Sketches, inspection plans, or 2-D drawings • FAI documentation / Delta FAI or Tool inspection • Sub-tier supplier notification
<p>10. Does the supplier have a process that includes control of non current (obsolete) authority datasets and dataset derivatives?</p> <p>Requirements D6-51991, Sec 2.2.4</p>	<ul style="list-style-type: none"> • Segregation and clear identification of current and past revision level datasets in supplier's directories. • Ensure compliance to contract data retention requirements • Look for separate files that are accessible to production • Archive process

Checklist Question	What to look for...
A. Digital Product Definition:	
<p>11. If providing Type Design or Tool Design to Boeing, does the supplier have a documented process for design and development?</p> <p>Requirements D6-51991, Sec 2.3</p>	<ul style="list-style-type: none"> • The supplier shall describe a documented process for design and development to ensure compliance to customer requirements. Compliance to Boeing Drafting Standards and Tool Design standards. • Designs will have traceability to engineering definition • Supplier's released design shall be reviewed for program requirements, the design will provide the data required to allow the product to be: <ul style="list-style-type: none"> • Identified • Manufactured • Inspected • All designs will include the part lists and specifications necessary to define the product or tool (e.g. material, process, features, annotation, specification, notes, and manufacturing and assembly data needed to ensure conformity of the product or tool). • Must include a reference for customer approval when required
<p>12. Does internal quality audits procedure include auditing or reviewing all internal and sub-tier operations for DPD data and related documentation?</p> <p>Requirements D6-51991, Sec 4.0</p>	<ul style="list-style-type: none"> • Internal audit procedures identify DPD processes for review. • Review audit checklist for compliance. Supplier checklist should address and be applicable to their processes. • Review internal audit records for evidence of having a completed internal audit for DPD processes. • Internal audit plan shall include provisions for audit of sub-tier supplier oversight • Review procurement process for flow down and an established ASL for sub tiers approved to D6-51991 or its equivalent.
<p>13. Does the supplier's documented procedure for corrective action include reporting, tracking and resolving hardware, software and dataset integrity (Including Boeing provided datasets)?</p> <p>Requirements D6-51991, Sec 5.0</p>	<ul style="list-style-type: none"> • Processes to report, track, and resolve dataset or software discrepancies to customer, OEM and all affected personnel. • Process to prevent use of discrepant datasets or software (remove from system) • The supplier must have a documented process to disclose products inspected with discrepant media, equipment, and/or tooling on items shipped to Boeing and their customers. This would include an internal CA and resolution. • Existing QMS non-conformance system process.
<p>14. Does the supplier have a process to assess, monitor and control sub-tier compliance with DPD requirements?</p> <p>Requirements D6-51991 6.1</p>	<ul style="list-style-type: none"> • Flow down of D6-51991 (or comparable) requirements to sub tiers (PO Note) • Look for a process for control of the suppliers i.e. what does it take to approve and disapprove them? • Supplier has performed assessment for sub-tiers and ensures the proper capabilities to manage and use the Boeing DPD/MBD datasets being provided. • Supplier maintains records of sub-tier DPD capabilities (equipment and process) • Supplier has documented process to ensure sub-tier supplier's inspection planning is compliant when used to accept Boeing product. • Supplier documented processes ensure sub-tier datasets are verified when translations occur. • Supplier performs periodic review on their DPD/MBD sub-tier supplier to ensure they are in compliance to DPD requirements, Boeing ITAR, EAR and contract requirements. • Supplier encryption protection for sending/receiving of electronically transmitted data. <p>Example of supplier purchase order clause. Use Boeing PO clause as example, (includes ITAR & EAR) Note; encryption required for electronically transmitted data.</p>

Checklist Question	What to look for...
