TIER-1 DESIGN READINESS SYSTEM

TIER-1
DFM AUDIT



MAAR
MANUFACTURABILITY AUDIT ASSESSMENT REPORT

COMPILED BY:
TIER-1 ENGINEER, LLC

PREPARED FOR:

JOE SCHMO ENGINEERING CORP.

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This MAAR has been prepared by Tier-1 Engineer, LLC as a limited manufacturability review based on the files, drawings, CAD models, documents, assumptions, and project context submitted by the client at the time of review. The report is intended to identify observed manufacturability concerns, process-fit considerations, drawing risks, and recommended corrective actions within the approved Tier-1 DFM Audit scope.

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DFM AUDIT OVERVIEW

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PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
MAAR-11-0038	11/13/2011	JOE SCHMO ENGINEERING CORP.

CLIENT TYPE	PART / ASSEMBLY NAME
STARTUP	COVER SHROUD

PROJECT STAGE	PART / ASSEMBLY DESCRIPTION
PRE-TOOLING	SUPPORT ARM COVER

ASSIGNED MATERIAL	TARGETED PROCESS
PC+ASA	INJECTION MOLDING

FILES / DOCUMENTATION RECEIVED

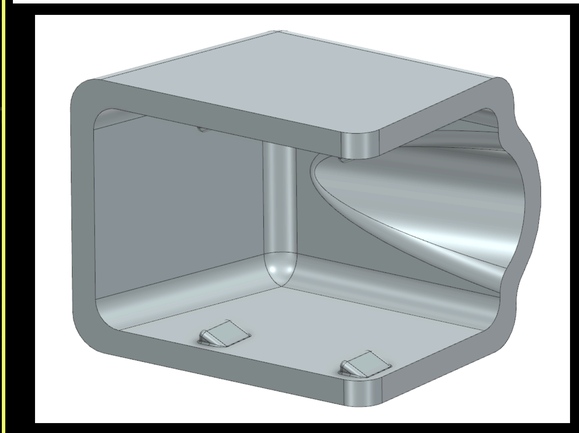
COVER_SHROUD.stp
SUPPORT_ASSEM.stp
COVER_SHROUD.pdf
RE: Cover Shroud RFQ.msg

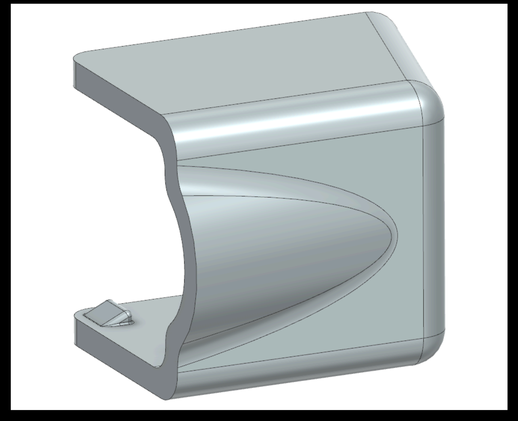
REVIEW LEVEL

LEVEL 1

DESIGN SUBMISSION

CAD FILE	FILE TYPE	UNITS
COVER_SHROUD.stp	STEP	METRIC





CAD DATA USABILITY

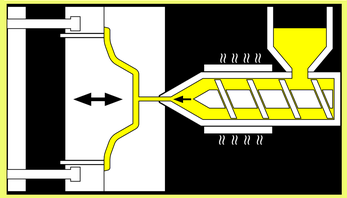
VERY GOOD

REVIEW ASPECTS INCLUDED

PROCESS FIT REVIEW

Checks whether the selected process makes sense for the part, material, volume, and production intent.

TARGETED PROCESS: INJECTION MOLDING



STATUS: REVIEWED

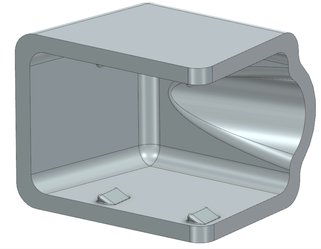
FILES REVIEWED

COVER_SHROUD.stp
COVER_SHROUD.pdf
SUPPORT_ASSEM.stp

SECTION 2

PART DESIGN REVIEW

Checks whether the geometry is manufacturable and identifies part design changes needed before release.



STATUS: REVIEWED

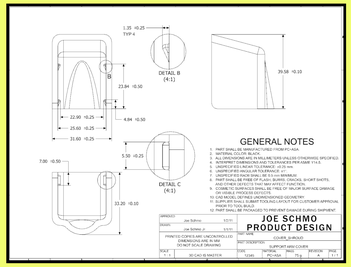
FILES REVIEWED

COVER_SHROUD.stp
COVER_SHROUD.pdf
SUPPORT_ASSEM.stp

SECTION 3

DRAWING REVIEW

Checks whether the drawing clearly defines dimensions, tolerances, notes, finishes, and supplier requirements.



STATUS: REVIEWED

FILES REVIEWED

COVER_SHROUD.pdf

SECTION 4

SUPPORTING DOCUMENT REVIEW

Checks non-CAD items such as emails, RFQ notes, supplier feedback, test reports, photos, and client concerns.

DOCUMENTATION

Material Supplier RFQ

STATUS: REVIEWED
NO AUDIT IMPACT

FILES REVIEWED

RE: Cover Shroud RFQ.msg

N/A

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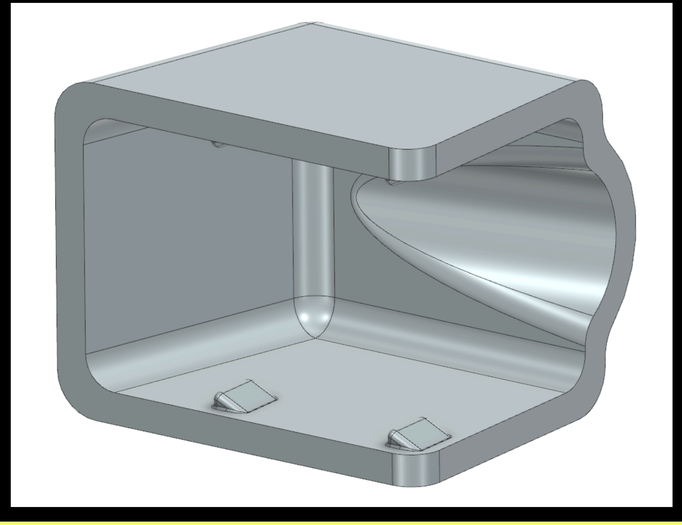
COVER_SHROUD.stp
SUPPORT_ASSEM.stp
COVER_SHROUD.pdf
RE: Cover Shroud RFQ.msg

REVIEW LEVEL

LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
COVER_SHROUD.stp	STEP	METRIC



TIER-1
DFM AUDIT
MAAR

SECTION 1

DFM AUDIT BRIEF

THIS SECTION PROVIDES A FRONT-END AUDIT SUMMATION OF READINESS, MAJOR CORRECTIONS, AND RECOMMENDED ACTION DIRECTION BEFORE THE DETAILED ASSESSMENT SECTIONS

DFM AUDIT BRIEF	1-1
RECOMMENDED CORRECTIVE ACTIONS	1-2
RECOMMENDED CORRECTIVE ACTIONS, CONT.	1-3

SECTION 1
DFM AUDIT BRIEF

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DESIGN INFORMATION

PART / ASSEMBLY NAME
COVER SHROUD

PART / ASSEMBLY DESCRIPTION
SUPPORT ARM COVER

ASSIGNED MATERIAL	TARGETED PROCESS
PC+ASA	INJECTION MOLDING

PROCESS SUITABILITY

Injection molding is a practical manufacturing process for the submitted part based on material, part size, estimated mass, and EAU.

Process fit is considered **suitable, pending corrections** of the part design and drawing issues identified in this report.

PROCESS FIT RATING
SUITABLE
PENDING CORRECTIONS OUTLINED IN THIS REPORT

PART DESIGN READINESS

The part geometry is generally moldable, but **not tooling-ready in its current condition**.

Key design concerns include localized wall thickness variation, missing draft, sharp non-functional edges, and retaining features that increase molding and tooling risk.

CURRENT RATING (AS-SUBMITTED)	PROJECTED RATING (IF CORRECTED)
CRITICAL	GOOD

PART DESIGN CORRECTIONS REQUIRED 4

EXPECTED CORRECTION DIFFICULTY

PROJECTED

DRAWING READINESS

The drawing provides enough information for initial review, but several requirements need correction before supplier release.

Main concerns include tight tolerances, redundant dimensioning, tolerance stack-up risk, and missing cosmetic requirements.

CURRENT RATING (AS-SUBMITTED)	PROJECTED RATING (IF CORRECTED)
CRITICAL	GOOD

DRAWING CORRECTIONS REQUIRED 4

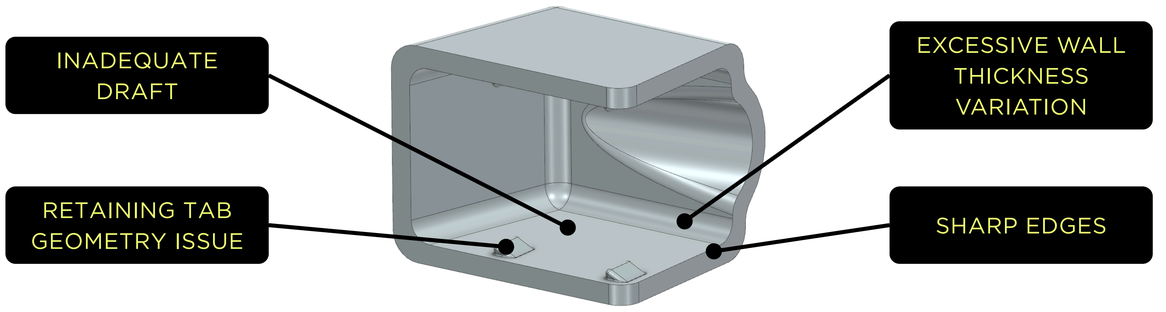
EXPECTED CORRECTION DIFFICULTY

PROJECTED

MANUFACTURABILITY RISKS IDENTIFIED

PART / ASSEMBLY NAME
COVER_SHROUD.stp

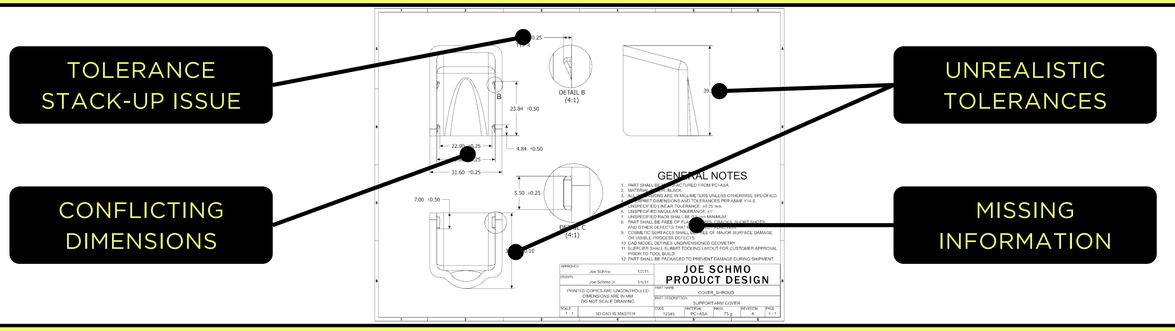
OBSERVED DESIGN RISKS 4



DRAWING RISKS IDENTIFIED

DRAWING NAME
COVER_SHROUD.pdf

OBSERVED DRAWING RISKS 4



RECOMMENDED NEXT STEPS

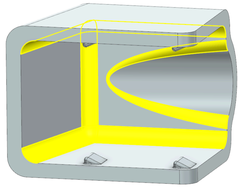
- **REVISE DESIGN BEFORE TOOLING REVIEW**
- **UPDATE DRAWING PACKAGE**
- REVIEW MATERIAL AND PROCESS TARGETS
- ESCALATE TO EXPANDED TIER-1 DFM AUDIT
- REQUEST SUPPLIER TOOLING FEEDBACK
- **ENGAGE SUPPLIER AFTER REVISIONS**

SECTION 1
DFM AUDIT BRIEF

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RECOMMENDED ACTIONS

DES-01



EXCESSIVE WALL THICKNESS VARIATION

WALL THICKNESS VARIES BEYOND PRACTICAL MOLDING FEASIBILITY, INCREASING RISK OF SINK, WARP, AND DIMENSIONAL INSTABILITY.

