TIER-1 DESIGN READINESS SYSTEM

TIER-1 DESIGN REVIEW



DRR

DESIGN REVIEW REPORT

COMPILED BY:
TIER-1 ENGINEER, LLC

PREPARED FOR:

J. MARSTON HOME GOODS

JMARS@JMARSHG.COM

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DESIGN REVIEW OVERVIEW

- CONFIDENTIAL - PREPARED ONLY FOR:
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PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
DRR-11-0038	11/13/2011	J. MARSTON HOME GOODS

CLIENT TYPE	PART / ASSEMBLY NAME
SMALL BUSINESS	SENSOR CRADLE ASSEMBLY

DESIGN STAGE	PART / ASSEMBLY DESCRIPTION
PRE-PROTOTYPE	SENSOR MOUNT

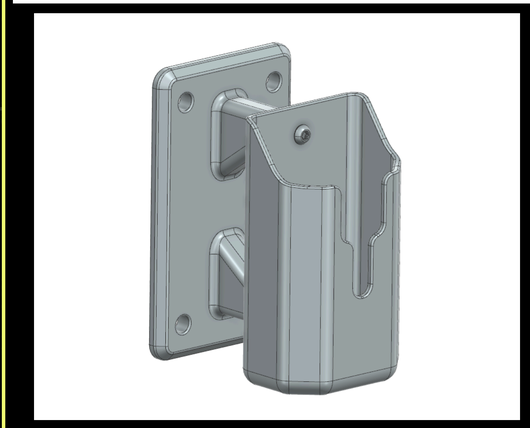
PLANNED MATERIAL	PLANNED PROCESS
ABS	SLS

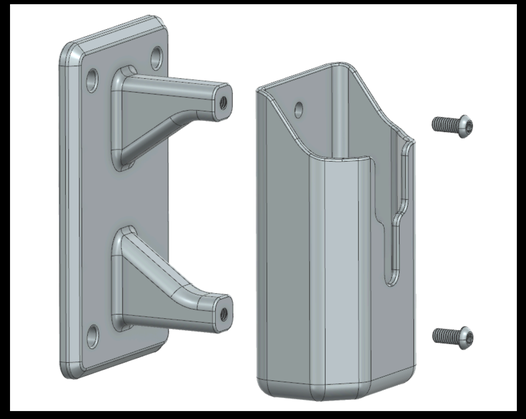
FILES / DOCUMENTATION RECEIVED
SENSOR_CRADLE_ASSEM.stp

REVIEW LEVEL
LEVEL 1

DESIGN SUBMISSION

CAD FILE	FILE TYPE	UNITS
SENSOR_CRADLE_ASSEM.stp	STEP	METRIC





CAD DATA USABILITY

VERY GOOD

REVIEW ASPECTS INCLUDED

DESIGN INTENT REVIEW

Checks whether the design direction matches the stated function, use case, constraints, and project goals.

DESIGN INTENT:
PROVIDE A LIGHTWEIGHT OUTDOOR WALL-MOUNTED CRADLE THAT SECURELY HOLDS A SMALL SENSOR WHILE ALLOWING SIMPLE SCREW INSTALLATION

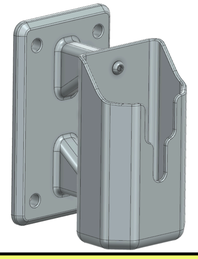
STATUS
REVIEWED

FILES REVIEWED
SENSOR_CRADLE_ASSEM.stp

→ SECTION 2

DESIGN REVIEW

Checks whether the submitted geometry presents obvious design, fit, access, assembly, or usability concerns.



STATUS
REVIEWED

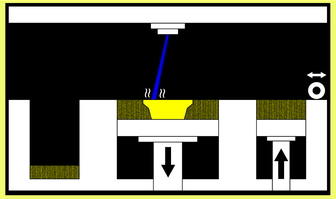
FILES REVIEWED
SENSOR_CRADLE_ASSEM.stp

→ SECTION 3

PROCESS SCREENING

Checks whether the planned material and process create obvious feasibility, cost, or build concerns.