A. Digital Product Definition:	
<p>15. Does supplier QA organization have responsibility for approval of all inspection media?</p> <p>Requirements D6-51991, Sec 8.1</p>	<ul style="list-style-type: none"> • Inspection media (paper inspection plans, inspection datasets, CMM programs, Mylars, media of inspection (MOI) tools, etc...) needs to be traceable to the authority dataset. • If the inspection media is created by an organization other than supplier Quality Assurance, there needs to be a documented and audited process approved by QA. • Describe Inspection Media and method that will ensure that all product features are planned for inspection
<p>16. Does the supplier have a documented process to create inspection media from a 3D model in addition to the 2D drawing?</p> <p>Requirements D6-51991, Sec 8.2, 8.3</p>	<ul style="list-style-type: none"> • A process to assure accuracy of derivative media (e.g. Mylars, tools, CMS programs, NC programs) from authority datasets. • Plotted Mylar media should be validated at each point of use. Ref applicable document for plotted media (Ref D1-8110-9) • Inspection media is independently derived from and traceable to the authority dataset. • Media must be under configuration control. • Media contains graphics and text sufficient to illustrate inspection operations , traceability and QA verification • Review process (checker, checklist, or peer/team review) • Media is created by qualified personnel. • Digital inspection operations are performed by qualified personnel. • Documentation of the coordinate system, datum targets, and datum features.
<p>17. Is there a process in place to document FAI's for product produced from authority datasets?</p> <p>Requirements D6-51991, Sec 8.5</p>	<ul style="list-style-type: none"> • This question applies to 2D drawings that are not fully dimensioned or partially dimensioned and requires a dataset for manufacturing and inspection. Customer provided drawings which have contoured surfaces shall be specifically called out on the drawings, flag notes or notes list. • Process for reduced dimension drawings (RDD), minimal dimensioned drawings (MDD), simplified drawings (SD) etc.) requires supplier to ensure all dimensioned, un-dimensioned features and general flag note requirements are planned for verification. • Unique identification of each feature is required. Various acceptable methods are available to manage this data (e.g. screen prints, supplier drawings & sketches etc.) • Digital measurement must have guidelines to ensure the appropriate quantity of individual measurements are taken on the feature being measured (i.e., quantity of surface points for measurement, CMM hits). • Supplier responsible to verify 100% of all the feature when using customer drawing and or datasets
<p>18. Does the supplier document the current level of hardware configuration, software, software revisions and other digital system information (e.g. PTF(s), project files) required to maintain compatibility with Boeing supplied datasets and/or data exchange formats per applicable Boeing system(s) requirement documents?</p> <p>Requirements D6-51991, Sec 9.1</p>	<ul style="list-style-type: none"> • Determine which Boeing sites send or will send datasets to the supplier. Note: The site specific data exchange requirements will determine the method of how you audit. (see PQAA) • Supplier data exchange software compliant to Boeing site requirements (e.g. encryption, file transfer protocol (FTP), web connection, etc...) • Ensure software levels and equipment matches DPD Capability questionnaire. • See matrix at end of this Guide for site-specific data exchange requirements. • If system is not compatible, there must be documented process to verify Boeing received authority data is acceptable before release.
<p>19. Does the supplier verify dataset translations when a supplier translates Boeing authority datasets from their as received format into their manufacturing or inspection software?</p> <p>Requirements D6-51991. Sec 9.2</p>	<ul style="list-style-type: none"> • When translations of digital datasets occur between CAD systems or digital equipment, a process must be in place to verify data. Examples of how this can be accomplished are using IGES_CHK, point cloud method or other software validation processes. • See matrix at end of this Guide for site-specific data exchange requirements

Checklist Question	What to look for...