ACTION PRIORITY

HIGH

RECOMMENDED ACTION

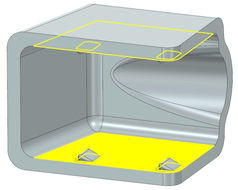
ADJUST CORNER RADII TO REDUCE LOCAL VARIATION

FINDING PAGE

3-3 →

EXPECTED DIFFICULTY

DES-02



LACK OF DRAFT ON RELEVANT FACES

LACK OF DRAFT ON INBOARD AND OUTBOARD FACES MAY PROHIBIT EFFECTIVE PART EJECTION FROM THE TOOL.

ACTION PRIORITY

HIGH

RECOMMENDED ACTION

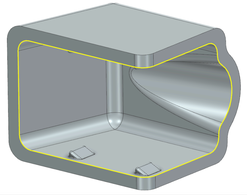
ADD DRAFT RELATIVE TO TOOL DRAW DIRECTION

FINDING PAGE

3-4 →

EXPECTED DIFFICULTY

DES-03



SHARP NON-PARTING LINE EDGES

SHARP EDGES ARE INCLUDED ON NON-PARTING LINE EDGES OF THE PART. SHARP EDGES MAY CAUSE PREMATURE TOOL WEAR AND STRESS-RISERS.

ACTION PRIORITY

MEDIUM

RECOMMENDED ACTION

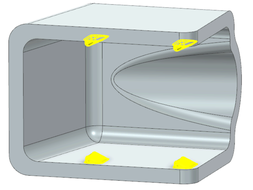
ADD PRACTICAL RADII TO NON-FUNCTIONAL SHARP EDGES

FINDING PAGE

3-5 →

EXPECTED DIFFICULTY

DES-04



LOCALIZED RISK AT RETAINING FEATURES

RETAINING FEATURES ARE MODELED AS SOLID, WITHOUT CORING OR ACTION-FRIENDLY GEOMETRY, INCREASING DEFECT RISK.

ACTION PRIORITY

HIGH

RECOMMENDED ACTION

CORE OUT RETAINING FEATURES

FINDING PAGE

3-6 →

EXPECTED DIFFICULTY

DIFFICULTY

SIMPLE — DIFFICULT

SHOWS EXPECTED EFFORT OF THE CORRECTION, FROM SIMPLE UPDATE TO MAJOR REDESIGN OR SUPPLIER/TOOLING INVOLVEMENT.

ACTION PRIORITY

LOW | MEDIUM | HIGH

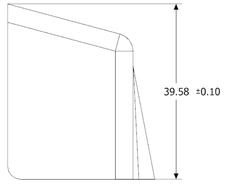
SHOWS CORRECTION IMPORTANCE BASED ON MANUFACTURABILITY RISK, RELEASE IMPACT, AND PRODUCTION EXPOSURE.

SECTION 1
DFM AUDIT BRIEF

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RECOMMENDED ACTIONS

TOL-01



UNREALISTICALLY TIGHT TOLERANCES

SOME TOLERANCES APPEAR TIGHTER THAN PRACTICAL MOLDING CONTROL REQUIRES.

ACTION PRIORITY

HIGH

RECOMMENDED ACTION

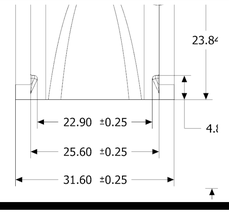
RELAX TOLERANCES, OR JUSTIFY THE CONTROL

FINDING PAGE

4-3 →

EXPECTED DIFFICULTY

TOL-02



REDUNDANT OR CONFLICTING DIMENSIONS

THE DRAWING CONTROLS OUTER SHELL AND INTERNAL OFFSET DIMENSIONS SEPARATELY, CREATING REDUNDANCY.

ACTION PRIORITY

MEDIUM

RECOMMENDED ACTION

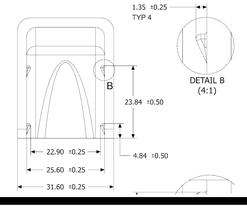
DEFINE THE PRIMARY CONTROL STRATEGY

FINDING PAGE

4-4 →

EXPECTED DIFFICULTY

TOL-03



TOLERANCE STACK-UP CONCERN

INDIVIDUAL TAB DIMENSIONS MAY REMAIN WITHIN TOLERANCE WHILE STILL CREATING A SPAN THAT EXCEEDS THE LIMIT.

ACTION PRIORITY

HIGH

RECOMMENDED ACTION

DEFINE THE FUNCTIONAL FEATURES

FINDING PAGE

4-5 →

EXPECTED DIFFICULTY

DWG-01

GENERAL NOTES

1. PART SHALL BE MANUFACTURED FROM PC+ASA.
2. MATERIAL COLOR: BLACK.
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
4. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5.
5. UNSPECIFIED LINEAR TOLERANCE: ±0.25 mm.
6. UNSPECIFIED ANGULAR TOLERANCE: ±1°.
7. UNSPECIFIED RADII SHALL BE 0.5 mm MINIMUM.
8. PART SHALL BE FREE OF FLASH, BURRS, CRACKS, SHORT SHOTS, AND OTHER DEFECTS THAT MAY AFFECT FUNCTION.
9. COSMETIC SURFACES SHALL BE FREE OF MAJOR SURFACE DAMAGE OR VISIBLE PROCESS DEFECTS.
10. CAD MODEL DEFINES UNDIMENSIONED GEOMETRY.
11. SUPPLIER SHALL SUBMIT TOOLING LAYOUT FOR CUSTOMER APPROVAL PRIOR TO TOOL BUILD.
12. PART SHALL BE PACKAGED TO PREVENT DAMAGE DURING SHIPMENT.

MISSING REQUIRED INFORMATION

THE DRAWING DOES NOT DEFINE SURFACE FINISH, COSMETIC EXPECTATIONS, OR SURFACE CLASSES.

ACTION PRIORITY

HIGH

RECOMMENDED ACTION

DEFINE SURFACE FINISH / COSMETIC REQUIREMENTS

FINDING PAGE

4-6 →

EXPECTED DIFFICULTY

DIFFICULTY

SIMPLE — DIFFICULT

SHOWS EXPECTED EFFORT OF THE CORRECTION, FROM SIMPLE UPDATE TO MAJOR REDESIGN OR SUPPLIER/TOOLING INVOLVEMENT.

ACTION PRIORITY

LOW | MEDIUM | HIGH

SHOWS CORRECTION IMPORTANCE BASED ON MANUFACTURABILITY RISK, RELEASE IMPACT, AND PRODUCTION EXPOSURE.

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ASSIGNED MATERIAL	TARGETED PROCESS
PC+ASA	INJECTION MOLDING

FILES / DOCUMENTATION RECEIVED

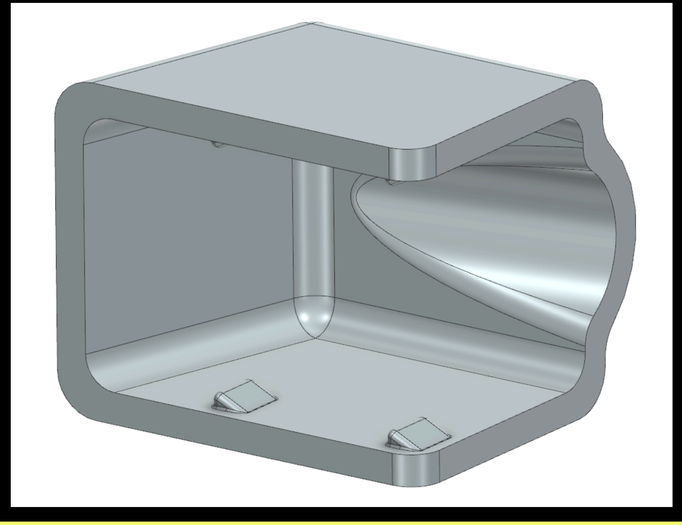
COVER_SHROUD.stp
SUPPORT_ASSEM.stp
COVER_SHROUD.pdf
RE: Cover Shroud RFQ.msg

REVIEW LEVEL

LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
COVER_SHROUD.stp	STEP	METRIC



TIER-1
DFM AUDIT
MAAR

SECTION 2

PROCESS FIT ASSESSMENT

THIS SECTION EVALUATES WHETHER THE SELECTED MANUFACTURING PROCESS IS SUITABLE FOR THE SUBMITTED PART BASED ON PART ATTRIBUTES AND PROCESS-SPECIFIC REQUIREMENTS

PROCESS FIT OVERVIEW	2-1
PROCESS FIT ASSESSMENT	2-2

SECTION 2
PROCESS FIT ASSESSMENT

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TARGETED MANUFACTURING PROCESS

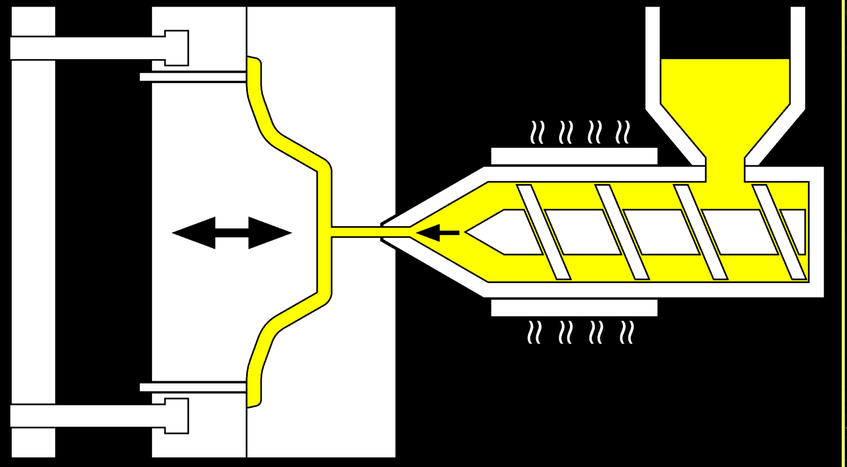
INJECTION MOLDING

ANNUAL PRODUCTION CAPABILITY
5,000 - 10+ MILLION UNITS

PART SIZE CAPABILITY
5 - 1000+ MM

PART COMPLEXITY CAPABILITY
HIGH

SURFACE FINISH CAPABILITY
VERY HIGH



KEY INJECTION MOLDING PARAMETERS

PARAMETER	CURRENT DESIGN ALIGNMENT		
	GOOD	MARGINAL	POOR
ASSIGNED MATERIAL: PC+ASA	●		
OVERALL DIMENSIONS (LxWxH): 33.2mm x 31.6mm x 39.6mm	●		
PART VOLUME: 10508 mm^3	●		
ESTIMATED PART MASS: 12 g	●		
ESTIMATED ANNUAL PRODUCTION VOLUME: 10,000 UNITS		● 1	
SPECIAL FEATURES: DEEP SHELL GEOMETRY, UNDERCUT MOUNTING FEATURES		● 2	

PROCESS FIT ASSESSMENT

Injection molding is a practical process choice for the submitted cover shroud based on the above parameters. The part geometry is generally compatible with molding, but it is **not tooling-ready in its current condition**. Several design and drawing issues must be resolved before supplier quotation, tooling release, or production planning (see Sections 3 and 4).

1. **ESTIMATED ANNUAL PRODUCTION VOLUME** of 10,000 units is on the lower end of practical injection molding feasibility. Tooling cost recovery, piece-price sensitivity, and design maturity should be reviewed before committing to production tooling.

2. **SPECIAL FEATURES** like undercut mounting features and deep shell geometry are moldable, but they may require tool action, feature redesign, added draft, or supplier review before the design can be considered clean for injection molding.

Injection molding remains the recommended production process, provided the design and drawing corrections identified in this report are completed before tooling release. SLS may be considered only as a bridge-build or low-volume alternative if tooling cost or timing does not support immediate mold investment.

OVERALL PROCESS FIT RATING



DESIGN REVISIONS NEEDED?
YES
SEE SECTIONS 3 AND 4

SECTION 2
PROCESS FIT ASSESSMENT

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PROCESS ALIGNMENT FACTORS

PLANNED MATERIAL

PC+ASA

INJECTION MOLDING MATERIAL FAMILY

THERMOPLASTIC BLEND

PC+ASA IS A THERMOPLASTIC RESIN BLEND AND IS COMPATIBLE WITH CONVENTIONAL INJECTION MOLDING. IT IS SUITABLE FOR MOLDED COVER APPLICATIONS WHERE IMPACT RESISTANCE, DIMENSIONAL STABILITY, AND IMPROVED OUTDOOR/WEATHERING PERFORMANCE ARE DESIRED.