PLANNED PROCESS:
SLS



STATUS
REVIEWED

FILES REVIEWED
SENSOR_CRADLE_ASSEM.stp

→ SECTION 4

DRAWINGS AND DOCUMENTS

Checks whether submitted files and notes support clear next-step recommendations.

DOCUMENTATION
NO OTHER DOCS

STATUS
NOT REVIEWED

FILES REVIEWED
NONE

N/A

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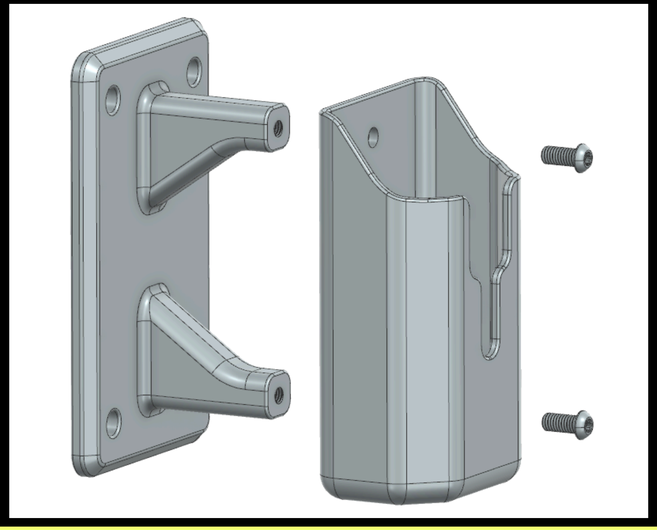
DESIGN STAGE	PART / ASSEMBLY DESCRIPTION
PRE-PROTOTYPE	SENSOR MOUNT

PLANNED MATERIAL	PLANNED PROCESS
ABS	SLS

FILES / DOCUMENTATION RECEIVED	REVIEW LEVEL
SENSOR_CRADLE_ASSEM.stp	LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
SENSOR_CRADLE_ASSEM.stp	STEP	METRIC



TIER-1 DESIGN REVIEW

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SECTION 1

DESIGN REVIEW BRIEF

THIS SECTION PROVIDES A FRONT-END REVIEW SUMMARY OF DESIGN MATURITY, KEY RISKS, AND RECOMMENDED NEXT STEPS BEFORE THE DETAILED REVIEW SECTIONS.

DESIGN REVIEW BRIEF	1-1
RECOMMENDED ACTIONS	1-2

SECTION 1
DESIGN REVIEW BRIEF

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DESIGN INFORMATION

PART / ASSEMBLY NAME
SENSOR CRADLE ASSEMBLY

PART / ASSEMBLY DESCRIPTION
SENSOR MOUNT

PLANNED MATERIAL	PLANNED PROCESS
ABS	SLS

STATED DESIGN INTENT

THE DESIGN INTENT IS TO PROVIDE A LIGHTWEIGHT OUTDOOR WALL-MOUNTED CRADLE ASSEMBLY THAT SECURELY HOLDS A SMALL, LIGHTWEIGHT SENSOR (<200G) IN A FIXED POSITION WHILE ALLOWING PRACTICAL INSTALLATION WITH THREADED FASTENERS.

DESIGN INTENT ALIGNMENT

DESIGN INTENT REFERS TO THE STATED PURPOSE, FUNCTION, USE CASE, AND CONSTRAINTS THE DESIGN IS EXPECTED TO SATISFY.

The submitted design appears to support the stated product goal, but several features require clarification before the design direction can be considered ready to move forward into the next steps of the design process.

ALIGNMENT RATING
MOSTLY ALIGNED
***CONDITIONAL UPON STATED DESIGN FIXES**

OVERALL DESIGN MATURITY

DESIGN MATURITY REFERS TO HOW DEVELOPED THE SUBMITTED DESIGN IS BASED ON COMPLETENESS, CLARITY, RISK LEVEL, AND READINESS FOR THE NEXT STEP.