A. Digital Product Definition:	
<p>20. Does the supplier ensure that when Tool Design responsibility is flowed down to sub tier suppliers that the sub-tier supplier is approved by the supplier?</p> <p>Requirements D6-51991, Sec 10.1.2</p>	<ul style="list-style-type: none"> • Locate several designed Special Tools. Assure that: <ul style="list-style-type: none"> • The tool identification bears a Supplier and/or Boeing Tooling Acceptance Stamp. (A Boeing stamp may or may not be required depending upon ST Category) • Authority Design information is identified on the tool and is legible or is available in Supplier records system. • Supplier has contractual notes that flow Boeing DPD/MBD requirements to all their approved sub-tier suppliers. • Compare list of suppliers receiving datasets to list of suppliers approved to receive datasets. • When controlled datasets are provided to sub-tier suppliers, the supplier ensures sub-tier supplier is in compliance to Boeing ITAR, EAR and contract requirements prior to approval and release of DPD/MBD datasets. • Supplier has assessed sub-tiers and ensures the proper capabilities to manage and use the Boeing DPD/MBD datasets being provided. <ul style="list-style-type: none"> • ASL that shows an approval for controlling Tool Design • Process for approval for Tool Design (Questionnaire with tool design questions) • Contract language or PO note that flows down requirements from customer • Supplier performance Metrics for the approved suppliers (What does it take to disapprove the supplier?) • Is there a process for protecting Boeing data when it is transferred to sub-tier to suppliers (secure transfer). • Where a Boeing provided dataset is provided to a sub-tier supplier, the dataset transfer must be encrypted. •
<p>21. Does the supplier have a documented process to ensure release, acceptance, identification, security, access and change control for:</p> <ul style="list-style-type: none"> • Tool design datasets • Tool Inspection datasets <p>Requirements D6-51991, Sec 10.1</p>	<ul style="list-style-type: none"> • There must be a documented process to review, revise and control tooling when authority dataset changes affect tooling configuration. • There must be a documented release process and secure storage of released tool design datasets. • Digital definition of physical tooling (including templates, check fixtures) must conform to digital engineering definition or approved tool design. • Tools and tool design/inspection datasets must be traceable to the authority dataset and the affected revision.
<p>22. Are digitally defined special tools and physical inspection media (check fixtures, templates, etc.) identified and traceable to the authority tool design dataset?</p> <p>Requirements D6-51991, Sec 10.2</p>	<ul style="list-style-type: none"> • Special Tooling must contain at a minimum, Tool Identification and the authority design information. • Non-Design Special Tooling - The revision level(s) of the Engineering Drawing/Dataset(s) used to fabricate the tool. • Designed Special Tooling - The revision level(s) of the Tool Engineering Drawing/Dataset(s) used to fabricate the tool. • Ideally, tools should be identified with Authority Design information somewhere on the tool. Either stamped directly on the tool or on a tag. (Ref UT6907). However, Authority Design information may also be contained within Supplier records. Locate several designed Special Tools. Assure that: • Authority Design information is identified on the tool and is legible or is available in Supplier records system.

Checklist Question	What to look for...
A. Digital Product Definition:	
<p>23. Are special tools and tooling media accepted and periodically validated to the authority design at a frequency determined to ensure accuracy and repeatability?</p> <p>Requirements D6-51991, Sec 10.3</p>	<ul style="list-style-type: none"> • Special Tooling must periodically be revalidated to its Authority Design requirements. This revalidation may be known as a PTI. It generally reviews several areas include but are not limited to: • Comparison of As Designed configuration to As Built configuration. • Visual Inspection for wear/damage • Dimensional Validation • Randomly sample some Special Tooling that bears Indication of Inspection Status (Sticker). Check to assure that the due date is somewhere after today. • Check due date back to Suppliers Inventory and Recall system for due date agreement. • Observe tool for obvious damage, nicks or de laminations, worn edges, etc. • A verification plan should be created for each tool or Supplier should have documentation that describes how verification is performed and what is validated.
<p>24. Does the supplier define training requirements that:</p> <ul style="list-style-type: none"> • Assure competence and maintain employee training records, including on-the-job-training, for all DPD system users. • Respond to changes to the DPD process, equipment, or software? <p>Requirements D6-51991, Sec 11.0</p>	<ul style="list-style-type: none"> • This can be a spreadsheet with a listing of personnel or job title that is cross referenced with the defined training that is required for DPD See example; • The supplier must have a documented process that ensures the appropriate quality assurance and other affected personnel responsible for product acceptance have proper training to use DPD/MBD/Product Acceptance Software for inspection planning, measuring and product/tool acceptance. • The supplier must have a documented process that ensures other affected personnel responsible have proper training to use DPD/MBD when it directly affects their job function. • The training must be formally documented and kept on file. This includes OJT when used as a training tool. • Look for changes to the training program in response to changes to the DPD process, equipment, or software.

Checklist Question	What to look for...