ALIGNMENT: SUITABLE

PART COMPLEXITY

MODERATE

PART GEOMETRY OVERVIEW

SHELLED FORM WITH UNDERCUT RETAINING FEATURES REQUIRING REVIEW BEFORE TOOLING RELEASE

OVERALL GEOMETRY IS COMPATIBLE WITH INJECTION MOLDING, BUT LOCAL FEATURES REQUIRE DESIGN CORRECTION BEFORE TOOLING RELEASE. SEE SECTION 3 FOR PART DESIGN FINDINGS.

ALIGNMENT: SUITABLE

ESTIMATED ANNUAL USAGE

10,000 UNITS

PRACTICAL INJECTION MOLDING VOLUME RANGE

1K — UNITS — 1M+

STATED ANNUAL VOLUME IS ON THE LOWER END OF PRACTICAL INJECTION MOLDING FEASIBILITY. TOOLING COST RECOVERY AND PIECE-PRICE SENSITIVITY SHOULD BE REVIEWED BEFORE COMMITTING TO PRODUCTION TOOLING.

ALIGNMENT: MARGINAL

COSMETIC REQUIREMENTS

NONE ASSIGNED

SURFACE FINISH / COSMETIC REQUIREMENT

SURFACE FINISH OR COSMETIC REQUIREMENTS NOT DEFINED

COSMETIC PROCESS FIT CANNOT BE FULLY CONFIRMED BECAUSE SURFACE FINISH, TEXTURE, GLOSS, PAINT, COATING, APPROVED SAMPLE, OR A/B/C SURFACE REQUIREMENTS ARE NOT DEFINED. SEE SECTION 4 FOR DRAWING AND TOLERANCING FINDINGS.

ALIGNMENT: POOR

PART SIZE

33.2 x 31.6 x 39.6

PRACTICAL INJECTION MOLDING PART SIZE RANGE

10 — MM — 1000

OVERALL PART SIZE ALIGNS WELL WITH INJECTION MOLDING. MATERIAL USAGE PER PART IS APPROXIMATELY 12 GRAMS (NOT ACCOUNTING FOR SPRUES/RUNNERS/GATING)

ALIGNMENT: SUITABLE

SPECIAL FEATURES

UNDERCUTS

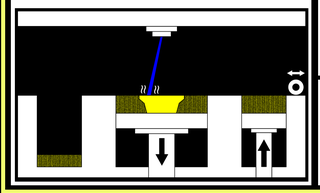
UNDERCUT MOUNTING / RETAINING TABS

UNDERCUT FEATURES ARE POSSIBLE WITH INJECTION MOLDING, WITHIN REASON. UNDERCUT MOUNTING FEATURES ARE COMMON IN MOLDED PARTS, BUT DESIGN RULES MUST BE FOLLOWED. SEE SECTION 3 FOR PART DESIGN FINDINGS.

ALIGNMENT: MARGINAL

REASONABLE ALTERNATIVE PROCESS

SLS



SLS MAY BE A PRACTICAL ALTERNATIVE FOR LOW-VOLUME PRODUCTION OR BRIDGE BUILDS IF INJECTION MOLD TOOLING COST IS NOT JUSTIFIED. HOWEVER, UNIT COST, SURFACE FINISH, DIMENSIONAL CONTROL, AND MATERIAL PERFORMANCE SHOULD BE REVIEWED.

PROS:	CONS:
NO HARD TOOLING	HIGHER UNIT COST
GOOD FOR LOW VOLUME	ROUGHER SURFACE FINISH
FAST DESIGN ITERATION	LESS MATERIAL CHOICE

RECOMMENDED PROCESS FIT ACTIONS

COSMETIC REQUIREMENTS	DEFINE COSMETIC REQUIREMENTS AND EXPECTATIONS BEFORE PROCESS COMMITMENT. SEE SECTION 4.	SEE SECTION 4
SPECIAL FEATURES	ENSURE THE INCLUDED UNDERCUT FEATURES FOLLOW INJECTION MOLDING DESIGN RULES, SEE SECTION 3.	SEE SECTION 3

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PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
MAAR-11-0038	11/13/2011	JOE SCHMO ENGINEERING CORP.

CLIENT TYPE	PART / ASSEMBLY NAME
STARTUP	COVER SHROUD

PROJECT STAGE	PART / ASSEMBLY DESCRIPTION
PRE-TOOLING	SUPPORT ARM COVER

ASSIGNED MATERIAL	TARGETED PROCESS
PC+ASA	INJECTION MOLDING

FILES / DOCUMENTATION RECEIVED

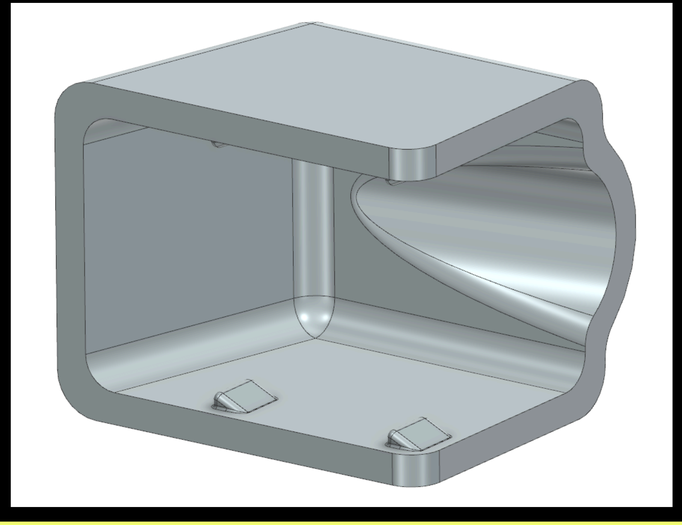
COVER_SHROUD.stp
SUPPORT_ASSEM.stp
COVER_SHROUD.pdf
RE: Cover Shroud RFQ.msg

REVIEW LEVEL

LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
COVER_SHROUD.stp	STEP	METRIC



TIER-1
DFM AUDIT
MAAR

SECTION 3

PART DESIGN ASSESSMENT

THIS SECTION EVALUATES THE SUBMITTED GEOMETRY FOR MANUFACTURABILITY RISKS AND IDENTIFIES PART DESIGN CORRECTIONS RECOMMENDED BEFORE SUPPLIER QUOTATION, TOOLING RELEASE, OR PRODUCTION PLANNING.

PART DESIGN OVERVIEW	3-1
PART DESIGN EVALUATION FACTORS	3-2
DESIGN FINDING - DES-01	3-3
DESIGN FINDING - DES-02	3-4
DESIGN FINDING - DES-03	3-5
DESIGN FINDING - DES-04	3-6

SECTION 3
PART DESIGN ASSESSMENT

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DESIGN INFORMATION

PART / ASSEMBLY NAME
COVER SHROUD

GENERAL DESCRIPTION
SUPPORT ARM COVER

CAD FILE
COVER_SHROUD.stp

GEOMETRY DESCRIPTION

THE SUBMITTED COVER_SHROUD IS A PROTECTIVE COVER WITH AN OPEN-SIDED SHROUD BODY, ROUNDED EXTERIOR EDGES, INTERNAL CLEARANCE VOLUME, MOUNTING/RETAINING FEATURES, AND LOCALIZED WALL TRANSITIONS. THE GEOMETRY IS INTENDED TO COVER THE SUPPORT ARM AREA WHILE PROVIDING A FINISHED EXTERIOR SURFACE AND ATTACHMENT TO THE MAIN ASSEMBLY.

PART DESIGN SUMMARY

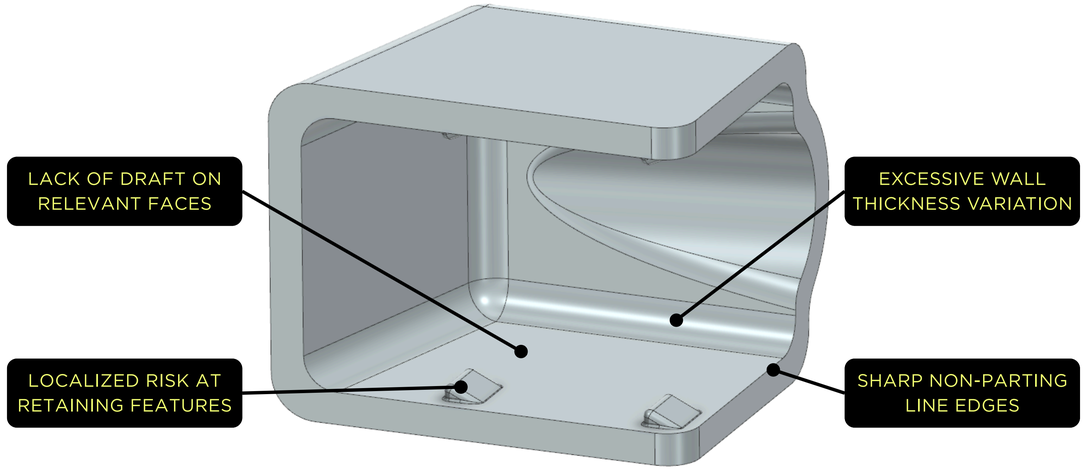
The submitted COVER_SHROUD appears suitable as a protective injection-molded cover for the support arm area. The overall concept, open shroud form, exterior cover surface, and general attachment approach appear reasonable for the stated part function.

The design should not be considered ready for tooling release as submitted. The current geometry shows several manufacturability concerns that should be corrected before mold design, supplier quoting, or production tooling. Key concerns include lack of draft on relevant faces, excessive wall thickness variation, sharp non-parting line edges, and localized molding risk around the retaining features.

The part should be revised to better support injection molding requirements. Draft should be added where needed for ejection, wall sections should be made more consistent, sharp edges should be softened where practical, and retaining features should be reviewed for fill, cooling, strength, and tooling feasibility.

The recommended next step is to revise the CAD before tooling review, with focus on draft, wall thickness consistency, molded edge condition, and retaining feature design.

PART DESIGN FINDINGS



DES-01	EXCESSIVE WALL THICKNESS VARIATION	3-3
DES-02	LACK OF DRAFT ON RELEVANT FACES	3-4
DES-03	SHARP NON-PARTING LINE EDGES	3-5
DES-04	LOCALIZED RISK AT RETAINING FEATURES	3-6

OVERALL PART DESIGN READINESS

CURRENT RATING: **CRITICAL**

DESIGN REVISIONS NEEDED?
YES
SEE NEXT PAGES

SECTION 3
PART DESIGN ASSESSMENT

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PART DESIGN EVALUATION FACTORS

NOMINAL WALL THICKNESS

3.0MM

NOMINAL WALL IS APPROXIMATELY 3.0MM, BUT LOCALIZED THICK SECTIONS EXIST NEAR CORNERS, TRANSITIONS, AND RETAINING FEATURES, INCREASING DEFECT RISK.

DESIGN READINESS

GOOD	MARGINAL	POOR
		●

CORRECTION REQUIRED

REFERENCE:
DES-01
DES-04

OVERALL PART SHAPE

DEEP, OPEN SHELL GEOMETRY

OPEN SHELL GEOMETRY IS GENERALLY WELL-SUITED FOR INJECTION MOLDING AND DOES NOT CREATE A MAJOR SHAPE-LEVEL MANUFACTURABILITY CONCERN.

DESIGN READINESS

GOOD	MARGINAL	POOR
●		

NO ACTION REQUIRED

REFERENCE:

DRAFT / TOOL RELEASE

0° ON ALL RELEVANT FACES

NO CLEAR DRAFT IS INCLUDED ON RELEVANT MOLDED FACES, CREATING POTENTIAL DIE-LOCK, PART DRAG, TOOL WEAR, AND RELEASE ISSUES DURING MOLDING.

DESIGN READINESS

GOOD	MARGINAL	POOR
		●

CORRECTION REQUIRED

REFERENCE:
DES-02
DES-04

RADII / EDGE CONDITIONS

SOME SHARP EDGES INCLUDED

SEVERAL NON-FUNCTIONAL MOLDED EDGES REMAIN SHARP WHERE RADII COULD BE ADDED, INCREASING STRESS CONCENTRATION, COSMETIC RISK, AND TOOLING SENSITIVITY.

DESIGN READINESS

GOOD	MARGINAL	POOR
	●	

CORRECTION REQUIRED

REFERENCE:
DES-03

UNDERCUT GEOMETRY

RETAINING TABS CAUSE UNDERCUT

RETAINING FEATURES CREATE UNDERCUT CONDITIONS THAT LIKELY REQUIRE TOOL ACTION, GEOMETRY REVISION, OR A DIFFERENT RETENTION STRATEGY BEFORE TOOLING RELEASE.

