1.0 INTRODUCTION

1.1 THIS DPD / MBD (DIGITAL PRODUCT DEFINITION / MODEL BASED DEFINITION) QUALITY ASSURANCE PROCESS GOVERNS RECEIPT, USAGE, AND DISTRIBUTION OF PRODUCT DEFINITION DATASETS AS REQUIRED BY CONTRACT. IT DEFINES THE DETERMINATION AND IDENTIFICATION OF AUTHORITY DATASETS, AND PROCEDURES TO ASSURE VALID CONFIGURATION THROUGHOUT ALL OPERATIONS UTILIZING DIGITAL DATA. THIS PROCESS DEFINES THE REQUIRED DOCUMENTATION OF DIGITAL OPERATIONS AND THE RESPONSIBILITIES OF QUALITY ASSURANCE PERSONNEL FOR CONTROL OF THEM.

1.2 THIS PROCESS MEETS METALTECH CUSTOMER CONTRACTS REQUIRING BOEING D6-51991 QUALITY ASSURANCE STANDARDS FOR DIGITAL PRODUCT DEFINITION AND SIMILAR DPD / MBD REQUIREMENTS BY OTHER CUSTOMERS. ALSO INCLUDED IS THE DPD / MBD REQUIREMENTS FOR METALTECH SUPPLIERS. ALL CUSTOMER DPD / MBD REQUIREMENTS, PER THE CUSTOMER CONTRACT / PURCHASE ORDER MUST BE MET BEFORE ANY PRODUCTS MAY BE ACCEPTED WITH DIGITAL INSPECTION.

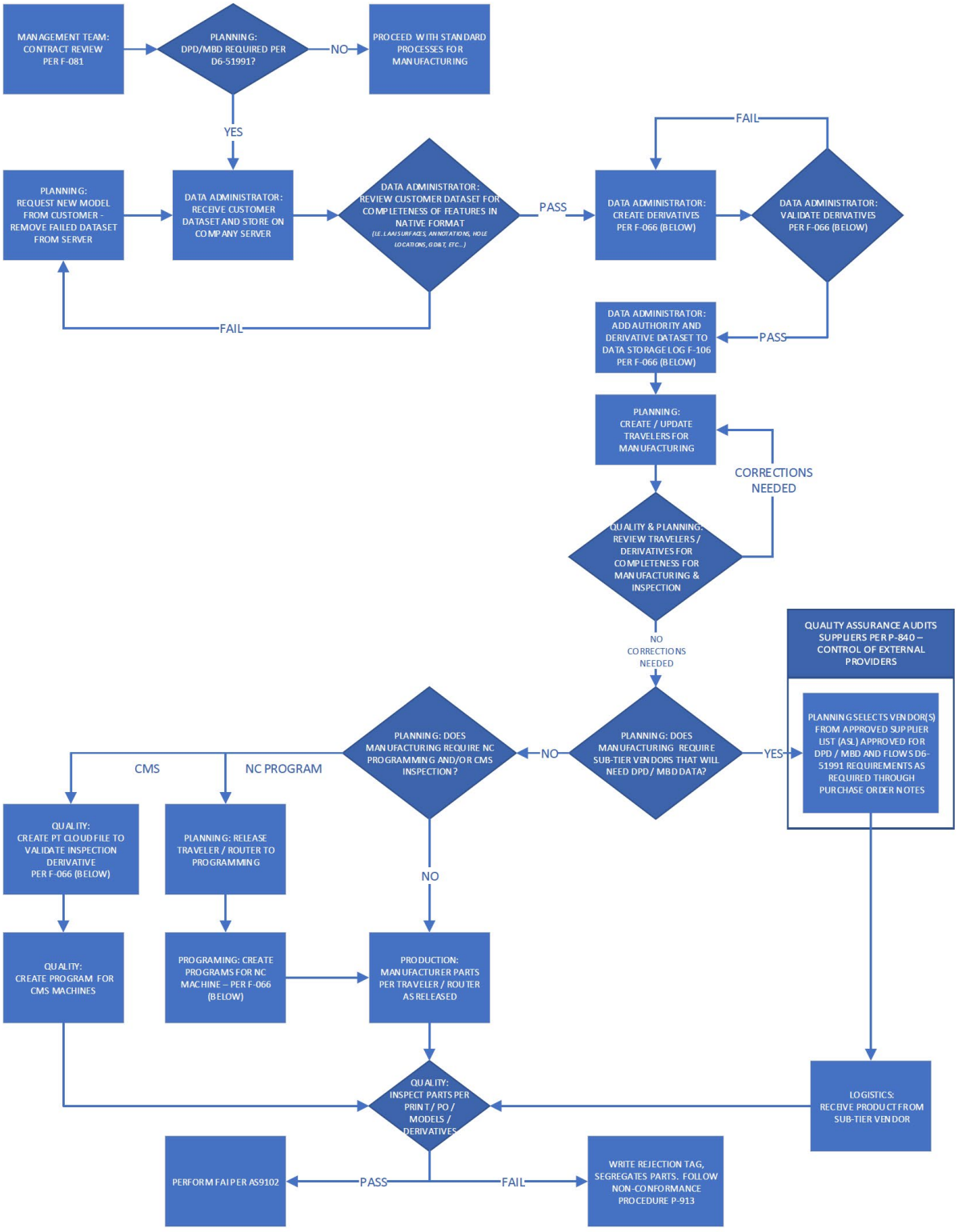
1.3 THE METALTECH DPD / MBD QUALITY ASSURANCE REPRESENTATIVE IS RESPONSIBLE TO INTERFACE WITH CUSTOMERS AND SUPPLIERS AS REQUIRED TO MAINTAIN TECHNICAL COORDINATION AND QUALITY CONTROL OF DIGITAL PRODUCT.

1.4 THE QA MANAGER HAS FULL RESPONSIBILITY FOR MAINTENANCE OF THIS PROCESS AND SHALL NOTIFY DPD/MBD CUSTOMER REPRESENTATIVES WITHIN 30 DAYS OF ANY CHANGES TO PROCESSES, CAD/CAM/CAI SOFTWARE, SOFTWARE/DATA SYNCHRONIZATION METHODS, CMS METROLOGY EQUIPMENT AS WELL AS ANY CHANGES OF THE QUALITY MANAGER OR KEY PERSONNEL. THE QA MANAGER IS RESPONSIBLE TO REVISE THE PROCESS AS REQUIRED FOR CONTROL OF NEW DPD/MBD OPERATIONS OR METHODS, AND FOR TIMELY COMMUNICATION OF CHANGING REQUIREMENTS WITH CUSTOMERS, SUPPLIERS, AND REGULATORY AGENCIES AS REQUIRED TO MAINTAIN CONTROL OF DIGITALLY DEFINED PRODUCT

1.5 THIS DOCUMENT ALSO DESCRIBES THE VALIDATION AND CERTIFICATION OF ALL HARDWARE AND SOFTWARE USED TO MANAGE AND STORE ALL DPD / MBD DATA FROM ALL METALTECH CUSTOMERS. SOFTWARE LIST CAN BE FOUND ON A SEPARATE DOCUMENT, FORM F-110 SOFTWARE INVENTORY.