B. Model Based Definition MBD	
<p>1. Does the supplier's CAD system have the ability to view annotation based on Boeing site-specific requirements?</p> <p>Requirements D6-51991, Sec 9.1</p>	<ul style="list-style-type: none"> • Determine which Boeing sites send or will send datasets to the supplier. Note: The site specific data exchange requirements will determine the method of how you audit. • Supplier data exchange software compliant to Boeing site requirements (e.g. encryption, file transfer protocol (FTP), web connection, etc...) • Ensure software levels and equipment matches DPD Capability questionnaire • Compatibility requirements may involve CAD systems or data exchange software. • Suppliers need the same Boeing CAD native software version or have the Boeing approved LEV to view the annotation. • See matrix at end of this Guide for site specific data exchange requirements. If site is not listed in matrix, contact Procurement Agent for specific requirements • This is CAD Code 6 where the model carries 100 percent authority.
<p>2. Does the supplier have a documented process to create inspection media from a 3D MBD model?</p> <p>Requirements D6-51991, Sec 8.2,</p>	<ul style="list-style-type: none"> • Process to determine when manufacturing and/or inspection views/sketches are needed to supplement authority dataset. • Obtain measurement values of all product features from the Authority Model • Supplier should assure only qualified personnel perform digital inspection • Process to identify/segregate pre-release or reference datasets • Note: Is supplier utilizing equipment capability (CAD, LEV, and CMS) to minimize/automate creation of inspection views? Preferred method is to utilize digital methods vs. creation of 2D media. •
<p>3. Does the supplier have a process to ensure verification of all design requirements of the authority dataset? (e.g., all defined by feature control frames, annotation, specifications, notes and other specified requirements in the authority DPD dataset and associated parts list including dimensional and other properties)</p> <p>Requirements D6-51991, Sec 8.4</p>	<ul style="list-style-type: none"> • When planning measurements for product acceptance, the suppliers QA must verify that all design requirements are identified and planned for inspection. Note: Compliance for this process is best verified by reviewing FAI documentation for a specific product. • Measurement process must have guidelines to ensure the appropriate quantity of individual measurements are taken on the feature being measured (i.e., quantity of surface points for measurement, CMM hits). • Process to ensure Key Characteristics identified on authority datasets are measured and the results are recorded for every unit. • This should use AS9102 or equivalent as a guideline for product • Note: Is supplier utilizing equipment capability (CAD, LEV, and CMS) to minimize/automate creation of inspection views? Preferred method is to utilize digital methods vs. creation of 2D media.
<p>4. Is there a process in place to document FAI's for product produced from MBD datasets?</p> <p>Requirements D6-51991, Sec 8.5</p>	<ul style="list-style-type: none"> • Process for reduced content datasets (MBD, RDD, SD, etc.) to ensure all dimensioned, un-dimensioned features and general / flag note requirements are planned for verification. • Unique identification of each feature is required. Various acceptable methods are available to manage this data (e.g. 3D model, screen prints, sketches etc.) • Measurement planning must have guidelines to ensure the appropriate quantity of individual measurements are taken on the feature being measured (i.e., quantity of surface points for measurement, CMM hits). • Use 9102 as a guideline for product <p>Note: Compliance for this process is best verified by reviewing FAI documentation for a specific product or concurrently validating process.</p>

Checklist Question	What to look for...
B. Model Based Definition MBD	
<p>5. Does the supplier have a process to assure sub-tier suppliers' ability to work with MBD information?</p> <p>Requirements D6-51991, Sec 6.1</p>	<ul style="list-style-type: none"> • Supplier has assessed sub tiers onsite and ensures the proper capabilities to manage and use the Boeing DPD/MBD datasets being provided. • Supplier maintains records of sub tier MBD capabilities (equipment and process) • Supplier has documented process to ensure sub tier suppliers inspection planning is compliant when used to accept Boeing product. • Supplier documented processes ensure sub tier CAD systems/format are verified when dataset translation occurs. • Must control sub tier DPD/MBD suppliers to the same standard as prime supplier. • Utilize the same Boeing DPD/MBD Checklist requirements.