DESIGN READINESS

GOOD	MARGINAL	POOR
		●

CORRECTION REQUIRED

REFERENCE:
DES-04

SPECIAL FEATURES

RETAINING TABS DEEP SHELL

RETAINING TABS AND DEEP SHELL FEATURES ARE FEASIBLE, BUT THEY REQUIRE REFINEMENT FOR CORING, DRAFT, TOOL ACCESS, WALL CONTROL, AND PART RELEASE.

DESIGN READINESS

GOOD	MARGINAL	POOR
	●	

CORRECTION REQUIRED

REFERENCE:
DES-01
DES-04

GOOD
APPEARS SUITABLE FOR THE TARGETED MANUFACTURING PROCESS WITH NO MAJOR CORRECTION IDENTIFIED.

MARGINAL
APPEARS FEASIBLE, BUT MAY CREATE TOOLING, MOLDING, QUALITY, COST, FIT, OR PRODUCTION RISK IF NOT REVIEWED OR CORRECTED.

POOR
SIGNIFICANT MANUFACTURABILITY OR TOOLING RISK. CORRECTION RECOMMENDED BEFORE QUOTE, TOOLING, OR RELEASE.

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PART DESIGN FINDING

DES-01

PRIORITY

HIGH

EXCESSIVE WALL THICKNESS VARIATION

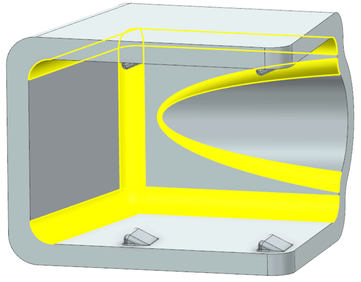
Localized wall thickness variation is present around corner and transition areas. This condition increases the risk of sink, uneven cooling, local shrinkage, and dimensional instability during molding.

POTENTIAL IMPACTS

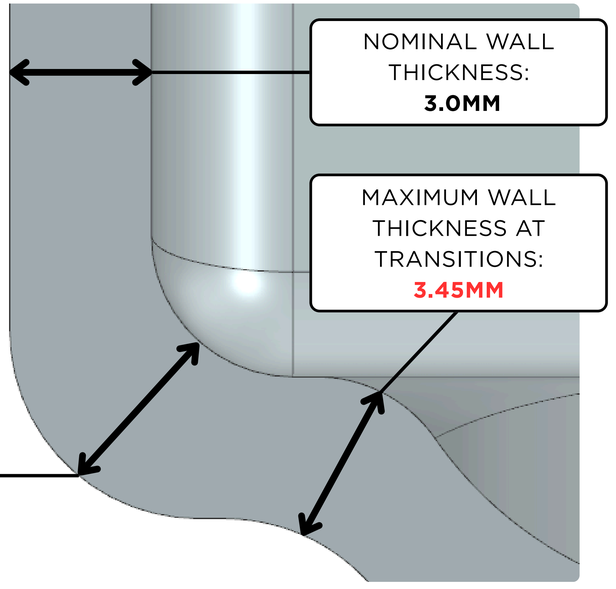
- **COSMETIC SINK OR SURFACE READ-THROUGH**
- **INCREASED RISK OF INTERNAL STRESS OR WARP**
- **HIGHER DIMENSIONAL VARIATION**
- **UNEVEN COOLING AND LOCALIZED SHRINKAGE**
- **SUPPLIER PUSHBACK**
- **TOOLING CORRECTION REQUESTS**

OBSERVED CONDITION

Inconsistent radius offsets, causing wall thickness variation at corners.



Incorrect radius offsets create thick wall sections at the cover corners and internal transition areas. Nominal wall is 3.0mm, but measured sections increase to approximately 3.83mm at corners and 3.45mm at transitions. These thick areas may cool slower than surrounding walls, increasing sink, shrink, warp, and dimensional variation.

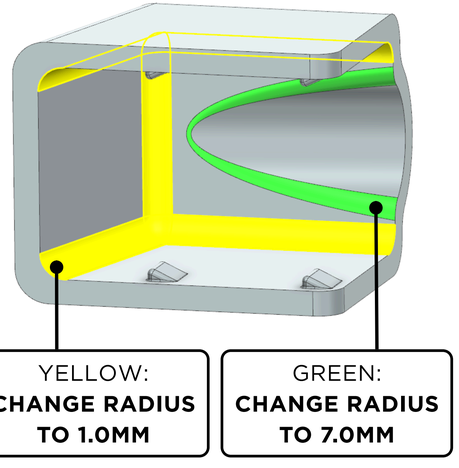


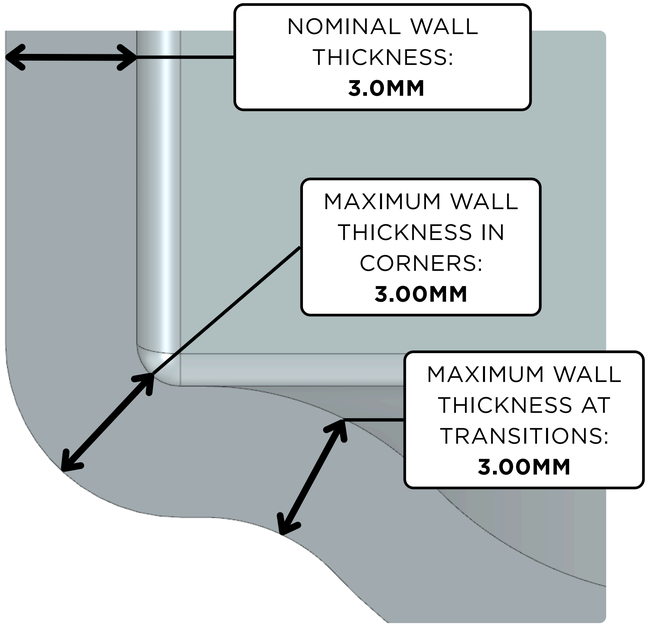
RECOMMENDED ACTION

PRIMARY ACTION: **ADJUST CORNER RADII TO REDUCE LOCAL WALL THICKNESS VARIATION**

EXPECTED DIFFICULTY

Revise corner and transition radii to maintain a more consistent 3.0mm wall section. Adjust the corner radius to 1.0mm and transition radius to 7.0mm where shown, then confirm the revised geometry maintains clearance, appearance, strength, and mold release requirements.





PART DESIGN FINDING

DES-02

PRIORITY

HIGH

LACK OF DRAFT ON RELEVANT FACES

Several vertical and sidewall faces appear to have zero draft relative to the assumed tool draw direction, increasing risk of die-lock, drag marks, poor release, and tool damage.

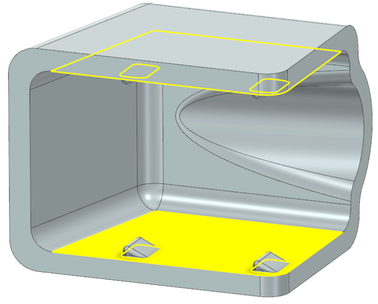
POTENTIAL IMPACTS

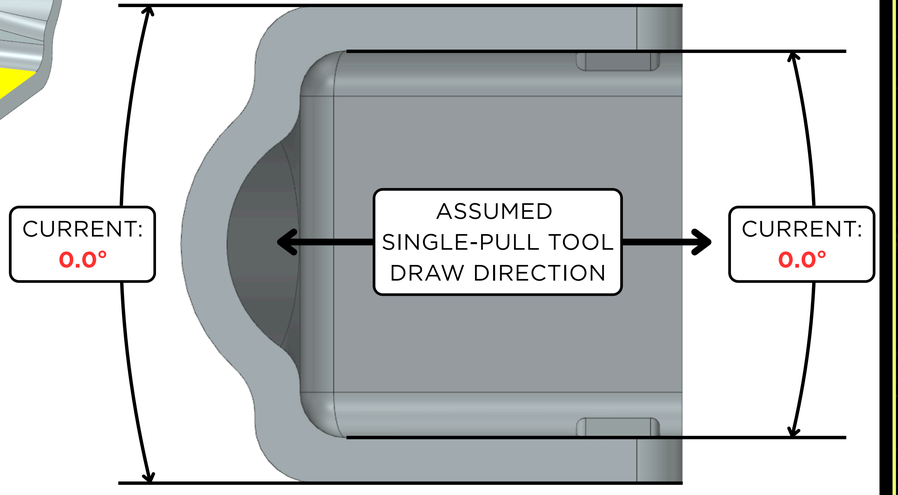
- **DIE-LOCK OR PART STICKING**
- **TOOL DAMAGE OR HIGH EJECTION FORCE**
- **INCREASED SCRAP OR COSMETIC DEFECTS**
- **DRAG MARKS ON RELEASE**
- **SUPPLIER PUSHBACK**
- **TOOLING CORRECTION REQUESTS**

OBSERVED CONDITION

Zero-draft condition, causing potential die-lock, defects, or tool damage.

Relevant molded faces do not show clear draft in the expected tool-pull direction. Several vertical and internal wall surfaces appear near 0°, which may create mold drag, part sticking, scuffing, ejection difficulty, and added tool wear during production. Draft should be confirmed against the intended parting line and mold-open direction.



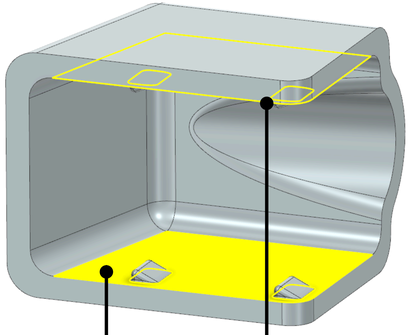


RECOMMENDED ACTION

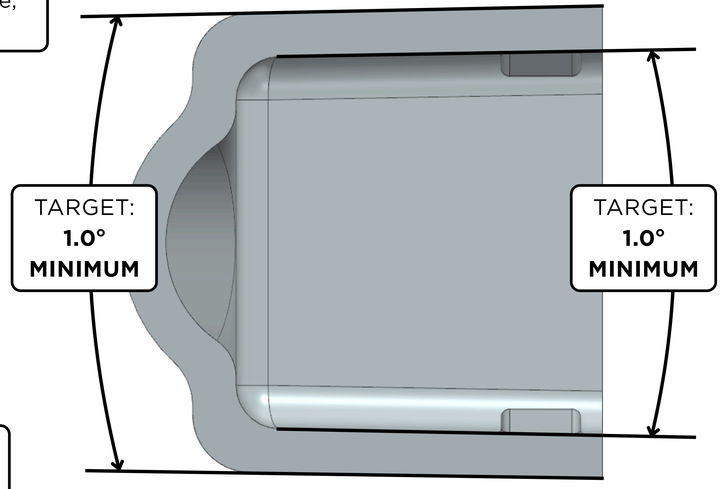
PRIMARY ACTION: **ADD DRAFT RELATIVE TO TOOL DRAW DIRECTION**

EXPECTED DIFFICULTY

Add draft to relevant molded faces based on the intended tool-pull direction, parting line, surface finish, and supplier molding requirements. Use at least 1° draft where practical, and increase draft on textured, deep, or high-drag surfaces. Confirm the revised geometry maintains fit, clearance, appearance, and assembly function.



YELLOW:
ADD MINIMUM 1.0° TOTAL DRAFT RELATIVE TO TOOL DRAW VECTOR



SECTION 3
PART DESIGN ASSESSMENT

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PART DESIGN FINDING

DES-03

PRIORITY
MEDIUM

SHARP NON-PARTING LINE EDGES

Sharp edges are present on molded geometry where radii appear practical. These edges may increase tooling wear, stress concentration, cosmetic defects, or molding instability.