1.6 THE FOLLOWING FLOW DIAGRAM GRAPHICALLY DEPICTS THE METALTECH FLOW OF DATA THROUGH THE MANUFACTURING AND INSPECTION PROCESSES FROM RECEIPT OF DPD / MBD DATA THROUGH ALL ORGANIZATIONS CREATING DERIVATIVES.

FLOW CHART


MANAGEMENT TEAM: CONTRACT REVIEW PER F-081
PLANNING: DPD/MBD REQUIRED PER D6-51991?
NO
PROCEED WITH STANDARD PROCESSES FOR MANUFACTURING
YES
PLANNING: REQUEST NEW MODEL FROM CUSTOMER - REMOVE FAILED DATASET FROM SERVER
DATA ADMINISTRATOR: RECEIVE CUSTOMER DATASET AND STORE ON COMPANY SERVER
DATA ADMINISTRATOR: REVIEW CUSTOMER DATASET FOR COMPLETENESS OF FEATURES IN NATIVE FORMAT (I.E. I.A.I SURFACES, ANNOTATIONS, HOLE LOCATIONS, GD&T, ETC...)
PASS
FAIL
DATA ADMINISTRATOR: CREATE DERIVATIVES PER F-066 (BELOW)
FAIL
DATA ADMINISTRATOR: VALIDATE DERIVATIVES PER F-066 (BELOW)
PASS
DATA ADMINISTRATOR: ADD AUTHORITY AND DERIVATIVE DATASET TO DATA STORAGE LOG F-106 PER F-066 (BELOW)
PLANNING: CREATE / UPDATE TRAVELERS FOR MANUFACTURING
CORRECTIONS NEEDED
QUALITY & PLANNING: REVIEW TRAVELERS / DERIVATIVES FOR COMPLETENESS FOR MANUFACTURING & INSPECTION
NO CORRECTIONS NEEDED
QUALITY ASSURANCE AUDITS SUPPLIERS PER P-840 – CONTROL OF EXTERNAL PROVIDERS
PLANNING SELECTS VENDOR(S) FROM APPROVED SUPPLIER LIST (ASL) APPROVED FOR DPD / MBD AND FLOWS D6-51991 REQUIREMENTS AS REQUIRED THROUGH PURCHASE ORDER NOTES
PLANNING: DOES MANUFACTURING REQUIRE SUB-TIER VENDORS THAT WILL NEED DPD / MBD DATA?
YES
NO
PLANNING: DOES MANUFACTURING REQUIRE NC PROGRAMMING AND/OR CMS INSPECTION?
CMS
NC PROGRAM
NO
QUALITY: CREATE PT CLOUD FILE TO VALIDATE INSPECTION DERIVATIVE PER F-066 (BELOW)
PLANNING: RELEASE TRAVELER / ROUTER TO PROGRAMMING
QUALITY: CREATE PROGRAM FOR CMS MACHINES
PROGRAMING: CREATE PROGRAMS FOR NC MACHINE – PER F-066 (BELOW)
PRODUCTION: MANUFACTURER PARTS PER TRAVELER / ROUTER AS RELEASED
QUALITY: INSPECT PARTS PER PRINT / PO / MODELS / DERIVATIVES
LOGISTICS: RECEIVE PRODUCT FROM SUB-TIER VENDOR
PERFORM FAI PER AS9102
PASS
FAIL
WRITE REJECTION TAG, SEGREGATES PARTS. FOLLOW NON-CONFORMANCE PROCEDURE P-913

2.0 CONFIGURATION MANAGEMENT AND MEDIA SECURITY

2.1 AUTHORITY DATASETS RESIDE IN THE CUSTOMER PROJECTS NEW FOLDER ON THE SECURED COMPANY SERVER. ALL DERIVATIVES CREATED FROM OR UTILIZING THESE DATASETS SHALL CONTAIN THE FULL FILE NAME OF THE AUTHORITY DATASET NAME, REVISION LEVEL, FILE EXTENSION, AND ANY ADDITIONAL UNIQUE CUSTOMER IDENTIFICATION TO ALLOW TRACING BACK TO THE AUTHORITY DATASET. IF THESE DERIVATIVES ARE REVISED A REVISION LEVEL WILL BE ADDED TO THE FILE NAME. IE. AUTHORITY DATASET NAME *123ABC-A.CATPART*, DERIVATIVE DATASET NAME *123ABC-A.[FILETYPE EXTENSION]* REVISED DERIVATIVE, *123ABC-A MT1.[FILETYPE EXTENSION],* NC DERIVATIVE *123ABC-A OP1 [PROGREV].NC*

2.2 DATA ADMINISTRATOR SAVES DATASETS IN THE CUSTOMER PROJECTS FOLDER ONLY AFTER THEY HAVE FULFILLED THE REQUIREMENTS OF THIS DOCUMENT IN SECTION 9.0 (CUSTOMER DATASETS). PROJECT MANAGERS / PROGRAMMING SHALL CONTROL STORAGE AND IDENTIFICATION OF ALL AUTHORITY DATASETS AND IT'S DERIVATIVES INCLUDING REVISION LEVEL OF ALL DERIVATIVE DATASETS USED FOR PART AND TOOL ACCEPTANCE. PLANNING / PROGRAMMING SHALL MAINTAIN IDENTIFICATION OF DATASETS INCLUDING DATASET REVISION LEVEL AND AUTHORITY DATASET EXTENSION (FILE TYPE). THE DPD / MBD DATA USERS DO NOT HAVE WRITE ACCESS TO THE CONTROLLED DOCUMENTS FOLDERS

2.3 REVISION LEVEL IN CURRENT PRODUCTION OF RELEASE DATASETS IS IDENTIFIED ACCORDING TO PROCEDURE P-750, CONTROL OF DOCUMENTED INFORMATION. REFERENCE DATASETS SHALL BE CLEARLY IDENTIFIED AS SUCH SO AS TO AVOID ACCIDENTAL USE IN PRODUCTION AND OR PLANNING.

2.4 RELEASED METALTECH OWNED TOOLING DATASETS, AND IF APPROVED CUSTOMER TOOLING, ARE STORED IN THE CUSTOMER PROJECTS FOLDER AND INCLUDE IDENTIFICATION OF AUTHORITY SOURCE (I.E. PROGRAM / OPERATION / INFORMATION).