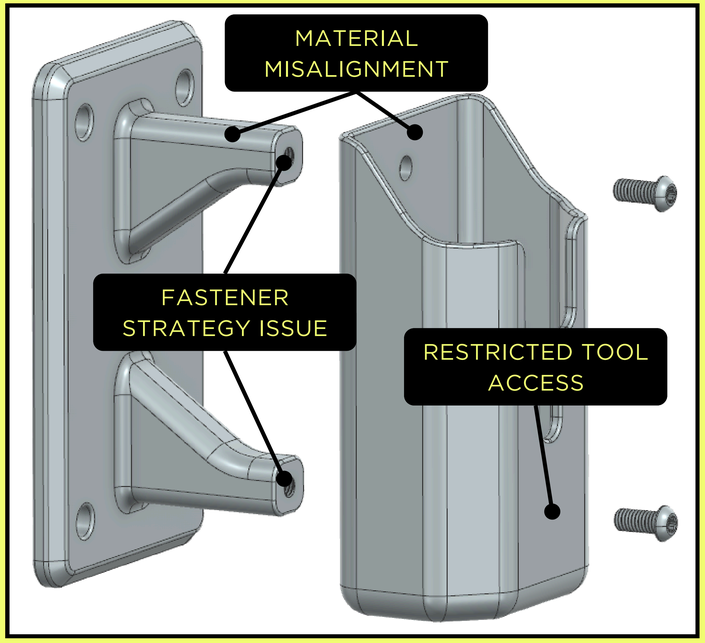
The submitted design direction appears generally workable, but several design, process, and installation issues should be corrected before supplier discussion, prototyping, or deeper manufacturability review.

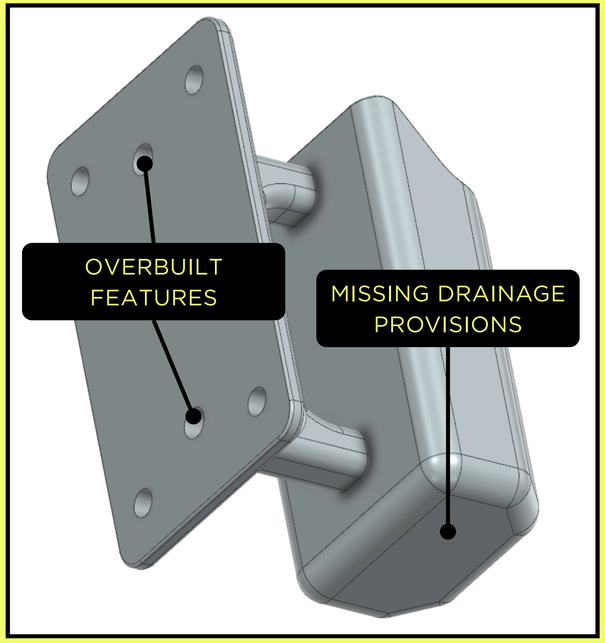
VERDICT
REVISE DESIGN
ACCORDING TO ITEMS OUTLINED IN THIS REPORT

DESIGN RISKS IDENTIFIED

PART / ASSEMBLY NAME
SENSOR CRADLE ASSEMBLY

OBSERVED DESIGN RISKS 5





RECOMMENDED NEXT STEPS

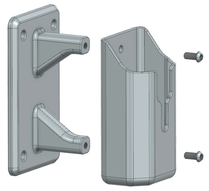
- PREPARE DRAWING PACKAGE
- ESCALATE TO TIER-1 DFM AUDIT
- PROCEED TO PROTOTYPE
- HOLD PENDING MISSING INFO
- **REVISE CAD BEFORE PROTOTYPE**
- REQUEST SUPPLIER FEEDBACK

SECTION 1
DESIGN REVIEW BRIEF

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RECOMMENDED ACTIONS

DR-01



MATERIAL MISALIGNMENT

PLANNED ABS MATERIAL DOES NOT ALIGN WITH SLS PRODUCTION, REQUIRING UPDATE BEFORE PROTOTYPE OR SUPPLIER REVIEW.