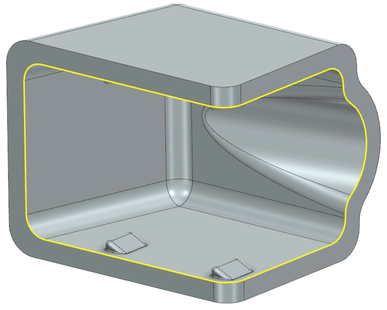
POTENTIAL IMPACTS

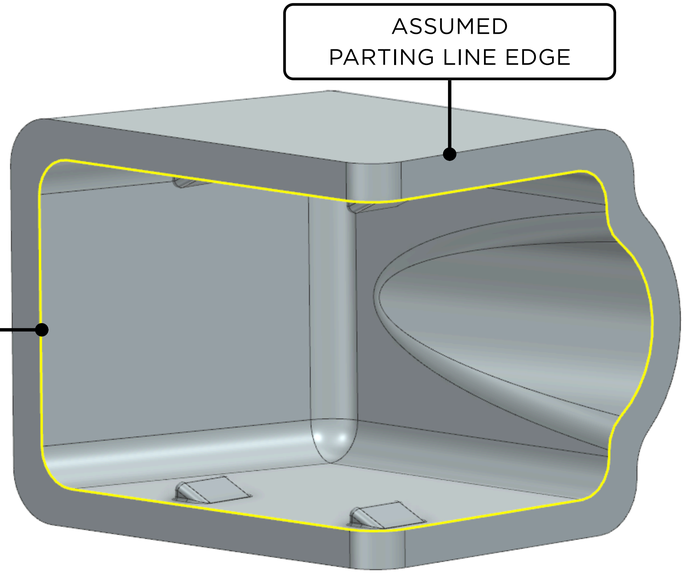
- **PREMATURE TOOL WEAR**
- **COSMETIC EDGE DEFECTS**
- **TOOLING CORRECTION REQUESTS**
- **LOCAL STRESS CONCENTRATION**
- **LOCAL FILL / COOLING INSTABILITY**
- **INCREASED TOOL MAINTENANCE RISK**

OBSERVED CONDITION

Sharp edges on non-parting-line geometry, which can cause tool wear, flow issues, and defects.

Several molded edges remain sharp in non-parting line areas where small radii could likely be added without changing the parting strategy. These sharp edge conditions may increase stress concentration, cosmetic sensitivity, handling sharpness, flow hesitation, and tooling wear. Edge breaks should be reviewed against fit, appearance, and mold construction needs.



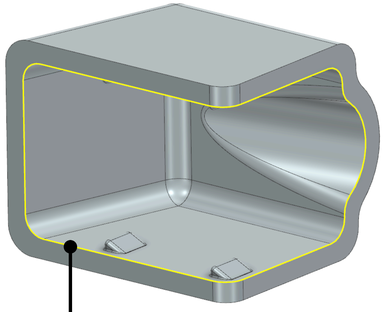


RECOMMENDED ACTION

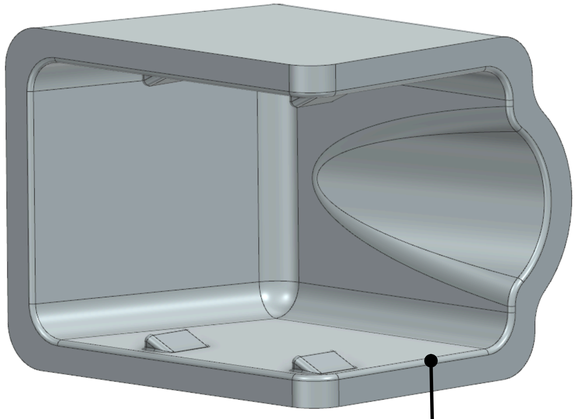
PRIMARY ACTION: **ADD PRACTICAL RADII TO NON-FUNCTIONAL SHARP EDGES**

EXPECTED DIFFICULTY

Add small radii or edge breaks to non-functional sharp molded edges where practical. Use consistent radius values that support molding, handling, durability, and cosmetic appearance without interfering with mating surfaces, shutoffs, parting line conditions, or required edge definition.



YELLOW:
ADD PRACTICAL RADII TO EDGE. MINIMUM 0.5MM RECOMMENDED



0.5MM MINIMUM RADIUS
(WHERE FUNCTIONALLY ALLOWABLE)

SECTION 3
PART DESIGN ASSESSMENT

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PART DESIGN FINDING

DES-04

PRIORITY

HIGH

LOCALIZED RISK AT RETAINING FEATURES

Retaining features are modeled as solid, localized mass without coring or action-friendly backside geometry. This may increase sink, shrinkage, tool complexity, and correction risk.

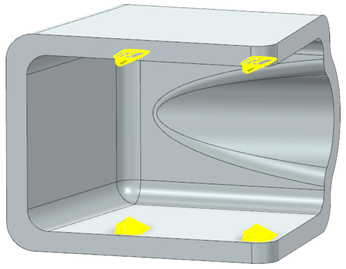
POTENTIAL IMPACTS

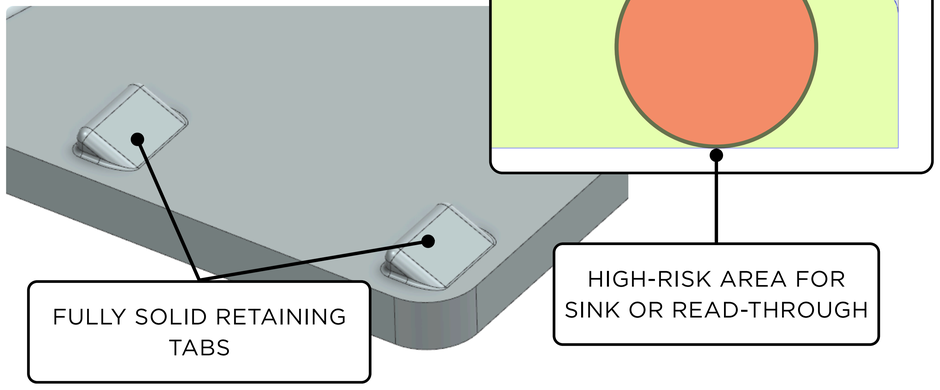
- **LOCALIZED SINK OR READ-THROUGH**
- **SLIDE/LIFTER COMPLEXITY**
- **DIMENSIONAL INSTABILITY NEAR RETAINERS**
- **UNEVEN COOLING AND SHRINKAGE**
- **SUPPLIER TOOLING CORRECTION REQUESTS**
- **REDESIGN RISK**

OBSERVED CONDITION

Localized solid retaining features, creating thick material sections and unclear tooling access conditions.

The retaining features appear to be modeled as localized solid protrusions tied directly into the surrounding wall. These areas create thick material sections that may cool differently than the main wall, increasing risk of sink, read-through, local shrinkage, and dimensional instability near the retainers. Backside geometry also appears to lack clear draft, coring, or action-friendly faces for straightforward tooling.



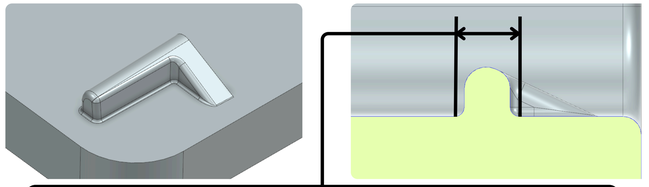


RECOMMENDED ACTION

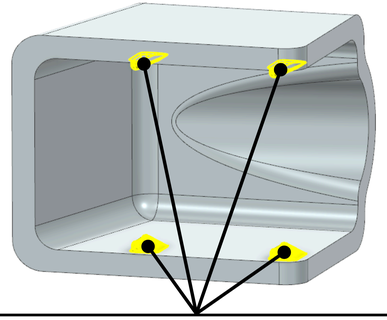
PRIMARY ACTION: **CORE OUT RETAINING FEATURES AND DEFINE ACTION-FRIENDLY FACES**

EXPECTED DIFFICULTY

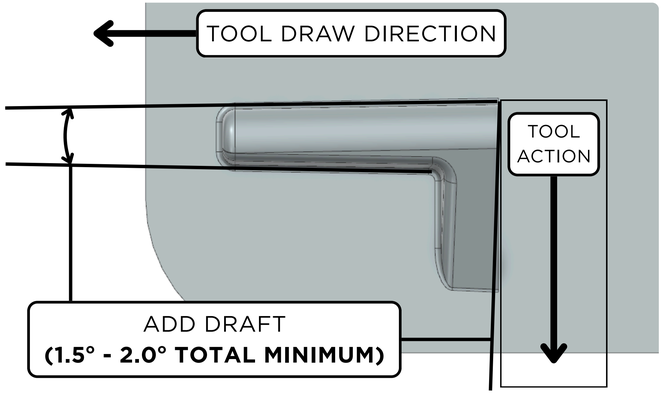
Revise the retaining features to reduce localized mass and improve tooling feasibility. Core out the backside where practical, maintain more consistent wall thickness, add appropriate draft, and define shutoff or action-friendly faces so the retaining function can be molded with lower sink, shrinkage, and tooling correction risk.



UTILIZE INJECTION MOLDING RIB DESIGN GUIDELINES FOR RETAINING TAB WIDTH:
(50-60% OF NOMINAL WALL THICKNESS)
3.0MM NOM. WALL = 1.5-1.8MM TAB THICKNESS



YELLOW:
CORE RETAINING FEATURES. ADD FLAT, DRAFTED BACKSIDE FACES FOR TOOL ACTION OR SHUTOFF.



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PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
MAAR-11-0038	11/13/2011	JOE SCHMO ENGINEERING CORP.

CLIENT TYPE	PART / ASSEMBLY NAME
STARTUP	COVER SHROUD

PROJECT STAGE	PART / ASSEMBLY DESCRIPTION
PRE-TOOLING	SUPPORT ARM COVER

ASSIGNED MATERIAL	TARGETED PROCESS
PC+ASA	INJECTION MOLDING

FILES / DOCUMENTATION RECEIVED

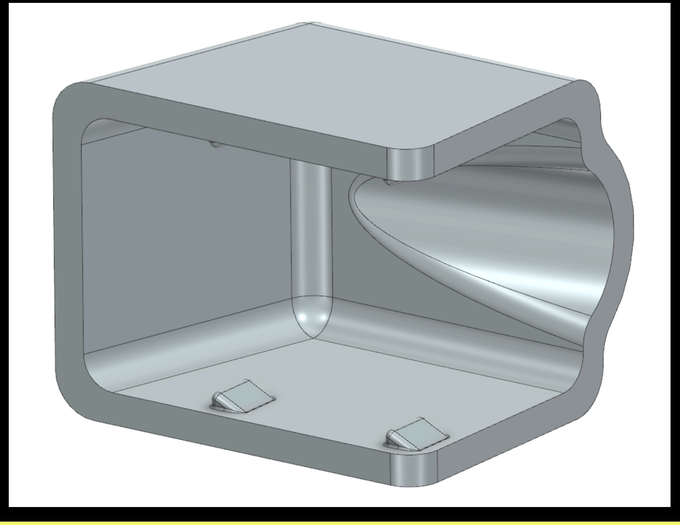
COVER_SHROUD.stp
SUPPORT_ASSEM.stp
COVER_SHROUD.pdf
RE: Cover Shroud RFQ.msg

REVIEW LEVEL

LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
COVER_SHROUD.stp	STEP	METRIC



TIER-1
DFM AUDIT
MAAR

SECTION 4

DRAWING ASSESSMENT

THIS SECTION EVALUATES THE SUBMITTED DRAWING FOR TOLERANCE PRACTICALITY, DIMENSIONING STRATEGY, SURFACE REQUIREMENTS, DRAWING CLARITY, AND SUPPLIER-FACING INFORMATION NEEDED BEFORE RELEASE.

DRAWING OVERVIEW	4-1
DRAWING EVALUATION FACTORS	4-2
DRAWING FINDING - TOL-01	4-3
DRAWING FINDING - TOL-02	4-4
DRAWING FINDING - TOL-03	4-5
DRAWING FINDING - DWG-01	4-6

SECTION 4
DRAWING ASSESSMENT

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DRAWING INFORMATION

DRAWING NAME			
COVER_SHROUD.pdf			
REVISION	**UNITS**	**PAGES**	**DRAWING TYPE**
A	METRIC	1	PART DRAWING
STANDARD		**DIMENSIONING SCHEME**	
ASME Y14.5		FEATURE-BASED	

SPECIAL CHARACTERISTICS

NONE STATED

DRAWING ASSESSMENT SUMMARY

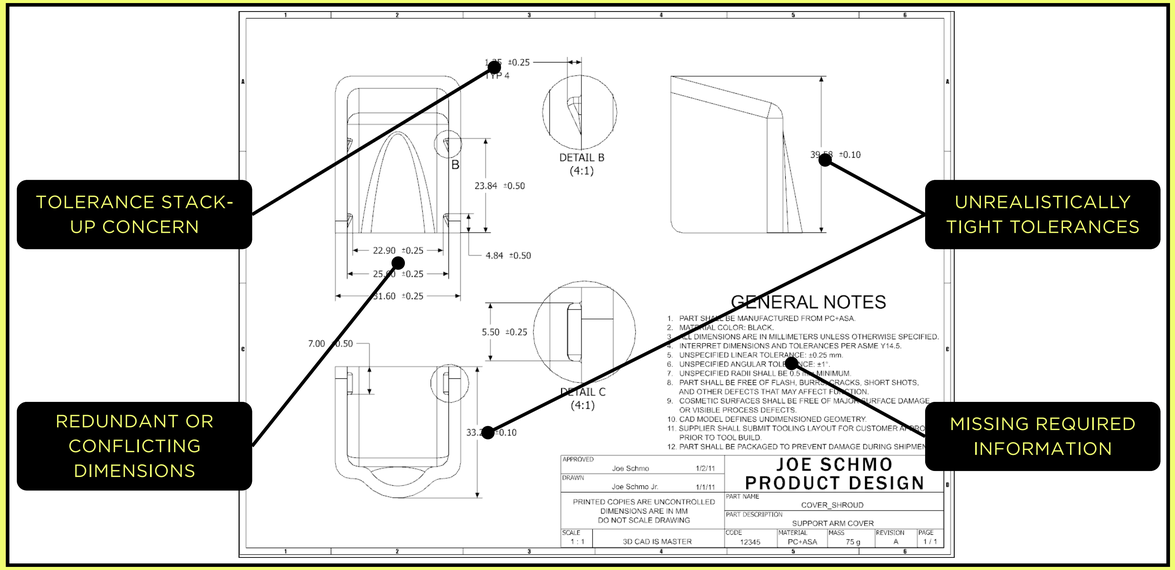
The submitted COVER_SHROUD drawing identifies the part, communicates basic dimensional intent, and supports early supplier review. The drawing appears generally useful as a reference document for the submitted CAD model, but it **should not be treated as a complete production release drawing in its current condition**.