2.5 DATASETS ARE BACKED UP ACCORDING TO PROCEDURE P-750, CONTROL OF DOCUMENTED INFORMATION.

2.6 METALTECH SHALL CONDUCT DESIGN CHANGE REVIEW FOR ALL NEW OR REVISED DATASETS AND DATASET DERIVATIVES. AN IMPACT ASSESSMENT SHALL BE CONDUCTED ON CHANGES BETWEEN REVISIONS AND HOW IT EFFECTS CURRENT PLANNING. CURRENT PLANNING AND NC PROGRAMS SHALL BE CHANGED IN ACCORDANCE TO THE IMPACT ASSESSMENT.

2.7 DERIVATIVE MEDIA (METALTECH INTERNAL DRAWINGS, SCREEN SHOTS) SHALL CLEARLY INDICATES AUTHORITY SOURCE (I.E. METALTECH TITLE BLOCK).

3.0 PRODUCT ACCEPTANCE SOFTWARE (PAS)

3.1 PRIOR TO USE, PRODUCT ACCEPTANCE SOFTWARE, (PAS) SHALL BE TESTED INDEPENDENTLY OF DEVELOPER AND TEST DOCUMENTATION SHALL BE RETAINED. THE CURRENT APPROVED SOFTWARE VERSION LEVEL IS RECORDED IN F-110 DPD/MBD SOFTWARE INVENTORY.

3.2 TO VALIDATE ANY PAS, A KNOWN PHYSICAL ARTIFACT IS MEASURED USING THE PAS SOFTWARE AND A REPORT OF THE MEASUREMENT SHALL BE GENERATED. THE DIFFERENCE BETWEEN THE KNOWN ARTIFACT AND CMS REPORT SHALL NOT EXCEED THE VOLUMETRIC MACHINE CALIBRATION CERTIFICATION. IF THE DEVIATION IS GREATER THAN MACHINE ALLOWANCE, THE INSPECTOR SHALL RE-RUN THE ARTIFACT PROGRAM IN AN EFFORT TO ASCERTAIN WHETHER OR NOT THE FIRST RUN THROUGH WAS AN ANOMALY OR IN FACT THERE IS A PROBLEM

WITH THE CMS. IF IT IS FOUND THAT THE PAS FAILED THE INSPECTOR SHALL IDENTIFY THE CMS TO PREVENT USE FOR PRODUCT ACCEPTANCE BY PLACING A RED TAG ON THE MACHINE STATING THAT THE CMS IS TAKEN OUT OF SERVICE. TAG MAY ONLY BE REMOVED ONCE REPAIRS CORRECTING THE PROBLEM HAS BEEN CONDUCTED AND VERIFIED.

3.3 WHEN PAS IS UPDATED OR REPLACED, THE PAS SHALL BE VALIDATED AS STATED IN 3.1 ONCE VALIDATED ALL PREVIOUS VERSIONS OF THE SOFTWARE SHALL BE REMOVED FROM THE COMPUTER TO PREVENT ACCIDENTAL USAGE

3.4 ACCESS TO OPERATIONAL PAS IS RESTRICTED TO TRAINED USERS OR THOSE SUPERVISED BY TRAINED USERS. DOCUMENT F-046, EQUIPMENT COMPETENCY RECORD FORM, IS USED TO DOCUMENT EMPLOYEE TRAINING AND ENTERED IN THE EQUIPMENT COMPETENCY LOG.

3.5 ALL PAS BY **METALTECH** SHALL BE VALIDATED AGAINST A PHYSICAL ARTIFACT AND CONTROLLED PER P-715, CONTROL OF MONITORING AND MEASURING EQUIPMENT.

4.0 INTERNAL QUALITY AUDIT

4.1 DPD/MBD USING DEPARTMENTS ARE AUDITED TO EACH SECTION OF THIS DOCUMENT PER PROCEDURE P-920, INTERNAL AUDITS. DOCUMENTED RECORDS OF THESE AUDITS SHALL BE RETAINED FOR REVIEW BY THE CUSTOMER UPON REQUEST.

4.2 INTERNAL QUALITY AUDIT PROCEDURES SHALL INCLUDE PROVISIONS FOR AUDITING ALL OPERATIONS AFFECTING DPD/MBD DATA AND RELATED DOCUMENTATION TO ASSURE COMPLIANCE WITH CONTRACTUAL REQUIREMENTS AND THE OBSERVANCE OF SECURITY RESTRICTIONS. THE AUDIT PROCESS SHALL INCLUDE PROVISIONS FOR AUDIT OF SUB-TIER SUPPLIERS USING DPD/MBD DATA FOR PRODUCTS.

4.2.1 AUDIT RESULTS ARE REVIEWED FOR PROCESS AND EQUIPMENT CHANGES, PROCESS AND PROCEDURE UPDATE, AND PROCESS IMPROVEMENT AS NEEDED

5.0 CONTROL OF DIGITAL DATA USED BY SUPPLIERS AND SUB-TIER SUPPLIERS

5.1 **METALTECH** WILL IDENTIFY DPD / MBD CAPABLE SUPPLIERS ON THEIR APPROVED SUPPLIER LIST WHEN DATASETS ARE PROVIDED FOR MANUFACTURING AND/OR INSPECTION, INCLUDING CMS SERVICE SUPPLIERS, TOOL DESIGN OR TOOL BUILD AND COMPLY WITH REQUIREMENTS OF D6-51991.

5.1.1 D6-51991 REQUIREMENTS WILL BE FLOWED DOWN IN PURCHASE DOCUMENTS (RFQ, PO, ETC) WHEN DIGITAL DATA IS PROVIDED TO SUPPLIERS. FLOW DOWN TO SUPPLIERS AND FROM SUPPLIERS TO SUB-TIER SUPPLIERS SHALL BE IN COMPLIANCE TO EXPORT/IMPORT REQUIREMENTS (SUCH AS ITAR, MLA, MA, TAA, AND EAR).

5.1.2 ALL DPD/MBD DATA SHALL BE ENCRYPTED PRIOR TO TRANSMISSION OR MOVED THROUGH A SECURE COMPANY PORTAL OR FTP SITE.

5.1.3 **METALTECH** SUPPLIERS SHALL BE AUDITED TO FORM F-111, DPD / MBD VENDOR CHECKLIST, TO SHOW COMPLIANCE WITH THE APPLICABLE SECTIONS OF THIS DOCUMENT AND METALTECH'S CUSTOMER REQUIREMENTS. **METALTECH** AUDITS SUPPLIERS, ENSURES COMPLIANCE OF SUB-TIERS, AND RETAINS EVIDENCE OF SUPPLIER COMPLIANCE. PRIOR TO SUBMISSION OF PURCHASE ORDER

5.2 METALTECH CUSTOMERS HAVE THE RIGHT TO SURVEY AND/OR REVIEW THE DPD / MBD QUALITY ASSURANCE AND CONFIGURATION MANAGEMENT SYSTEMS OF SUPPLIERS.