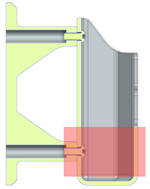
ACTION PRIORITY
HIGH

RECOMMENDED ACTION
UPDATE MATERIAL TO PA11

FINDING PAGE
3-2 →

EXPECTED DIFFICULTY

DR-02



RESTRICTED LOWER FASTENER ACCESS

LOWER FASTENER LOCATION LIMITS STRAIGHT TOOL ACCESS INSIDE THE CRADLE, CREATING INSTALLATION DIFFICULTY.

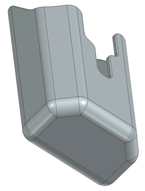
ACTION PRIORITY
HIGH

RECOMMENDED ACTION
ADD LOWER FASTENER TOOL ACCESS

FINDING PAGE
3-3 →

EXPECTED DIFFICULTY

DR-03



DRAINAGE PROVISION NOT INCLUDED

CRADLE MAY COLLECT WATER OR DEBRIS WITHOUT A DEFINED LOW-POINT DRAINAGE PATH DURING NORMAL INSTALLED USE.

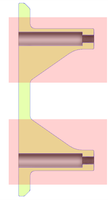
ACTION PRIORITY
HIGH

RECOMMENDED ACTION
ADD DRAINAGE FEATURE

FINDING PAGE
3-4 →

EXPECTED DIFFICULTY

DR-04



BRACKET ARMS OVERBUILT

CURRENT SUPPORT ARMS ARE BUILDABLE BY SLS, BUT APPEAR HEAVIER THAN NEEDED FOR THE STATED LIGHTWEIGHT SENSOR LOAD.

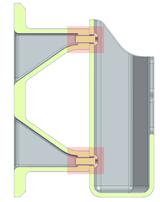
ACTION PRIORITY
MEDIUM

RECOMMENDED ACTION
REDUCE SUPPORT ARM MATERIAL

FINDING PAGE
3-5 →

EXPECTED DIFFICULTY

DR-05



REVIEW THREADED MOUNTING STRATEGY

TAPPED PA11 MOUNTING HOLES MAKE PRINTED POLYMER THREADS RESPONSIBLE FOR LOAD AND RETENTION.

ACTION PRIORITY
HIGH

RECOMMENDED ACTION
VALIDATE FASTENING STRATEGY

FINDING PAGE
3-6 →

EXPECTED DIFFICULTY

DIFFICULTY
SIMPLE — DIFFICULT
SHOWS EXPECTED EFFORT TO ADDRESS THE FINDING, FROM SIMPLE DESIGN UPDATE TO MAJOR REDESIGN OR ADDED REVIEW.

ACTION PRIORITY
LOW | MEDIUM | HIGH
SHOWS ACTION IMPORTANCE BASED ON DESIGN RISK, NEXT-STEP IMPACT, AND PROJECT DESIGN INTENT IMPACT.

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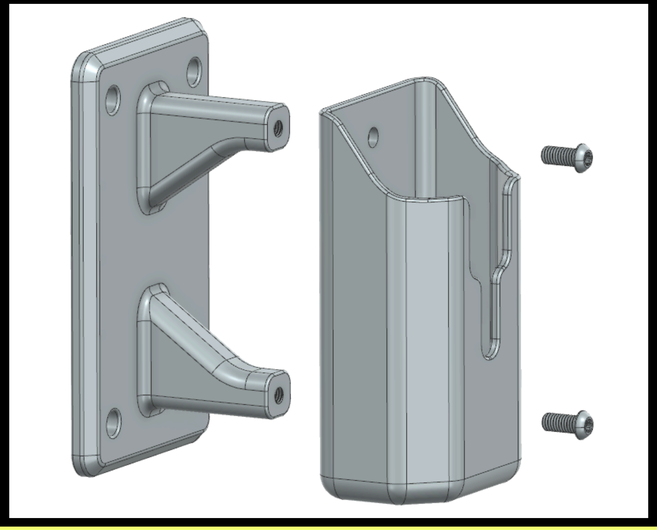
DESIGN STAGE	PART / ASSEMBLY DESCRIPTION
PRE-PROTOTYPE	SENSOR MOUNT

PLANNED MATERIAL	PLANNED PROCESS
ABS	SLS

FILES / DOCUMENTATION RECEIVED	REVIEW LEVEL
SENSOR_CRADLE_ASSEM.stp	LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
SENSOR_CRADLE_ASSEM.stp	STEP	METRIC



TIER-1 DESIGN REVIEW
DRR

SECTION 2
DESIGN INTENT REVIEW

THIS SECTION EVALUATES WHETHER THE SUBMITTED DESIGN DIRECTION ALIGNS WITH THE STATED FUNCTION, USE CASE, REQUIREMENTS, AND PROJECT CONSTRAINTS.