Several drawing and tolerancing items should be clarified before mold design, supplier quoting, or production approval. Key concerns include incomplete or unclear datum control, limited definition of critical dimensions, insufficient inspection direction, and drawing information that may not fully control the molded part.

For an injection-molded component, the drawing should clearly communicate the features that matter most for fit, assembly, retention, cosmetic condition, and inspection. Datums, tolerances, material notes, finish expectations, critical features, and any required inspection points should be reviewed so the supplier understands what must be controlled vs. what can follow normal molded-part variation.

The recommended next step is to revise the drawing before tooling review, with focus on datum structure, critical dimensions, tolerance strategy, material/process notes, inspection requirements, and clear identification of the features that drive fit, function, assembly, and cosmetic acceptability.

DRAWING ASSESSMENT FINDINGS



TOL-01	UNREALISTICALLY TIGHT TOLERANCES	4-3
TOL-02	REDUNDANT OR CONFLICTING DIMENSIONS	4-4
TOL-03	TOLERANCE STACK-UP CONCERN	4-5
DWG-01	MISSING REQUIRED INFORMATION	4-6

OVERALL DRAWING READINESS

CURRENT RATING: **CRITICAL**

DRAWING REVISIONS NEEDED?

YES

SEE NEXT PAGES

SECTION 4
DRAWING ASSESSMENT

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DRAWING / TOLERANCING EVALUATION FACTORS

BASE DRAWING COMPLETENESS

ALL NECESSARY VIEWS AND CONTENT INCLUDED

THE DRAWING INCLUDES BASIC PART IDENTIFICATION, MATERIAL CALLOUT, GENERAL NOTES, ORTHOGRAPHIC VIEWS, AND DIMENSIONAL INFORMATION.

DESIGN READINESS

GOOD	MARGINAL	POOR
●		

NO ACTION REQUIRED

REFERENCE:

OVERALL DRAWING READABILITY

CONTENT IS WELL SPACED AND ORGANIZED

THE DRAWING VIEWS APPEAR SUFFICIENT TO COMMUNICATE THE GENERAL PART SHAPE, MAJOR FEATURES, AND DIMENSIONAL LAYOUT FOR INITIAL REVIEW.

DESIGN READINESS

GOOD	MARGINAL	POOR
●		

NO ACTION REQUIRED

REFERENCE:

TOLERANCE PRACTICALITY

SEVERAL OVERLY-TIGHT TOLERANCES INCLUDED

SEVERAL TOLERANCES APPEAR TIGHTER THAN NEEDED FOR MOLDED PART CONTROL, INCREASING INSPECTION BURDEN, TOOLING SENSITIVITY, QUOTE RISK, AND SUPPLIER PUSHBACK.

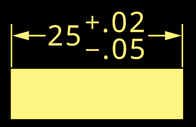
DESIGN READINESS

GOOD	MARGINAL	POOR
		●

CORRECTION REQUIRED

REFERENCE:
TOL-01

DIMENSIONING STRATEGY



FEATURE-BASED. CLEAR, BUT SOME CONFLICTS

SEVERAL RELATED DIMENSIONS ARE CONTROLLED SEPARATELY, CREATING REDUNDANT INSPECTION REQUIREMENTS AND POSSIBLE CONFLICT.

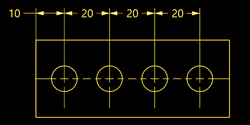
DESIGN READINESS

GOOD	MARGINAL	POOR
	●	

CORRECTION REQUIRED

REFERENCE:
TOL-02

TOLERANCE STACK-UP



TOLERANCE STACK-UP CONCERN INCLUDED

RETAINING FEATURE CONTROLS MAY STACK AGAINST SHELL WIDTH LIMITS, ALLOWING INDIVIDUAL DIMENSIONS TO PASS WHILE THE FUNCTIONAL SPAN BECOMES NONCONFORMING.

DESIGN READINESS

GOOD	MARGINAL	POOR
		●

CORRECTION REQUIRED

REFERENCE:
TOL-03

GENERAL NOTES & REQUIREMENTS

MISSING REQUIRED INFORMATION

THE DRAWING DOES NOT CLEARLY DEFINE COSMETIC SURFACE CLASSES OR REQUIRED FINISH CONDITION, LEAVING FINISH EXPECTATIONS OPEN TO SUPPLIER INTERPRETATION.

DESIGN READINESS

GOOD	MARGINAL	POOR
		●

CORRECTION REQUIRED

REFERENCE:
DWG-01

GOOD
APPEARS SUITABLE FOR THE TARGETED MANUFACTURING PROCESS WITH NO MAJOR CORRECTION IDENTIFIED.

MARGINAL
APPEARS FEASIBLE, BUT MAY CREATE TOOLING, MOLDING, QUALITY, COST, FIT, OR PRODUCTION RISK IF NOT REVIEWED OR CORRECTED.

POOR
SIGNIFICANT MANUFACTURABILITY OR TOOLING RISK. CORRECTION RECOMMENDED BEFORE QUOTE, TOOLING, OR RELEASE.

SECTION 4
DRAWING ASSESSMENT

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DRAWING / TOLERANCING FINDING

TOL-01

PRIORITY

HIGH

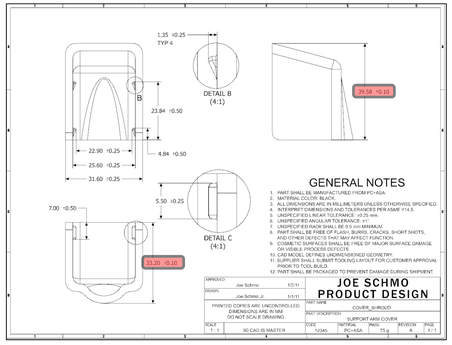
UNREALISTICALLY TIGHT TOLERANCES

Overall tolerances appear tighter than practical molding control requires, creating unnecessary supplier risk, inspection burden, cost, and potential quote resistance.

POTENTIAL IMPACTS

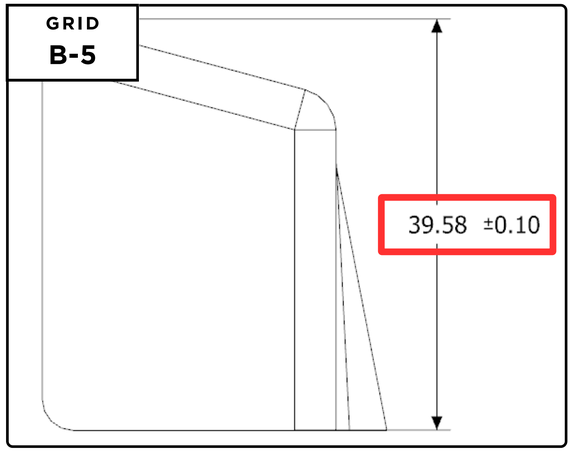
- **HIGHER INSPECTION BURDEN**
- **HIGHER TOOLING CHANGE RISK**
- **HIGHER QUOTED COST**
- **INCREASED SUPPLIER PUSH-BACK**
- **UNNECESSARY SCRAP OR REWORK**
- **DRAWING CORRECTION REQUESTS**

OBSERVED CONDITION

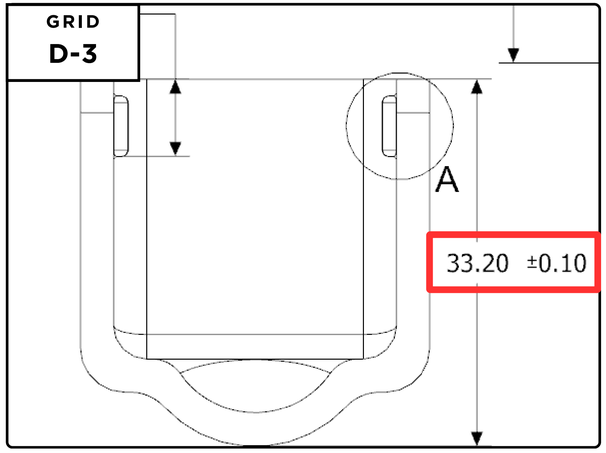


Both overall dimensions are controlled to ±0.10 mm. This may be tighter than needed for the part function, especially where wall variation, tool steel condition, shrink behavior, and parting line geometry influence final size.

GRID B-5



GRID D-3



RECOMMENDED ACTION

PRIMARY ACTION: **RELAX TOLERANCES, OR JUSTIFY THE CONTROL**

EXPECTED DIFFICULTY

OPTION 1

WIDEN NON-CRITICAL TOLERANCES

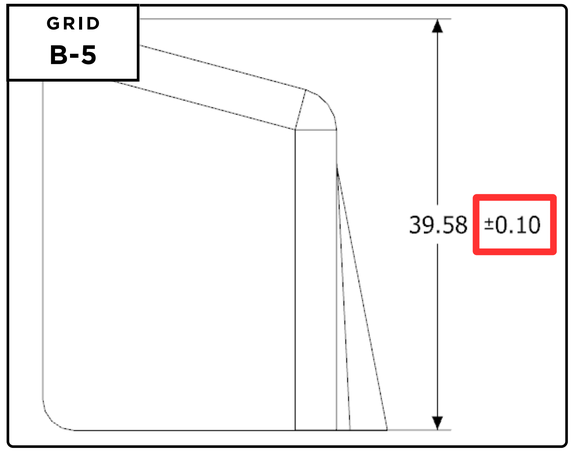
TO ALIGN WITH INJECTION MOLDING STANDARD TOLERANCE RANGES FOR STATED FEATURE SIZE, AND CONFIRM WITH SUPPLIER.

OPTION 2

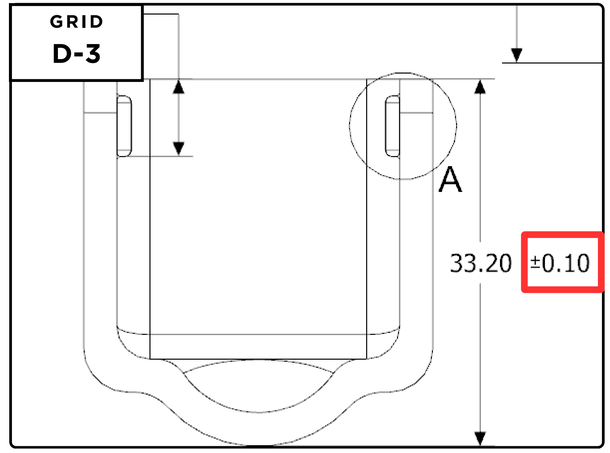
JUSTIFY THE TIGHT TOLERANCES

INTERNALLY AND WITH THE SUPPLIER. EXPECT POSSIBILITY OF HIGHER QUOTE COST IF THE TOLERANCE MUST REMAIN UNCHANGED.

GRID B-5



GRID D-3



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DRAWING / TOLERANCING FINDING

TOL-02

PRIORITY

MEDIUM

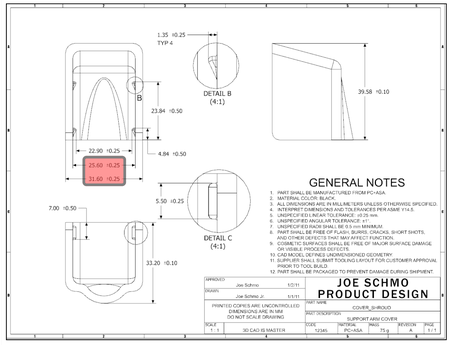
REDUNDANT / CONFLICTING DIMENSION

The drawing controls both outside shell width and internal offset geometry, creating redundant dimensional control and potential tolerance conflict during inspection.