6.0 MEASUREMENT AND TEST EQUIPMENT

6.1 ALL EQUIPMENT UTILIZED FOR PRODUCT ACCEPTANCE INSPECTION IS CALIBRATED AND CERTIFIED ACCORDING TO P-715.

6.2 COORDINATED MEASURING MACHINE'S ARE CERTIFIED ACCORDING TO P-715. IN ADDITION, CALIBRATION OF ALL CMS MEASURING EQUIPMENT SHALL BE TRACEABLE TO NIST OR AN EQUIVALENT INTERNATIONAL STANDARD.

6.3 IN THIS SECTION METALTECH DOCUMENTS ITS OPERATING PROCEDURES AND INTERNAL CONTROLS FOR METALTECH AND THEIR SUPPLIERS USE OF PORTABLE COORDINATED MEASUREMENT SYSTEMS.

6.4 METALTECH USES AN ARTICULATING ARM DURING IN-PROCESS AND FINAL INSPECTION.

6.5 CALIBRATION AND MAINTENANCE OF THIS TOOL IS CONTROLLED BY PROCEDURE P-715, CONTROL OF MONITORING OF MEASUREMENT EQUIPMENT, AND BY A PROVIDER THAT MEETS ALL CALIBRATION REQUIREMENTS OF THE MANUFACTURER (OEM). IT IS ACCEPTABLE TO UTILIZE THE ARTICULATING ARM TO MEASURE FEATURES WITH ENGINEERING TOLERANCE AT LEAST 5X THE VOLUMETRIC PERFORMANCE TEST RESULTS OF LAST CALIBRATION (±.005) AND 2X THE LARGEST FIELD CHECK DEVIATION. (±.002)

6.6 FIELD CHECK SHALL BE PERFORMED AT A MINIMUM OF ONCE A MONTH OR PRIOR TO MEASURING A PART IF ROMER ARM USE HAS ELAPSED MORE THEN A MONTH.

6.6.1 PRODUCT ACCEPTANCE SOFTWARE (PAS)IS VALIDATED PER THIS PROCEDURE (3.0).

6.6.2 THE ARM COORDINATE LOCATION IS CHECKED PRIOR TO THE BEGINNING OF EVERY PART CHECK SEQUENCE INCLUDING FLAT PLANE ORIENTATION ALL WITHIN A TOLERANCE OF +/-.002.

6.6.3 COORDINATE SYSTEMS ESTABLISHED AND CHECKED AT THE BEGINNING OF EVERY PART CHECK SEQUENCE. THE ACCEPTABLE COORDINATE SYSTEM IS A PHYSICAL "3-2-1" TYPE ALIGNMENT REFERENCING THE DATUM STRUCTURE IN THE CUSTOMER SUPPLIED DATA. DATUM SHALL BE IDENTIFIED AND MEASUREMENTS SHALL BE RECORDED AT THE BEGINNING OF THE CMS REPORTS.

6.6.4 WHEN METALTECH NEEDS TO USE IT'S PORTABLE CMS IN A SETUP THAT REQUIRES MULTIPLE SETUP STATIONS THE OPERATION OF THE MOVING AND SETUP OF EACH POSITION IS CONTROLLED BY CHECKING A MINIMUM OF 7 COMMON POINTS BETWEEN SET UP AND SPREAD OUT ACROSS THE PORTABLE CMS ENVELOPE OF 7-1/2FT DIA. NOT TO EXCEED THAT DIA. IT IS ACCEPTABLE TO UTILIZE MULTIPLE SETUP STATION TO MEASURE FEATURES WITH AN ENGINEERING TOLERANCE AT LEAST 4X THE LARGEST FIELD CHECK DEVIATION (±.004). COMMON POINT SHALL BE IDENTIFIED ON THE CMS REPORT

6.6.5 DATA COLLECTION PARAMETERS THE DENSITY AND SPREAD OF CONTACT POINTS MUST BE SUFFICIENT TO INDICATE ACTUAL FEATURE DIMENSIONS. MEASUREMENT COMMANDS AND REPORTS MUST BE CORRESPOND TO THE ENGINEERING REQUIREMENTS (GD&T PROFILE AND POSITION)

6.6.6 REPORTS ARE TO BE CREATED IN A VISUAL FORMAT WITH A CLEAR REPRESENTATION OF THE OF THE CONTACT POINTS NUMBERING SYSTEM WITH THE ACTUAL, NOMINAL AND DEVIATION VALUES DEFINED,

DATUM FEATURES AND INSPECTED FEATURES. ALL REPORTS SHALL HAVE THE FOLLOWING IN THE REPORT HEADER, JOB #, OBJECT TEMPERATURE (AMBIENT TEMP IF PART HAVE HAD SUFFICIENT SOAK TIME) PART NUMBER. THE BODY OF THE REPORT SHALL START WITH THE ALIGNMENT VERIFICATION (COORDINATE SYSTEM ESTABLISHMENT) AND FOLLOW FEATURE IDENTIFICATION WITH MEASURED RESULTS AND NOMINAL VALUES AND TOLERANCES. A GRAPHIC REPORT SHALL ACCOMPANY THE REPORT SHOWING LOCATION OF FEATURES THAT CORRELATE TO THE DATA SET.

6.6.7 ALL RECORDS AND REPORTS ARE TO BE SAVED IN THE REPORTS FOLDER UNDER THE *CUSTOMER PROJECTS* FOLDER ON THE SERVER, WITH TRACEABILITY TO THE AUTHORITY DATA SET AND REV LEVEL.

6.6.8 TRAINING OF THE ARTICULATING ARM BY QUALITY ASSURANCE MAY INCLUDING A MINIMUM OF 3 DAYS OJT BY QUALIFIED INTERNAL USERS (AS NOTED ON COMPETENCY RECORDS LIST), OR TRAINING BY 3RD PARTY TRAINER (EITHER ONSITE OR OFFSITE), ONLINE TUTORIALS BY THE CMS MANUFACTURER AND PAS SOFTWARE DEVELOPER, AND A GD&T OVERVIEW. USAGE OF THE PORTABLE CMS IS CONTROLLED BY PROCEDURE AND F-068 ARTICULATING ARM INSTRUCTION SHEET.