<p>6. Has the supplier identified specific training requirements for all functions associated with use and control of MBD datasets? (e.g. planning, purchasing, contract review and Mfg)</p> <p>Requirements D6-51991, Sec 11.1</p>	<ul style="list-style-type: none"> • This can be a spreadsheet or training Matrix with a listing of personnel or job title that is cross referenced with the defined training that is required for DPD • The supplier must have a documented process that ensures the appropriate quality assurance and other affected personnel responsible for product acceptance have proper training to use MBD for inspection planning, measuring and product/tool acceptance. • The supplier must have a documented process that ensures other affected personnel responsible have proper training to use MBD when it directly affects their job function. • The training must be formally documented and kept of file. This includes OJT when used as a training tool. Their must be a formal quality system training process. • Look for changes to the training program in response to changes to the DPD/MBD process, equipment, or software. • Process to ensure quality assurance or other persons responsible for product acceptance been brought into the digital measurement and measurement planning process. • Process to train and document tasks when product acceptance or media generation is performed by non QA personnel. • Process to encouraged and documented OJT. • Process to provide training for users of CAD, NC, CMS equipment. • Process to provide training when software changes are implemented

Checklist Question	What to look for...
C. Coordinate Measuring Systems	
<p>1. Does the supplier use CMS equipment for Tooling and or Product acceptance?</p> <p>Check all that apply:</p> <p>Requirements D6-51991, Sec 7.2 D950-1159-1, Sec. 8.2.B D33200, Sec. 1.19</p>	<ul style="list-style-type: none"> • Articulating Arm - Portable Coordinate Measuring Machine • Digital Theodolite • Fixed Coordinate Measurement Machine • Fixed Scanning Coordinate Measurement Machine • Indoor Global Positioning System • Laser Projectors - Optical Layout Template • Laser Radar • Laser Scanner • Laser Tracker • Numerical Control Machine Inspection using probes or scanners. • Photo or Video-grammetry • Other_____

Checklist Question	What to look for...
<p data-bbox="77 144 488 174">C. Coordinate Measuring Systems</p> <p data-bbox="64 180 488 233">2. Does the supplier have a process to control critical functions of the CMS?</p> <p data-bbox="64 275 215 300">Requirements</p> <p data-bbox="77 306 297 331">D6-51991, Sec 7.2.1</p> <p data-bbox="77 338 342 363">D950-1159-1, Sec. 8.2.B</p> <p data-bbox="77 369 285 394">D33200, Sec. 1.19</p> <p data-bbox="77 401 289 426">D6-56202, Sec.11.1</p>	<ul style="list-style-type: none"> <li data-bbox="618 180 1511 233">a) Purpose / Scope – Overview or statement of specific equipment and its intended use. <li data-bbox="618 239 1544 432">b) Calibration – Supplier shall define calibration intervals and maintain a system for periodic maintenance of measurement equipment. The supplier must document inventory of all specific components used for CMS and OLT measurement that could affect the integrity of data collection.. This inventory should include and not be limited to target accessories (e.g. bushings, adapters, sphere mounts, bar/rod, probing, drift nest, supports, etc.), all reflector types, and weather station equipment. <li data-bbox="618 438 1455 491">c) Product Acceptance Software – Supplier shall perform Product Acceptance Software testing per section 3.0. <li data-bbox="618 497 1500 550">d) Field Checks / Set up – Establish criteria for field checks / set up to ensure data and system accuracy prior to collecting measurement data. <li data-bbox="618 556 1533 665">e) Drift Points / Stability – When environmental conditions, vibration, or stability of the product being measured could affect measurement data, drift point analysis is required. A record of drift points measured and acceptance tolerance used, before and after measurements is required as objective evidence. <li data-bbox="618 672 1539 865">f) Temperature Compensation / Scale Factors – When products are measured in an uncontrolled environment a documented process to compensate for thermal effects on the objects being measured is required. Verify compensation using a scale bar of like (product) material before and after measurements. A record of scale bars measured and acceptance tolerance used is required as objective evidence. The product dimensional characteristics being verified must meet the engineering definition requirements as defined in ANSI/ASME Y14.5, ANSI B89.6.2.1993. <li data-bbox="618 871 1544 1008">g) Establish Coordinate System – Establish criteria for changing the