POTENTIAL IMPACTS

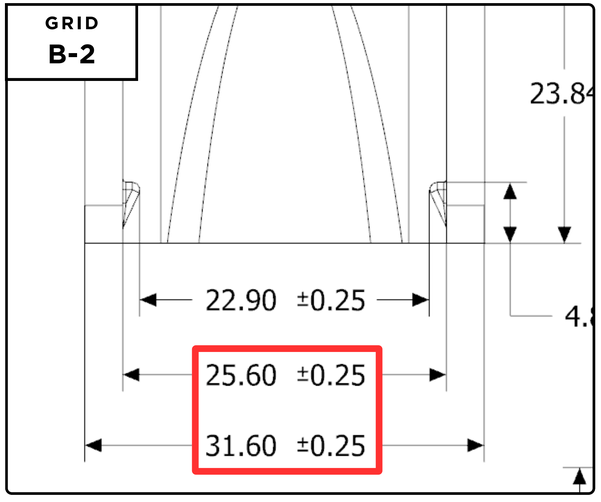
- **SUPPLIER INTERPRETATION ISSUES**
- **HIGHER QUOTED COST**
- **DRAWING REVISION REQUESTS**
- **UNCLEAR INSPECTION PRIORITY**
- **UNNECESSARY INSPECTION BURDEN**
- **TOLERANCE STACK-UP CONFUSION**

OBSERVED CONDITION



The drawing dimensions the outside shell width while also controlling internal offset faces created by the same wall feature. These dimensions appear related and may over-constrain the geometry if both are treated as independently controlled inspection requirements.

Avoid controlling both sides of the same wall condition unless both dimensions serve a clear functional purpose.



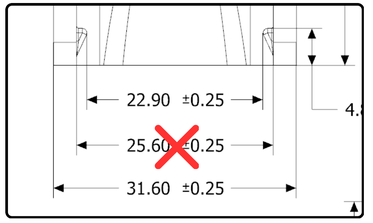
RECOMMENDED ACTION

PRIMARY ACTION: **DEFINE THE PRIMARY CONTROL STRATEGY**

EXPECTED DIFFICULTY

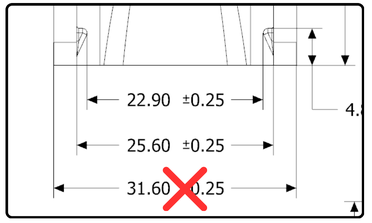
OPTION 1

USE THE OUTSIDE SHELL WIDTH AS THE PRIMARY CONTROLLED DIMENSION AND REMOVE OR REFERENCE THE RELATED INTERNAL OFFSET DIMENSIONS WHERE THEY ARE NOT FUNCTION-CRITICAL.



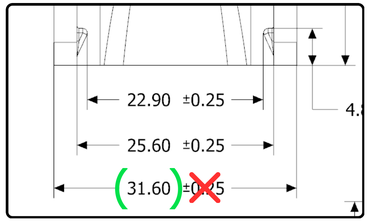
OPTION 2

IF THE INTERNAL OPENING CONTROLS FIT, CLEARANCE, OR ASSEMBLY FUNCTION, **MAKE THE INTERNAL GEOMETRY THE CONTROLLING DIMENSION** AND TREAT THE OUTSIDE SHELL WIDTH AS SECONDARY.



OPTION 3

CONVERT NON-CRITICAL RELATED DIMENSIONS TO **REFERENCE DIMENSIONS** WHERE THEY SUPPORT INTERPRETATION ONLY AND DO NOT REQUIRE INSPECTION CONTROL.



DRAWING / TOLERANCING FINDING

TOL-03

PRIORITY

HIGH

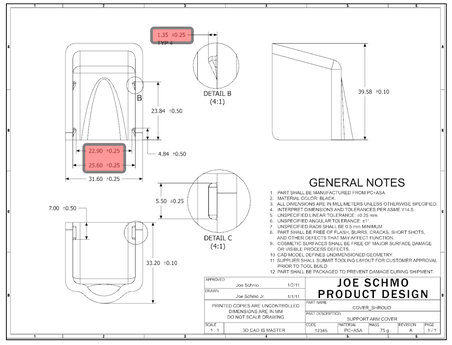
TOLERANCE STACK-UP CONCERN

Tab thickness tolerance can stack against the inside shell width tolerance, creating a nonconforming span even when the individual tab dimensions are acceptable.

POTENTIAL IMPACTS

- **TOLERANCE STACK-UP CONFLICT**
- **UNCLEAR INSPECTION PRIORITY**
- **DRAWING REVISION REQUESTS**
- **FUNCTIONAL FITMENT RISK**
- **SUPPLIER INTERPRETATION ISSUES**
- **TOOLING CHANGE RISK**

OBSERVED CONDITION



The drawing controls retaining feature span separately from individual retaining feature height. At worst-case conditions, the retaining tabs may remain within their stated tolerance while still reducing the available internal span beyond the allowable shell-width limit.

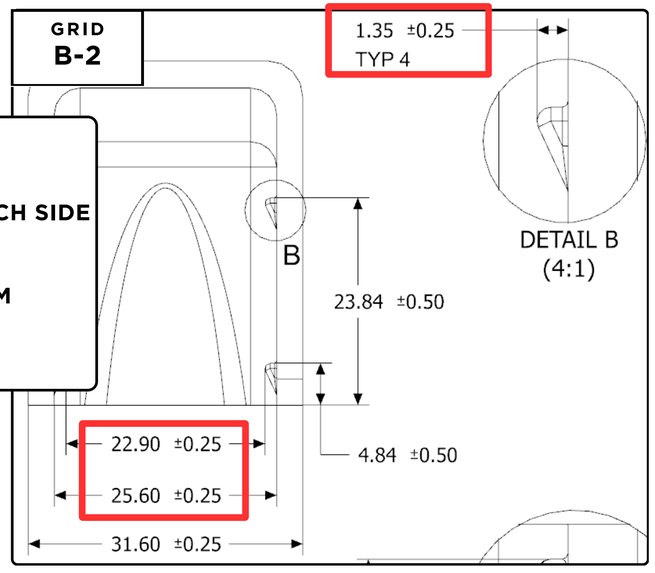
EXAMPLE:
INSIDE SHELL MAX WIDTH: **25.85 MM**

RETAINING TAB MIN CONDITION: **1.10 MM EACH SIDE**

CALCULATED ACTUAL SPAN: **23.65 MM**

ALLOWABLE RETAINING SPAN MAX: **23.15 MM**

OUTCOME: CALCULATED SPAN EXCEEDS ALLOWABLE SPAN BY **0.50 MM**



RECOMMENDED ACTION

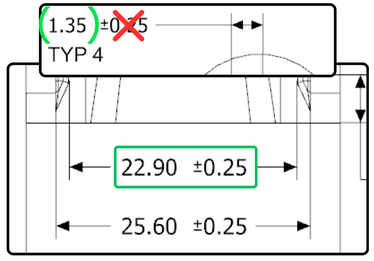
PRIMARY ACTION: **DEFINE THE FUNCTIONALLY CONTROLLING FEATURES**

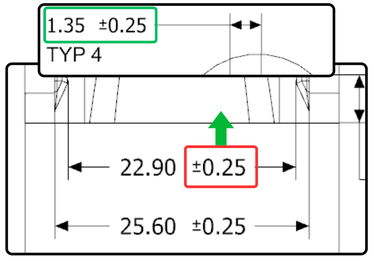
EXPECTED DIFFICULTY

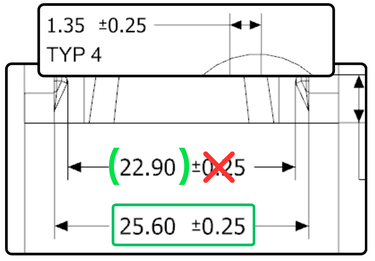
OPTION 1
CONTROL THE REQUIRED TAB SPAN DIRECTLY AND TREAT TAB THICKNESS AS A REFERENCE OR SECONDARY DIMENSION.

OPTION 2
CONTROL TAB THICKNESS DIRECTLY ONLY IF RETAINING TAB SIZE IS THE TRUE FUNCTIONAL REQUIREMENT, THEN RELAX THE RELATED TAB SPAN DIMENSION.

OPTION 3
CONTROL THE SHELL SPAN AND TAB DEPTH, THEN REFERENCE THE TAB-TO-TAB SPAN AS THE CALCULATED RESULT OF THOSE CONTROLLED DIMENSIONS.







SECTION 4
DRAWING ASSESSMENT

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DRAWING / TOLERANCING FINDING

DWG-01

PRIORITY

HIGH

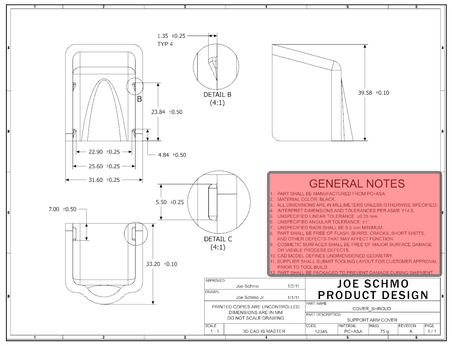
MISSING SURFACE FINISH / COSMETIC SPEC

The drawing does not define surface finish, cosmetic expectations, or A/B/C surface classifications, leaving appearance requirements open to supplier interpretation.

POTENTIAL IMPACTS

- **INCONSISTENT COSMETIC QUALITY**
- **INSPECTION ACCEPTANCE DISPUTES**
- **DRAWING REVISION REQUESTS**
- **QUOTE ASSUMPTION RISK**
- **SUPPLIER INTERPRETATION ISSUES**
- **TOOLING CHANGE RISK**

OBSERVED CONDITION



The drawing does not define surface finish, cosmetic expectations, or surface classification requirements. No clear distinction is made between visible exterior surfaces, functional surfaces, hidden surfaces, or non-cosmetic areas. This leaves finish, texture, gloss, color, inspection method, and cosmetic acceptance criteria open to supplier interpretation.

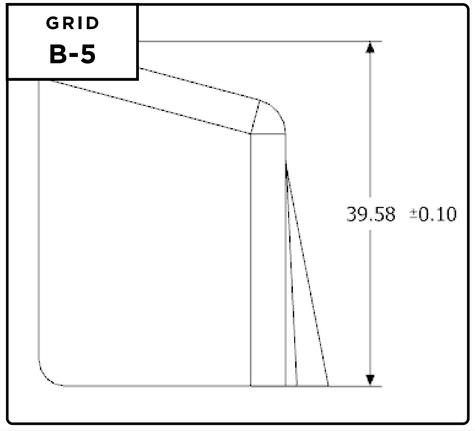
GRID D-5

GENERAL NOTES

1. PART SHALL BE MANUFACTURED FROM PC+ASA.
2. MATERIAL COLOR: BLACK.
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
4. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5.
5. UNSPECIFIED LINEAR TOLERANCE: ±0.25 mm.
6. UNSPECIFIED ANGULAR TOLERANCE: ±1°.
7. UNSPECIFIED RADII SHALL BE 0.5 mm MINIMUM.
8. PART SHALL BE FREE OF FLASH, BURRS, CRACKS, SHORT SHOTS, AND OTHER DEFECTS THAT MAY AFFECT FUNCTION.
9. COSMETIC SURFACES SHALL BE FREE OF MAJOR SURFACE DAMAGE OR VISIBLE PROCESS DEFECTS.
10. CAD MODEL DEFINES UNDIMENSIONED GEOMETRY.
11. SUPPLIER SHALL SUBMIT TOOLING LAYOUT FOR CUSTOMER APPROVAL PRIOR TO TOOL BUILD.
12. PART SHALL BE PACKAGED TO PREVENT DAMAGE DURING SHIPMENT.

NO SURFACE FINISH REQUIREMENT IS LISTED IN THE DRAWING NOTES, TITLE BLOCK, OR FEATURE CALLOUTS.

GRID B-5



COSMETIC SURFACE CLASSES ARE NOT IDENTIFIED, AND NO DISTINCTION IS MADE BETWEEN VISIBLE, FUNCTIONAL, HIDDEN, OR NON-COSMETIC SURFACES.