7.0 INSPECTION MEDIA FROM DATASETS

7.1 METALTECH QA PERSONNEL COORDINATE WITH OTHER DEPARTMENTS REVIEWING THE ENTIRE MANUFACTURING CYCLE OF EACH PRODUCT AND DETERMINING EFFECTIVE LOCATIONS AND METHODS OF INSPECTION OF EACH PRODUCT FEATURE.

7.2 FOR ALL REDUCED CONTENT AND DPD/MBD DATASETS, METALTECH QA PERSONNEL ENSURE THAT ALL PRODUCT FEATURES ARE IDENTIFIED FOR SUFFICIENT INSPECTION OPERATION FOR VALIDATION TO DESIGN REQUIREMENTS.

7.3 INSPECTION INCLUDES TEXTUAL DESCRIPTION OF INSPECTION OPERATION AND 3D OR 2D ILLUSTRATIONS OF PRODUCT FEATURES TO BE INSPECTED. INSPECTION PLANS ARE AUTHORIZED BY METALTECH QA PERSONNEL WHENEVER AN INSPECTION OPERATION REQUIRES INFORMATION SUPPLEMENTAL TO AND DERIVED FROM THE AUTHORITY DATASET. SEE ATTACHMENT A DRAWING DERIVATIVE TEMPLATE.

7.4 METALTECH QA PERSONNEL ARE RESPONSIBLE FOR ACCEPTANCE OF ALL EXTRACTED INSPECTION MEDIA USED FOR PRODUCT ACCEPTANCE. INSPECTION PLAN AND INSPECTION DATASETS ARE STORED IN QA DIRECTORIES.

7.5 TYPICAL SURFACE AND FEATURE MEASUREMENT FOR CMS DATA COLLECTION IS PERFORMED ACCORDING TO CMS DATA COLLECTION INSPECTION POINTS (ATTACHMENT B).

7.6 DATASETS IDENTIFIED AS REFERENCE ONLY MAY NOT BE USED FOR PRODUCT ACCEPTANCE.

7.7 WHEN PLANNING MEASUREMENTS FOR FAI, QA WILL VERIFY THAT ALL EXPLICIT AND IMPLICIT DESIGN REQUIREMENTS ARE IDENTIFIED AND PLANED FOR INSPECTION/VALIDATION. EXAMPLES INCLUDE: ALL FEATURES DEFINED BY FEATURE CONTROL FRAMES, ANNOTATION, NOTES AND OTHER SPECIFIED REQUIREMENTS IN THE AUTHORITY DPD/MBD DATASET AND ASSOCIATED PARTS LIST, INCLUDING DIMENSIONAL AND OTHER PROPERTIES.

7.7.1 ALL METALTECH FAI'S WILL BE PLANNED IN ACCORDANCE TO AS9102 REQUIREMENTS.

7.7.2 CUSTOMER GD&T STANDARDS FOR DIMENSIONING AND TOLERANCING STANDARDS ARE DEFINED BY ENGINEERING DRAWINGS, NOTES LIST AND /OR PARTS LIST.

8.0 DATA EXCHANGE METHODS

8.1 PROJECT MANAGER SHALL VISUALLY INSPECT AUTHORITY DATASETS RECEIVED FROM CUSTOMERS FOR MISSING ELEMENTS AND/OR INFORMATION. DATASETS MISSING ANY INFORMATION SHALL BE IDENTIFIED AND MOVED TO THE ARCHIVED / OBSOLETE FOLDER. THE CUSTOMER SHALL BE CONTACTED FOR A REPLACEMENTS DATASET.

8.2 WHEN METALTECH TRANSLATES DATASETS FROM THE ORIGINAL NATIVE CAD SYSTEM TO MANUFACTURING OR INSPECTION SOFTWARE, THE TRANSLATION MUST BE VERIFIED. THE VERIFICATION PROCESS WILL INCLUDE VALIDATION BACK TO THE AUTHORITY DATASET AND OBJECTIVE EVIDENCE OF COMPLETION USING THE METHODS PER SECTION 9.5.

8.3 WHEN CUSTOMER DPD / MBD DATA CONTAINING 2D AND 3D GEOMETRY IS RECEIVED IN TRANSLATED FORMAT (E.G., .STP), METALTECH VERIFIES THE DATASET AND STORES THE DATA IN THE APPROPRIATE DIRECTORY MAKING IT AVAILABLE TO QA AND MANUFACTURING DEPARTMENTS.

8.4 METALTECH WILL VERIFY AND VALIDATE THEIR TRANSLATIONS (PER SECTION 3.), IN ORDER TO MAINTAIN AUTHORITY STATUS.

8.5 TRANSLATION – RECEIVED DATASETS OTHER THEN SOLIDWORKS, STP, IGES, OR DXF FORMATS WILL NEED TO BE TRANSLATED. IN THE NEXT SECTIONS METALTECH WILL DESCRIBE THE TRANSLATION AND VERIFICATION PROCESS.

8.6 METALTECH TRANSLATES ALL CATIA FILES TO A STP OR IGES FORMAT THAT IS COMPATIBLE WITH OUR CAD / CAM SOFTWARE (SOLIDWORKS AND MASTERCAM).

8.7 THE FILE NAME / REV STAYS THE SAME BUT CHANGING THE FILE TYPE TO THE TRANSLATED EXTENSION, AS SHOWN IN SECTION 2.0. THE FILE IS SAVED WITH THE EXACT FILE NAME AS THE AUTHORITY DATA WITH THE REV LEVEL IN THE TRANSLATED FOLDER UNDER THE CONTROLLED DOCUMENTS DIRECTORY.

8.8 VERIFICATION OF TRANSLATED DATA IS ACHIEVED USING ANY ONE OF THESE 3 METHODS:

1. **POINT CLOUD** – POINTS IN A .500 OR LESS, WIDE GRID PATTERN ARE CREATED ON ALL SURFACES OF THE 3D PART THEN PROJECTED ONTO THE 3D PART. THE PROJECTED POINTS ARE THEN SAVED IN THE STEP FORMAT. THE POINTS IN STEP FORMAT ARE THEN OVERLAID ONTO THE NATIVE PART WITHIN THE NATIVE CAD SYSTEM AND ANALYZED AGAINST THE NATIVE CUSTOMER 3DPART. CHECKING THAT ALL ANNOTATIONS AND FEATURE FRAMES USED FOR INSPECTION ARE ACCOUNTED FOR AND WERE NOT ALTERED. IF THE POINTS ARE WITHIN .001 FROM THE 3D PART THEN THE TRANSLATION WAS SUCCESSFUL AND THE VERIFICATION FILE WITH BOTH THE AUTHORITY DATASET AND THE POINTS OVERLAID ON IT IS SAVED IN THE TRANSLATED FILES DIRECTORY WITH THE TRANSLATED STEP FILE.