coordinate system from a local coordinate system to a part or tool coordinate system. (e.g. tolerances, datum targets, datum features, tooling holes, tool enhanced reference system or best fit). Establishment of coordinate systems shall be in accordance with customer engineering definition and ANSI/ASME Y14.5 as applicable. <li data-bbox="618 1014 1533 1150">h) Multiple Station Set-up Criteria – When moving CMS equipment from one location to another, or combining CMS equipment during a survey, supplier shall document their process and acceptance tolerance. A minimum of seven adequately distributed common points used as reference for repositioning/adding the CMS equipment during a survey shall be verified and recorded as objective evidence. <li data-bbox="618 1157 1539 1266">i) Data Collection Parameters – Establish measurement guidelines and specific collection parameters for the CMS equipment prior to collecting measurement data. (e.g. point density, time/distance separation parameters, apex angles, distance limitations). <li data-bbox="618 1297 1479 1350">j) Data Analysis – Establish guidelines for the evaluation of 3D point data to tool engineering, engineering datasets, or drawings. <li data-bbox="618 1356 1528 1472">k) Reports – Establish standard process for CMS reports (e.g. job information, coordinate system establishment, object temperature, scale bars, drift points, data analysis and measured results). Reports shall be in English and in inches unless directed otherwise by customer contract. <li data-bbox="618 1478 1544 1556">l) Record Retention – Establish standard process for all inspection and test records to be archived and retained per customer contract requirements and provided to the customer upon request. <li data-bbox="618 1562 1539 1640">m) Training – Suppliers shall define training requirements to assure competence and maintain employee training records, including on-the-job-training, for all CMS users per section 11.0. <p data-bbox="578 1650 1520 1728">Note: Is supplier utilizing equipment capability (CAD, LEV, and CMS) to minimize/automate creation of inspection views? Preferred method is to utilize digital methods vs. creation of 2D media.</p>

Checklist Question	What to look for...
C. Coordinate Measuring Systems	
<p>3. Does the supplier maintain certification/calibration for equipment used for inspection, including:</p> <ul style="list-style-type: none"> • CMS equipment (Fixed and Portable): • NC equipment with inspection probe capability used for product acceptance • OLT's • Ply Cutters • Other equipment used to accept part attributes (Scale bar, adaptive tooling, ball bars, etc.) <p>Requirements D6-51991, Sec 7.1 D950-1159-1, Sec. 8.2.B D33200, Sec. 1.19. D6-56202, Sec.6.1</p>	<ul style="list-style-type: none"> • Tractability to Calibration records must be maintained for all CMS equipment & special target adapters • CMS equipment must be calibrated at periodic intervals • Calibration process must meet NIST or equivalent standards. • Measuring equipment will be physically identified in accordance with certification records • Process will provide records of date of acceptance/rejection and next maintenance due date • <p>There must be a process to validate probes for CMM prior to use at each probe angle. This will be performed before each probe is used base on a certified monument(ball).</p>
<p>4. Is there a process in place to validate Product Acceptance Software (PAS) independent of the software developer?</p> <p>Requirements D6-51991, Sec 3.1 D950-1159-1, Sec. 8.2.B D33200, Sec. 1.19 D6-56202, Sec.6.1, 11.8</p>	<p>Suppliers procedures must include:</p> <ul style="list-style-type: none"> • Supplier PAS must be verified prior to product acceptance use. • The supplier will establish and maintain a procedure independent of the software developer • Determine that the software, and subsequent revisions, accomplishes its intended function. • A means of identifying approved PAS software. • Software Security and Storage
<p>5. Does the supplier develop software for inspection and acceptance of product?</p> <ul style="list-style-type: none"> • Is there a documented process to require creation of plans and instructions for the building, configuration management, loading and testing of "Supplier developed" product acceptance software? <p>Requirements D6-51991, Sec 3.2, 3.3 D950-1159-1, Sec. 8.2.B D33200, Sec. 1.19</p>	<p>There must be a documented process for:</p> <ul style="list-style-type: none"> • Control of the build/creation of the CMS software • Approval and certification testing to assure the software meets industry standards. accuracies • Configuration management • Problem and Trouble Shooting • Manuals and documentation for the Supplier Developed CMS Software

Checklist Question	What to look for...