DESIGN INTENT REVIEW	2-1
INTENT ALIGNMENT FACTORS	2-2

SECTION 2
DESIGN INTENT REVIEW

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DETAILED DESIGN INTENT STATEMENT

The design intent is to provide a lightweight outdoor wall-mounted cradle assembly that securely holds a small sensor in a fixed position while allowing practical installation with threaded fasteners. The sensor is relatively lightweight (<200g), static during normal use, and not subject to repeated cycling, adjustment, or high service loads.

The design should support outdoor exposure, simple field installation, and stable sensor retention without unnecessary complexity. Key design intent considerations include material suitability for the selected process, water drainage, fastener access, thread engagement, and efficient support geometry.

DESIGN INTENT ALIGNMENT PARAMETERS

PARAMETER	CURRENT DESIGN ALIGNMENT		
	GOOD	MARGINAL	POOR
PLANNED MATERIAL: ABS			●
USE ENVIRONMENT: OUTDOOR	●		
PERFORMANCE REQUIREMENTS: LIGHTWEIGHT SENSOR - STATIC LOAD <200g	●		
CYCLE / DURABILITY REQUIREMENTS: NONE	●		
ASSEMBLY / INSTALLATION REQUIREMENTS: ASSEMBLY - THREADED FASTENERS		●	
SPECIAL REQUIREMENTS: NONE STATED	●		

DESIGN INTENT ASSESSMENT

The submitted design generally aligns with the stated intent of providing a lightweight outdoor wall-mounted cradle for holding a small static sensor. The overall concept, basic form, wall-mounted configuration, and cradle-style retention approach appear reasonable for a low-load sensor support application.

The primary design concerns are not with the overall concept, but with several details that affect whether the design is ready to move forward. The planned ABS material does not align with the selected SLS process and should be revised to PA11 or another SLS-compatible material before prototype or supplier review. Because the product is intended for outdoor use, UV exposure, moisture exposure, surface finish, drainage, and long-term service expectations should also be confirmed.

The design intent also depends on practical installation and retention. The lower fastener location appears to limit direct tool access, and the threaded fastening strategy should be reviewed before relying on printed polymer threads for clamp load or long-term retention. The cradle pocket should include a drainage path to prevent water and debris from collecting during outdoor use.

Based on the stated low static load and lack of repeated cycling, the support structure appears workable, but the bracket arms may be heavier than necessary for the intended sensor load. Material reduction or open relief geometry may improve build efficiency without changing the basic design direction.

Overall, the design intent is **mostly aligned**. The design should be revised before prototyping to correct the material/process mismatch, improve installation access, define drainage, review the fastening strategy, and reduce unnecessary support mass where practical.

DESIGN INTENT ALIGNMENT RATING



DESIGN REVISIONS NEEDED?
YES
SEE NEXT PAGES

SECTION 2
DESIGN INTENT REVIEW

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DESIGN INTENT ALIGNMENT FACTORS

PLANNED MATERIAL

ABS

ABS DOES NOT ALIGN WITH THE SELECTED SLS PROCESS. REVISE TO PA11 OR ANOTHER APPROVED SLS NYLON BEFORE PROTOTYPE OR SUPPLIER REVIEW.

INTENT ALIGNMENT: POOR

ACTION NEEDED:
REVIEW OR REVISE MATERIAL SEE SECTION 4 →

USE ENVIRONMENT

OUTDOOR

OUTDOOR USE IS REASONABLE FOR PA11, BUT UV EXPOSURE, MOISTURE EXPOSURE, FINISH CONDITION, AND SERVICE-LIFE EXPECTATIONS SHOULD BE CONFIRMED.