2. **VALIDATION SOFTWARE** – VALIDATION IS ACHIEVED USING SOFTWARE VALIDATION TOOL. THIS SOFTWARE PREFORMS A CHECK AGAINST ALL 3D FEATURES AND ANNOTATIONS OF THE TRANSLATED DATA TO THE AUTHORITY DATA SET. ALL DATASETS ARE VERIFIED TO 1/10 OF THE SMALLEST ENGINEERING TOLERANCE. WHEN ANALYSIS IS COMPLETE THE VALIDATION SOFTWARE PRINTS OUT A PASS OR NO PASS REPORT. THE REPORT IS SAVED IN THE SAME FOLDER AS THE DERIVATIVE DATASET.

3. **HAND ANALYZE CHECK –** THE 2 DATA FILES CAN BE OVERLAID OVER EACH OTHER AND ANALYZED TO EACH OTHER CHECKING EACH FACE, SURFACE, LINE, CURVE AND\OR POINT TO THE AUTHORITY DATASET. ALSO DOING A DIMENSIONAL CHECK ON ALL AREAS OF THE TRANSLATED DATA TO THE AUTHORITY DATASET.

CHECKING THAT ALL ANNOTATIONS AND FEATURE FRAMES USED FOR INSPECTION ARE ACCOUNTED FOR AND WERE NOT ALTERED.

8.9 RESULTS OF CAD TRANSLATION VERIFICATIONS WILL BE TRACKED AND ANALYZED FOR POTENTIAL REDUCED SCOPE BASED ON PROCESS STABILITY AND MANAGEMENT OF DEMONSTRATED RISK.

8.10 SENDING OF DATA - DATASETS THAT WILL BE SENT TO SUB TIER SUPPLIERS SHALL BE SENT IN THE TRANSLATED AND VERIFIED FORM, VIA EITHER AN ITAR COMPLIANT BASED FILE SHARING SYSTEM, INTERNAL FTP SITE OR ENCRYPTED E-MAIL TO ENSURE THE DATA IS SECURE & NOT CORRUPTED IN THE TRANSFER.

9.0 SPECIALTY TOOLING

9.1 ALL METALTECH OWNED TOOL AND TOOL INSPECTION DATASETS COMPLY WITH DERIVATIVE REQUIREMENTS OF THIS DOCUMENT SECTION 7.0.

9.2 ALL METALTECH DIGITALLY DEFINED TOOLS AND PHYSICAL TEMPLATES ARE TRACEABLE TO AUTHORITY SOURCE. METALTECH QA INDICATES ACCEPTANCE OF TOOLS AND TEMPLATES AND DETERMINES AND DOCUMENTS SCOPE AND FREQUENCY OF PERIODIC RE-INSPECTION.

10.0 TRAINING AND PROCESS PERFORMER

10.1 ALL DPD / MBD SYSTEM USERS MUST BE TRAINED ON THIS PROCEDURE, AND A GD&T OVERVIEW ALONG WITH ALL CHANGES DRIVEN BY NEW EQUIPMENT, SOFTWARE OR BOEING PROGRAM REQUIREMENTS. SEE ALSO SECTION 7.4 FOR PERSONNEL AUTHORIZED TO RELEASED EXTRACTED INSPECTION MEDIA**.**

10.2 ALL FORMAL METALTECH DPD / MBD EQUIPMENT USERS' TRAINING RECORDS (INCLUDING ON THE JOB TRAINING) ARE RETAINED PER PROCEDURE P-720.

DEFINITIONS

AUTHORITY DATASET - A DATASET WHICH PROVIDES THE UNDISPUTED SOURCE FOR PRODUCT ACCEPTANCE TO APPROVED TYPE DESIGNS. IT IS UNDER CONFIGURATION MANAGEMENT WITH ACCESS, RELEASE, AND CHANGE CONTROLS IN PLACE TO ENSURE DEFINITION INTEGRITY.

COORDINATE MEASUREMENT SYSTEM - COMPUTER AIDED MEASUREMENT DEVICE THAT COLLECTS 3D DATA FROM PHYSICAL ARTICLES.

CAD - COMPUTER AIDED DESIGN - (1) ANY COMPUTER SYSTEM OR PROGRAM THAT SUPPORTS THE DESIGN PROCESS. (2) THE USE OF COMPUTERS TO ASSIST ENGINEERING DESIGN IN DEVELOPING, PRODUCING, AND EVALUATING DESIGN, DATA AND DRAWINGS.

DERIVATIVE - A REPRODUCTION OF ALL OR PART OF AN AUTHORITY DATASET. DERIVATIVES INCLUDE PAPER AND MYLAR PLOTS, TOOL DESIGNS, INSPECTION DATASETS CREATED TO ANALYZE AS-BUILT DESIGNS, CHECK TEMPLATES, NUMERICAL CONTROL (N/C) DATASETS/MEDIA, DATASETS WITH NOMINAL VALUES FOR CMS USE, QA INSPECTION PROCESSES AND OTHER EXTRACTIONS (DIMENSIONS, VIEWS, ETC.) FOR INSPECTION/MEASUREMENT USE, AND JOB TRAVELERS.

DPD / MBD - DIGITAL PRODUCT DEFINITION – THE ELECTRONIC DATA ELEMENTS THAT SPECIFY THE GEOMETRY AND ALL DESIGN REQUIREMENTS FOR A PRODUCT (INCLUDING NOTATION AND PARTS LISTS), AND THE USE OF THIS DATA THROUGHOUT AN INTEGRATED SYSTEM USING COMPUTER AIDED DESIGN, COMPUTER AIDED MANUFACTURING, AND COORDINATE MEASUREMENT SYSTEMS. ALSO KNOWN AS CAD/CAM SYSTEM.

FEATURE - ANY HARDWARE DESIGN ATTRIBUTE OR CHARACTERISTIC. THIS INCLUDES PHYSICAL PORTIONS OF HARDWARE SUCH AS A SURFACE, FACE, EDGE, RADIUS, HOLE, TAB, SLOT, PIN, ETC., AND REQUIREMENTS SUCH AS NON-DESTRUCTIVE INSPECTION (NDI) AND INTERCHANGEABILITY AND REPLACEABILITY (I&R). ALL FEATURES REQUIRE VALIDATION TO CONFORM THE PRODUCT TO THE DESIGN AUTHORITY. ALL FEATURES HAVE ASSOCIATED NOTES AND/OR GEOMETRIC DIMENSIONING AND TOLERANCING FEATURE CONTROL FRAMES (FCF). BUT ONE NOTE OR FCF MAY REFER TO SEVERAL FEATURES.