<p>C. Coordinate Measuring Systems</p> <p>6. Does the supplier define training requirements that:</p> <ul style="list-style-type: none"> ● Assure competence and maintain employee training records, including on-the-job-training, for all CMS system users. ● Respond to changes to the CMS process, equipment, or software? <p>Requirements D6-51991, Sec 11.1 D950-1159-1, Sec. 8.2.B D33200, Sec. 1.19 D6-56202, Sec.11.3</p>	<ul style="list-style-type: none"> ● There must be specific training requirements that assure operators and inspectors have been trained on all functions associated with use and control of the CMS ● The training process must have instruction to assure training is provided when changes to processes, equipment or software occur ● Supplier shall demonstrate CMS capability and compliance to Boeing approved CMS procedures ● If supplier receives authority dataset to measure product and tooling they must be DPD approved.

Checklist Question	What to look for...
<p>D. Plotter</p> <p>1. Are there documented processes for the control of Mylar plots used as a media of inspection? Those procedures shall include at a minimum the following:</p> <ul style="list-style-type: none"> ● Plotter Calibration ● Verification of engineering definition ● Verification of plot accuracy ● Quality Acceptance Stamping ● Verify accuracy prior to use <p>Requirements D6-51991, Sec 8.6.1</p>	<ul style="list-style-type: none"> ● Plotter Calibration <ul style="list-style-type: none"> ● Plotting equipment should be located in a temperature and humidity controlled environment. ● Typically plotters come with calibration software, this software should be run and used to adjust the plotter. ● A Circle, Diamond, Square pattern is preferred as a independent for validation of proper calibration ● After the plotter has been calibrated then it should be identified with a calibration sticker and put a scheduled calibration cycle ● Plotting environment should be 68 degrees +/- .002 degrees ● Record of certification test and frequency any adjustments made and result after adjustment. This is done daily ● Verification of engineering definition <ul style="list-style-type: none"> ● Plotted media should be under Configuration control and be traceable to authority dataset ● A process to verify flat patterns ● Derivative media (Model) shall include gridlines or plot points used for verification. ● Plots are not permitted to be used for engineering tolerances < .030 inches ● Verification of plot accuracy <ul style="list-style-type: none"> ● Process to validate plots at time of creation (Ref D1-8110-9 for example) ● Grid lines or plot points should be +/- .010 across the length of the plot ● Record temp and humidity at the time of plot ● Quality Acceptance Stamp <ul style="list-style-type: none"> ● Quality should verify the calibration, temp, humidity, and verification of plot accuracy ● Quality should stamp and date and approve the plot for inspection use ● Verify accuracy prior to use <ul style="list-style-type: none"> ● Plots should be verified prior to each use Sec 8.6 ● Temperature compensation (Ref D1-8110-9)
<p>2. Does the supplier define training requirements that:</p> <ul style="list-style-type: none"> ● Assure competence and maintain employee training records, including on-the-job-training, for all system users. ● Respond to changes to the Plotter process, equipment, or software? <p>Requirements D6.51991, Sec 11.1</p>	<ul style="list-style-type: none"> ● There must be specific training requirements that assure operators and inspectors have been trained on all functions associated with use and control of the plotter ● The training process must have instruction to assure training is provided when changes to processes, equipment or software occur ● Supplier shall demonstrate compliance to Boeing approved plotter procedures ● If supplier receives authority dataset to create plotted media must be DPD approved