INTENT ALIGNMENT: GOOD

ACTION NEEDED:
NONE

PERFORMANCE REQUIREMENTS

STATIC LOAD: <200g
NO DYNAMIC LOAD
NO IMPACT LOAD
NO CHEMICAL LOAD

THE STATED LOAD CASE IS LIGHT AND STATIC. THE DESIGN DIRECTION APPEARS REASONABLE FOR BASIC SENSOR SUPPORT. NO CYCLIC LOADING STATED. NO IMPACT LOADING STATED. NO CHEMICAL LOAD STATED

INTENT ALIGNMENT: GOOD

ACTION NEEDED:
NONE

ASSEMBLY REQUIREMENTS

THREADED CONNECTION

ASSEMBLY INTENT IS MOSTLY CLEAR, BUT FASTENER ACCESS AND THREADED MOUNTING DETAILS SHOULD BE REVISED BEFORE MOVING FORWARD.

INTENT ALIGNMENT: MARGINAL

ACTION NEEDED:
REVIEW ASSEMBLY STRATEGY SEE SECTION 4 →

INSTALLATION REQUIREMENTS

FIELD INSTALL: SCREWS INTO SUBSTRATE

SCREW-MOUNTED INSTALLATION IS PRACTICAL. SUPPORT PLATE HAS ADEQUATE PROVISIONS FOR ATTACHMENT TO SUBSTRATE WITH SCREWS.

INTENT ALIGNMENT: GOOD

ACTION NEEDED:
NONE

SPECIAL REQUIREMENTS

NONE STATED

NO SPECIAL REQUIREMENTS WERE PROVIDED. REVIEW DOES NOT ASSUME SEALING, CERTIFICATION, IMPACT RATING, OR REGULATED PERFORMANCE.

INTENT ALIGNMENT: GOOD

ACTION NEEDED:
NONE

POOR	MARGINAL	GOOD	CONCERN
POOR DESIGN INTENT ALIGNMENT OR MAJOR CORRECTION REQUIRED	FEASIBLE, BUT MAY AFFECT FIT, FUNCTION, OR DURABILITY	DESIGN APPEARS APPROPRIATE FOR THE DESIGN INTENT	CLARIFICATION OR CORRECTION NEEDED BEFORE PROCEEDING

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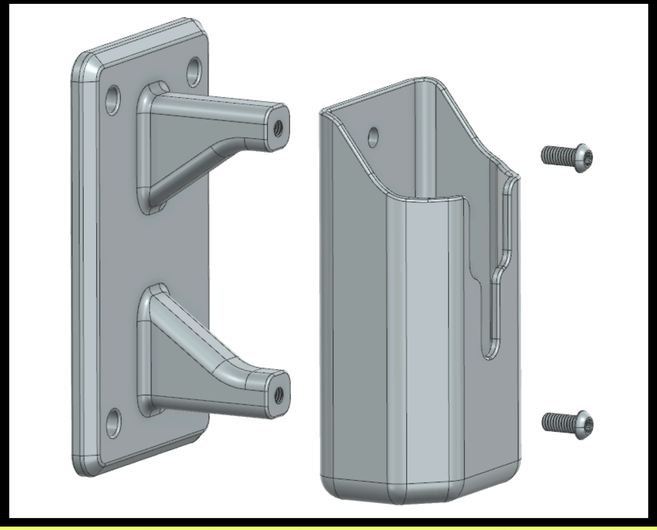
SENSOR_CRADLE_ASSEM.stp

REVIEW LEVEL

LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
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TIER-1 DESIGN REVIEW

DRR

SECTION 3

DESIGN REVIEW

THIS SECTION EVALUATES THE SUBMITTED GEOMETRY FOR PRACTICAL DESIGN, FIT, ACCESS, ASSEMBLY, USABILITY, AND REVISION CONCERNS.

DESIGN OVERVIEW	3-1
DESIGN FINDING - DR-01	3-2
DESIGN FINDING - DR-02	3-3
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SECTION 3
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DESIGN INFORMATION

PART / ASSEMBLY NAME
SENSOR CRADLE ASSEMBLY

GENERAL DESCRIPTION
SENSOR MOUNT

CAD FILE
SENSOR_CRADLE_ASSEM.stp

STATED DESIGN INTENT

Provide a lightweight outdoor wall-mounted cradle assembly for holding a small sensor in a fixed position. design intended for screw-mounted assembly, low static loading, no cycle requirement, and use in an outdoor environment.