FEATURE REQUIREMENTS LIST - A LIST OF ALL TOLERANCE REQUIREMENTS CONTAINED IN A REDUCED CONTENT DATASET, WITH UNIQUE IDENTIFIERS.

IGES - INITIAL GRAPHICS EXCHANGE STANDARD - A NATIONAL BUREAU OF STANDARDS CAD/CAM GRAPHICS DATABASE EXCHANGE FILE FORMAT, WHICH PERMITS GRAPHICS FILES FROM DISSIMILAR COMPUTER SYSTEMS TO BE EXCHANGED.

INSPECTION PLAN - A DESCRIPTION OF 2D AND/OR 3D COMPUTER GENERATED INSPECTION MEDIA/METHODS, DERIVED FROM AUTHORITY DPD / MBD DATASETS, USED TO COMMUNICATE INSPECTION REQUIREMENTS AND MEDIA USAGE TO MANUFACTURING AND INSPECTION AREAS. TYPICAL INSPECTION VIEWS INCLUDE ENGINEERING AND PROCESS CONFIGURATION/TRACEABILITY, OVERLAY/SETUP INSTRUCTIONS, AND A LIST AND/OR GRAPHIC REPRESENTATION OF THE FEATURES TO BE INSPECTED.

NC - NUMERICAL CONTROL – ELECTRONIC MEDIA AND PROCESS USED TO MANUFACTURE PRODUCTS. ALSO KNOW AS CAM – COMPUTER AIDED MANUFACTURING.

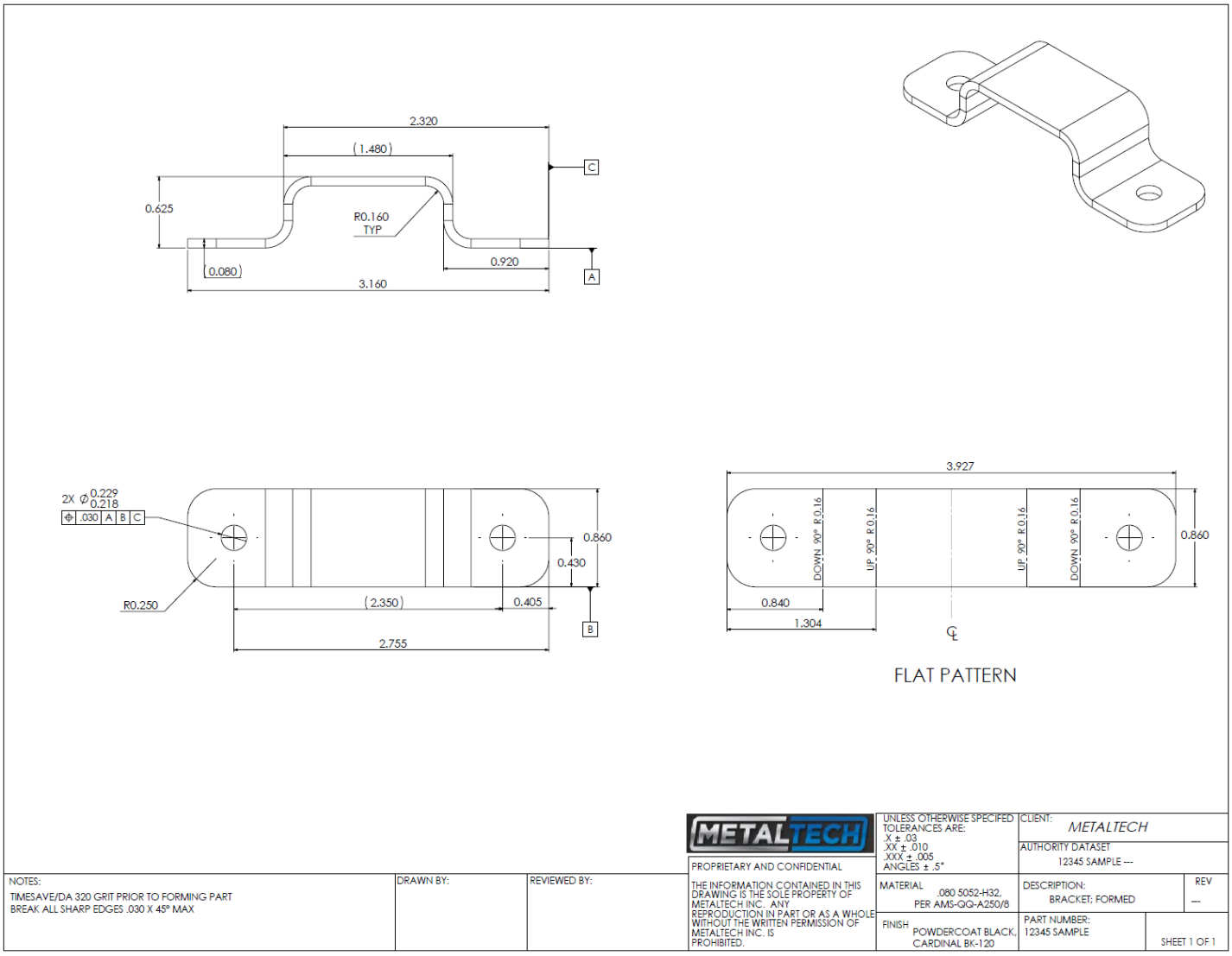
PAS - PRODUCT ACCEPTANCE SOFTWARE - DPD / MBD SOFTWARE (INCLUDING CAD, LEV, DATA EXCHANGE, AND CMS SYSTEMS) USED TO INSPECT AND ACCEPT PARTS, ASSEMBLIES, TOOLING, AND SYSTEMS. (NOTE: NOT EMBEDDED OR LOADABLE AIRBORNE S/W)

REDUCED CONTENT DATASET - ANY DPD / MBD DESIGN DATASET WITHOUT FULL DIMENSIONING OF PRODUCT FEATURES ON A 2D SHEET. THIS FORMAT MAY OR MAY NOT INCLUDE ON OR MORE 2D SHEETS. MODEL BASED DEFINITION (MBD) IS ONE TERM USED TO DESCRIBE A DATASET WITHOUT 2D SHEETS.

STEP - STANDARD TECHNICAL EXCHANGE PROTOCOL. AN INTERNATIONAL STANDARDS OR **ORGANIZATION** STANDARD FOR COMPUTER-INTERPRETABLE REPRESENTATION AND EXCHANGE OF PRODUCT DATA. USED TO EXCHANGE DATASETS BETWEEN DISSIMILAR COMPUTER SYSTEMS.