RECOMMENDED ACTION

PRIMARY ACTION: **DEFINE SURFACE FINISH AND COSMETIC REQUIREMENTS**

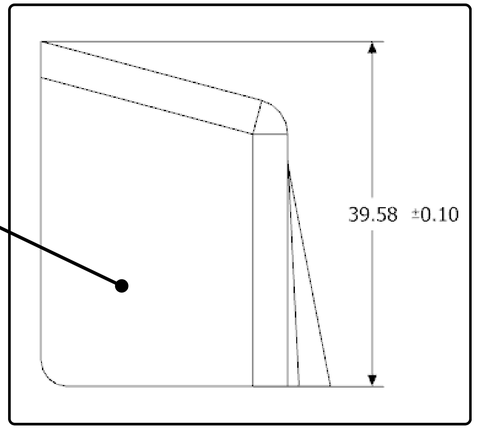
EXPECTED DIFFICULTY

Identify cosmetic surface classes directly on the drawing, then define the required finish condition in the general notes. Class A and Class B surfaces should be clearly separated so supplier quoting, tooling, inspection, and acceptance expectations are not left open to interpretation.

*If final appearance is subjective, define acceptance using an approved master sample, texture plaque, color standard, or cosmetic specification.

EXAMPLE DRAWING CALLOUT:

ALL CAVITY-SIDE EXTERNAL SURFACES ARE CLASS ‘A’
ALL CORE-SIDE INTERNAL SURFACES ARE CLASS ‘B’



EXAMPLE NOTATION (GENERAL NOTES):

3.SURFACE FINISH: CLASS ‘A’: [TEXTURE / GLOSS / PAINT / APPROVED SAMPLE REQUIREMENT]
CLASS ‘B’: [TEXTURE / GLOSS / PAINT / APPROVED SAMPLE REQUIREMENT]

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PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
MAAR-11-0038	11/13/2011	JOE SCHMO ENGINEERING CORP.

CLIENT TYPE	PART / ASSEMBLY NAME
STARTUP	COVER SHROUD

PROJECT STAGE	PART / ASSEMBLY DESCRIPTION
PRE-TOOLING	SUPPORT ARM COVER

ASSIGNED MATERIAL	TARGETED PROCESS
PC+ASA	INJECTION MOLDING

FILES / DOCUMENTATION RECEIVED

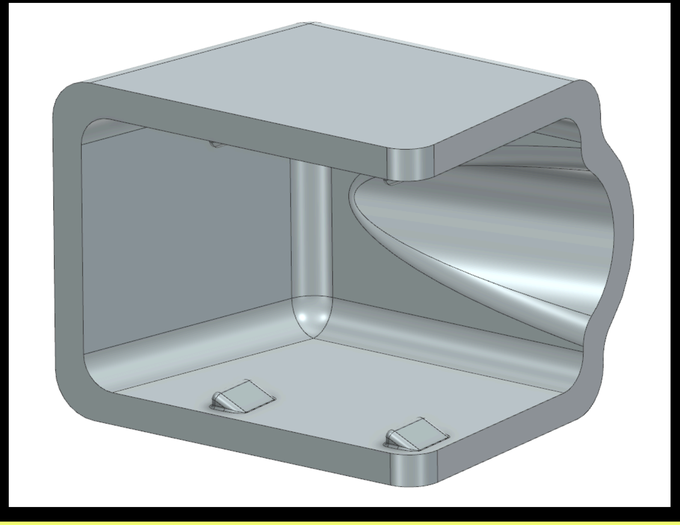
COVER_SHROUD.stp
SUPPORT_ASSEM.stp
COVER_SHROUD.pdf
RE: Cover Shroud RFQ.msg

REVIEW LEVEL

LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
COVER_SHROUD.stp	STEP	METRIC



TIER-1
DFM AUDIT
MAAR

SECTION 5

NEXT STEPS AUDIT CLOSE-OUT

THIS SECTION PROVIDES THE FINAL AUDIT DISPOSITION, RECOMMENDED CORRECTION ORDER, RELEASE-READINESS GUIDANCE, OPTIONAL CLARIFICATION MEETING PATH, AND OFFICIAL AUDIT CLOSEOUT STATEMENT.

NEXT STEPS & CLOSEOUT	5-1
REFERENCE: KEY TERMINOLOGY	5-2

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FINAL AUDIT DISPOSITION

The submitted cover shroud is conditionally suitable for injection molding, and the selected process does not appear to be the primary concern. However, **the current CAD and drawing should not be considered tooling-ready without correction**.

The primary manufacturability risks are concentrated in part design and drawing control, including wall thickness variation, insufficient draft, retaining feature design, tight tolerances, dimensional control conflict, and missing cosmetic requirements. Complete and verify the recommended CAD and drawing updates before supplier quotation, tooling release, or production planning.

PRACTICAL NEXT STEP — **REVISE DESIGN AND DRAWING, AND ENGAGE SUPPLIER**

PART DESIGN READINESS

CURRENT RATING	PROJECTED RATING
CRITICAL	GOOD
CORRECTIONS REQUIRED 4	PENDING CORRECTIONS

DRAWING READINESS

CURRENT RATING	PROJECTED RATING
CRITICAL	GOOD
CORRECTIONS REQUIRED 4	PENDING CORRECTIONS

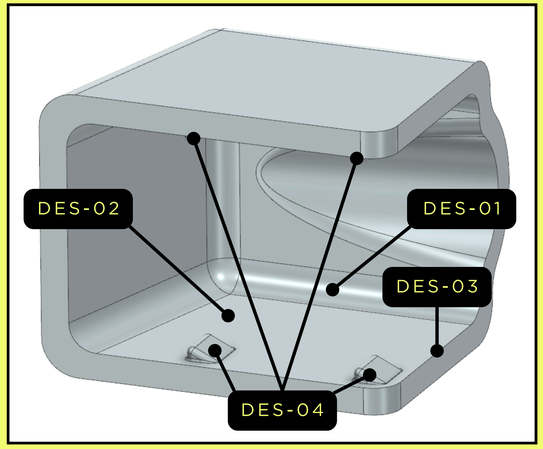
CURRENT RELEASE READINESS

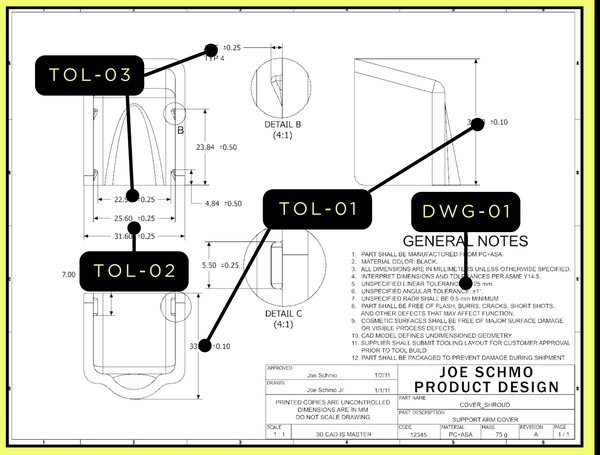
NOT READY FOR RELEASE

PROJECTED RELEASE READINESS

SUITABLE FOR RELEASE / SUPPLIER ENGAGEMENT

RECOMMENDED ACTIONS





FIX ORDER	ID	FINDING	RECOMMENDED ACTION	PAGE
1	DES-01	EXCESSIVE WALL THICKNESS VARIATION	ADJUST CORNER RADII TO REDUCE VARIATION	3-3
2	DES-02	LACK OF DRAFT ON RELEVANT FACES	ADD DRAFT RELATIVE TO TOOL DRAW DIRECTION	3-4
3	DES-04	LOCALIZED RISK AT RETAINING FEATURES	CORE OUT RETAINING FEATURES	3-6
4	DES-03	SHARP NON-PARTING LINE EDGES	ADD PRACTICAL RADII TO SHARP EDGES	3-5
5	DWG-01	MISSING SURFACE FINISH / COSMETIC SPEC	DEFINE SURFACE FINISH AND COSMETIC REQUIREMENTS	4-6
6	TOL-03	TOLERANCE STACK-UP CONCERN	DEFINE THE FUNCTIONALLY CONTROLLING FEATURES	4-5
7	TOL-02	REDUNDANT OR CONFLICTING DIMENSIONS	DEFINE THE PRIMARY CONTROL STRATEGY	4-4
8	TOL-01	UNREALISTICALLY TIGHT TOLERANCES	RELAX TOLERANCES, OR JUSTIFY THE CONTROL	4-3

Delivery of this MAAR constitutes official closeout of the Tier-1 DFM Audit under the approved IAAR scope. New files, design revisions, supplier feedback, added requirements, implementation support, or expanded questions are outside this closed audit scope and may require separate review.

*Optional clarification meeting available to review findings, recommended action order, and next steps. Meeting is limited to report clarification and does not include review of new files, revised designs, supplier feedback, or implementation support.
DFM@TIER1ENGINEER.COM



SECTION 5
KEY TERMINOLOGY

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TERM	DEFINITION
Action Priority	The importance of correcting a finding based on manufacturability risk, release impact, and production exposure.
Assigned Material	The material specified for the part, including resin, alloy, grade, blend, or material family.
CAD Data Usability	The practical usefulness of the submitted CAD file based on file type, units, geometry condition, clarity, completeness, and accessibility.
Cosmetic Requirements	Appearance-related requirements such as surface finish, texture, gloss, color, paint, coating, surface class, or approved sample expectations.
Critical Dimension	A dimension that directly affects fit, function, assembly, inspection, supplier acceptance, or production quality.
DFM Audit	A manufacturability-focused review of a submitted design against the targeted process, material, volume, geometry, drawing, and production assumptions.
Draft	A slight angle added to molded faces so the part can release from the tool without sticking, dragging, scuffing, or damaging the mold.
Drawing Readiness	The condition of the drawing based on clarity, tolerance practicality, dimensioning strategy, notes, inspection requirements, and release suitability.
Drawing Revision	A change to the drawing intended to clarify dimensions, tolerances, notes, material callouts, surface requirements, or supplier-facing information.
Ejection	The process of removing the molded part from the tool after cooling, typically using ejector pins, plates, sleeves, or other release methods.
Expected Difficulty	The estimated effort required to correct a finding, from a simple update to major redesign or supplier/tooling involvement.
IAAR	The Initial Audit Assessment Report used to assign audit level, scope, price, lead time, missing information, and Phase Three readiness.
Injection Molding	A manufacturing process that injects molten plastic into a mold cavity to produce repeatable production parts.
MAAR	The Manufacturability Audit Assessment Report containing DFM findings, manufacturability risks, drawing risks, recommended actions, and next-step guidance.
Manufacturability Risk	A design, drawing, material, tooling, or process condition that may create production difficulty, defects, cost increase, delay, or supplier pushback.
Mold Release	The ability of a molded part to separate cleanly from the tool without sticking, dragging, damaging surfaces, or requiring excessive ejection force.

TERM	DEFINITION
Part Design Readiness	The condition of the submitted CAD geometry based on manufacturability, tooling feasibility, defect risk, and correction needs.
Parting Line	The split between mold halves or tool components where the molded part separates during tool opening.
PC+ASA	A thermoplastic blend combining polycarbonate and ASA, often used when impact resistance, dimensional stability, and weathering performance are desired.
Process Fit	The degree to which the targeted manufacturing process is suitable for the part, material, volume, geometry, and production assumptions.
Production Volume	The estimated number of parts expected to be produced per year or per production run.
Recommended Action	The suggested correction, review step, or next move intended to reduce manufacturability, drawing, tooling, quality, or production risk.
Release Readiness	The condition of the CAD and drawing package relative to supplier quotation, tooling review, tooling release, or production planning.
Retaining Feature	A molded feature intended to hold, clip, locate, latch, or secure the part to another component or assembly.
Sink Mark	A visible or dimensional depression caused by uneven cooling, excessive local wall thickness, ribs, bosses, tabs, or heavy material sections.
Supplier Tooling Feedback	Input from the selected molder or tooling supplier regarding toolability, mold construction, quoted cost, timing, risk, and required design changes.
Surface Finish	The specified texture, gloss, roughness, coating, paint, polish, or visual condition expected on molded surfaces.
Targeted Process	The manufacturing process the part is intended to use, such as injection molding, die casting, machining, stamping, extrusion, or additive manufacturing.
Tool Action	A moving tool component, such as a slide or lifter, used to form geometry that cannot be created by a simple straight-pull mold.
Tooling Release	The point where CAD, drawings, requirements, and supplier assumptions are approved for mold design or tool construction.
Tolerance Stack-Up	The combined effect of multiple tolerances that can cause a final functional dimension or fit condition to fall outside the intended range.
Wall Thickness Variation	A condition where molded wall sections differ in thickness, increasing risk of sink, warp, shrinkage, uneven cooling, and dimensional variation.