Site specific data connection requirements

Site Specific Data Exchange Formats & Delivery Method								
Digital Product Definition D6-51991								
	Site	Delivery Method/Media	CAD Formats Supported	Synchronization Requirements	Verification method	Viewing MBD annotation	Specific Program Requirements	
1	BCA Long Beach	BPN/CITIS CD-ROM	NX (UG) Native IGES	NX = Yes (Memo) IGES = None	NX Native = None IGES = IGES Check software	N/A		
2	BCA Puget Sound	SNET CD-ROM	CATIA Native V4 CATIA Native V5 IGES	CATIA V4 = Yes (D6-56199) CATIA V5 = Yes (D6-56199) CATIA DMU = Yes (D6-56199) IGES = None	CATIA Native = None IGES = IGES Check software STEP = Gage Model for translation	CATIA (annotation module) DMU LEV	a) Catia V4 2.4 R1 or DMU (Project file) with IGES 737-747- 757 767-777	b) Catia V5 or DMU 787 & 747-8
3	IDS Anaheim	BPN/CITIS CD-ROM Message Courier PIMS web	CATIA Native V5 ADOBE 3D STEP	NONE	As received	CATIA Native V5 DMU LEV Acrobat Viewer	CEEDS/CATIA	
4	IDS El Segundo	Message Courier	Pro/Engineer Native Product View STEP	Yes - Quality clause Q029	Pro/Engineer Native = None ProductView (LEV) = None As received.	Pro/Engineer (Native models) ProductView LEV		
5	IDS Fort Walton Beach	BPN CD-ROM	CATIA V5 IGES STEP	None	As received	N/A		
6	IDS Huntington Beach, DPD Requirements	BPN/CITIS CD-ROM	CATIA V4 (a) UG II all versions Parasolid	None	As received	N/A	a) 767 Tanker Offload - Catia V4 2.4 R1 or DMU with IGES	
7	IDS Huntington Beach, MBD requirements	BPN/CITIS CD-ROM	CATIA Native V5 R12 NX Native NX2	Yes- Quality clause Q029H	As received	Native environment		

	Site	Delivery Method/Media	CAD Formats Supported	Synchronization Requirements	Verification method	Viewing MBD annotation	Specific Program Requirements	
8	IDS Huntsville	CD-ROM	NX (UG) Native CATIA V5 IGES	NX (UG) = None Catia = None IGES = None	NX (UG) Native = None Catia = None IGES = IGES Check software	NX (UG) Native CATIA Native N/A		
9	IDS Long Beach (C17)	PSN	NX (UG) Native IGES SUPPAR STEP	NX (UG) = Yes (PSN Notification) IGES = None STEP = None	NX (UG) Native = None IGES = IGES Check Software STEP = Gage Model for translation	NX (UG) File as downloaded from PSN IGES SUPPAR STEP SUPPAR VisView LEV		
10	IDS Mesa	BPN/CITIS CD_ROM	NX (UG) Native CATIA V5 IGES SUPPAR IGES STEP	NX = None IGES SUPPAR = None IGES = None	NX (UG) Native = None IGES = IGES Check software	NX (UG) File as received IGES SUPPAR VisView LEV		
11	IDS Philadelphia	BPN/CITIS/TEC CD-ROM	CATIA Native V4 CATIA Native V5 NX (UG) Native STEP STEP SUPPAR	CATIA Native V4 = none CATIA Native V5 = none NX (UG) Native = none STEP = none STEP SUPPAR = none	As received	CATIA (annotation module) NX (UG) File as received DMU LEV STEP SUPPAR		
12	IDS Puget Sound	BPN/CITIS CD- ROM	CATIA Native V4 CATIA Native V5 IGES	CATIA V4 = None CATIA V5 = None IGES = None	As received	N/A		
13	IDS Southern CA (C130)	PSN Message Courier	NX (UG) Native IGES SUPPAR STEP	NX (UG)= Yes (PSN Notification) IGES = None STEP = None	NX (UG) Native = None IGES = IGES Check Software STEP = Gage Model for translation	NX (UG) File as downloaded from PSN IGES SUPPAR STEP SUPPAR		
14	IDS St. Louis	BPN/CITIS CD-ROM Message Courier	NX (UG) Native IGES SUPPAR IGES STEP Parasolid CATIA V5	NX (UG)= None IGES SUPPAR = None IGES = None Catia = Yes (TBD)	As received	NX (UG)File as downloaded IGES SUPPAR Catia compatible LEV	a) 767 Tanker Offload - Catia V4 2.4 R1 or DMU with IGES	
15	IDS Wichita	SNET CD-ROM 3.5" Disk 4mm Cassette 8mm Cassette 1/4" Cassette 36 Track Cassette	CATIA Native V4 CATIA Native V5 IGES STEP	CATIA V4 = Yes (D6-56199) CATIA V5 = Yes (D6-56199) CATIA DMU = Yes (D6-56199) IGES = None STEP = None	CATIA Native = None IGES = IGES Check software STEP = Gage Model for translation	CATIA (annotation module) DMU LEV		