ATTACHMENT A

DRAWING DERIVATIVE TEMPLATE



ATTACHMENT B

STANDARD MEASUREMENT VERIFICATION GUIDELINES

USE OF AN INSPECTION POINT GRID IS FAVORABLE FOR FIRST ARTICLE INSPECTION OR FOR FIRST PART TRYOUT OF N/C MACHINING PROGRAMS AND CORRESPONDING CMM INSPECTION PROGRAMS. USE OF THE GRID WILL ENSURE GOOD INSPECTION POINT COVERAGE OF MACHINED FEATURES FOR THE FIRST PARTS CREATED AND ASSIST IN PROCESS FEEDBACK AND IMPROVEMENT UNTIL THE N/C PRODUCTION STAGE BEGINS.

WHEN FEATURES TYPES HAVE SURFACE AREAS OF GREATER THAN 4 X 4 INCHES, BUT UNDER 8 FEET IN LENGTH OR WIDTH, AN INSPECTION POINT GRID OF APPROXIMATELY 1 POINT EVERY 4 SQ. INCHES SHOULD BE PLACED ON THE FEATURE. FOR FEATURES GREATER THAN 8 FEET IN LENGTH OR WIDTH, AN INSPECTION POINT GRID OF 1 POINT FOR EVERY 6 SQ. INCHES SHOULD BE PLACED ON THE FEATURE.

IN ADDITION, INSPECTORS WILL CONSIDER PRODUCT MANUFACTURING PROCESSES AND ADD INSPECTION POINTS AS NEEDED TO VERIFY CONFORMANCE TO THE DESIGN. FOR EXAMPLE, PROCESSES WITH PERPENDICULAR OR FLATNESS TOLERANCES WILL REQUIRE ADDITIONAL POINTS FOR A COMPLETE ANALYSIS OF THE DESIGN FEATURE.

FEATURE TYPE	MINIMUM NUMBER OF POINTS
LINE	2
PLANE	3
SURFACE (+/-.010 TO .021)	5 POINTS (ADD PTS. PER POINT GRID CRITERIA ABOVE)
SURFACE (GREATER THAN 5 SQ. IN.)	5 (SEE INSPECTION POINT GRIDS ABOVE)
SURFACE (LESS THAN 2 SQ. IN.)	3 POINTS
SURFACE (>10 DEGREES CONTOUR)	5 POINTS + POINTS SPACED AT EVERY 10 DEGREES OF CONTOUR
TANGENT SURFACES	ADD POINTS PER INSP.
CURVES (LESS THAN 5 INCHES)	3 POINT MINIMUM OR 1 PT PER INCH
CURVES (GREATER THAN 5 INCHES)	5 POINT MINIMUM OR 1 PT. PER 6 IN. (SEE POINT GRID ABOVE)
RADIUS	3

ADDITIONAL CONSIDERATIONS

INDIVIDUAL SURFACES - POINTS ADDED .250 TO.500 FROM THE NOMINAL EDGES OF THE INDIVIDUAL SURFACES

TANGENT SURFACES – (FACES, PATCHES, TANGENT SURFACES/PROCESSES, ETC.) – INSPECTION POINTS ARE ADDED AT APPROXIMATELY ONE INCH ON EITHER SIDE OF SURFACE INFLECTIONS, AND AT THE TANGENCY BETWEEN SURFACES.

RADIUS – A RADIUS LOCATION MAY BE INSPECTED BY A SINGLE POINT. RADIUS SIZE SHALL BE VERIFIED WITH RADIUS GAGES. RADIUS SIZE IS QUICKLY AND ADEQUATELY INSPECTED USING A PHYSICAL RADIUS GAUGE, THAT IS NOT INCLUDED AS PART OF CMM INSPECTION REPORT.
INSPECTION POINTS ARE REQUIRED FOR THE CENTER OF TOOLING HOLES, SCRIBE LINES (TRIM, CROSSHAIR, ETC.), DATUM PROCESSES, AND TOOLING SURFACES (PROCESSES). IN ALL CASES, THE CMM INSPECTION SHOULD BEGIN WITH AN INSPECTION OF EACH SETUP SKETCH DATUM TO DOCUMENT THE SETUP IS VALID, WITHOUT SEARCHING THROUGH THE CMM REPORT FOR THOSE DATUM FEATURES.

IN ALL CASES, WHEN ANY FEATURE IS OUT-OF-TOLERANCE, ADDITIONAL INSPECTION POINTS NEED TO BE CREATED AROUND THE DISCREPANT AREA TO DETERMINE THE FULL EXTENT OF THE OUT-OF-TOLERANCE CONDITION ON THE FEATURE.

PRODUCTION INSPECTION

WHEN N/C PROGRAMS HAVE COMPLETED THE INITIAL RUN PROCESS, AND A CMS PROGRAM HAS VERIFIED AN ACCEPTABLE FAI OF THE PRODUCT, THE NUMBER OF FAI INSPECTION POINTS SHOULD BE REDUCED FOR "PRODUCTION" INSPECTIONS. PRODUCTION INSPECTIONS MUST PROVIDE ENOUGH INSPECTION POINTS TO PROVIDE FEEDBACK FOR N/C VARIABLES SUCH AS CUTTER WEAR, TOOL CHANGES OPERATIONS, ETC. INSPECTION WILL ALSO EVALUATE PRODUCT MANUFACTURING PROCESSES TO DETERMINE IF MEASUREMENTS PROVIDE ENOUGH FEEDBACK TO THE OPERATOR, AND A SUFFICIENT NUMBER OF MEASUREMENT POINTS ARE IN USE. THE NUMBER OF MEASUREMENT POINTS MAY NOT BE REDUCED BELOW THE "MINIMUM NUMBER OF POINTS" PER FEATURE LISTED ABOVE.

Revision History

Rev	Date	Section	Paragraph	Summary of change	Authorized by
A	05/20/2014			INITIAL RELEASE	JUSTIN EVANS – QUALITY MANAGER
B	07/15/2019	ALL	ALL	FULL REVIEW / UPDATE – INCLUDING FORMATTING / PROCEDURE CHANGE UPDATES.	JUSTIN EVANS – QUALITY MANAGER
C	07/10/2020	ALL	ALL	ADDED MBD TERMINOLOGY THROUGHOUT; UPDATED FLOW CHART, ADDED NOTE TO SOFTWARE LIST, ADDED NEW DER. DWG	JUSTIN EVANS – QUALITY MANAGER
D	8/14/2020	VARIOUS	VARIOUS	UPDATED NOTES / CONTENT THROUGHOUT – ADDED NEW DRAWING SAMPLE / UPDATED FLOW CHART	JUSTIN EVANS – QUALITY / OPERATIONS MANAGER