DESIGN REVIEW SUMMARY

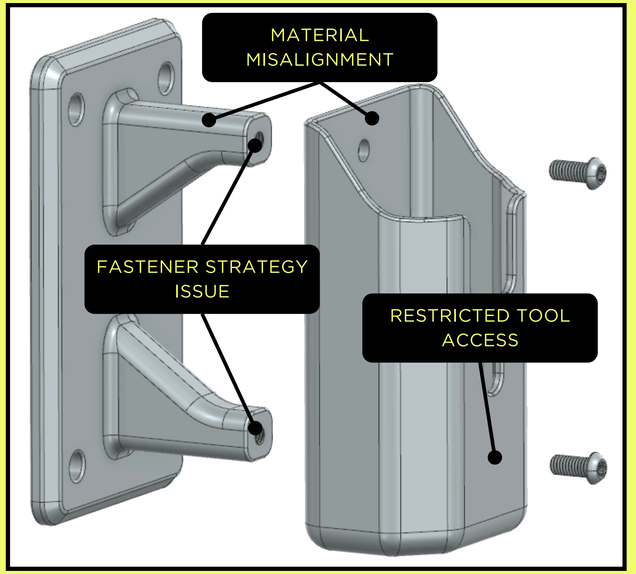
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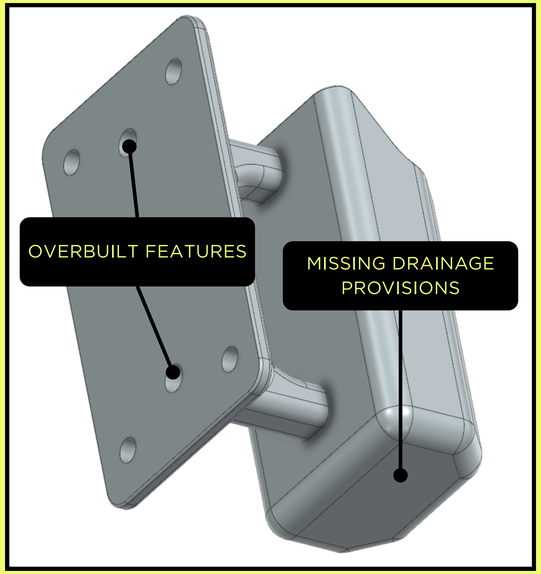
The design should not be considered ready for prototype release as submitted. The planned ABS material does not align with the selected SLS process and should be revised to PA11 or another SLS-compatible material. The lower fastener location appears to restrict direct tool access, which may create installation or service difficulty.

Outdoor use also introduces several practical concerns. The cradle should include a defined drainage path to prevent water and debris from collecting in the pocket. The threaded mounting strategy should be reviewed before relying on printed polymer threads for retention of the cradle. The support arms appear buildable, but may be heavier than necessary for the stated lightweight sensor load.

The recommended next step is to revise the CAD before prototyping, with focus on material/process alignment, fastener access, drainage, fastening strategy, and support arm efficiency.

DESIGN REVIEW FINDINGS





DR-01	MATERIAL MISALIGNMENT	3-2
DR-02	RESTRICTED LOWER FASTENER ACCESS	3-3
DR-03	DRAINAGE PROVISION NOT INCLUDED	3-4
DR-04	BRACKET ARMS OVERBUILT	3-5
DR-05	REVIEW THREADED MOUNTING STRATEGY	3-6

DESIGN MATURITY RATING

NEEDS MODERATE REVISION

DESIGN REVISIONS NEEDED?
YES
SEE NEXT PAGES

DESIGN FINDING

DR-01

PRIORITY

HIGH

MATERIAL MISALIGNMENT

The submitted design identifies ABS as the planned material while SLS is listed as the intended manufacturing process. As SLS cannot produce parts in ABS, the chosen material must change.

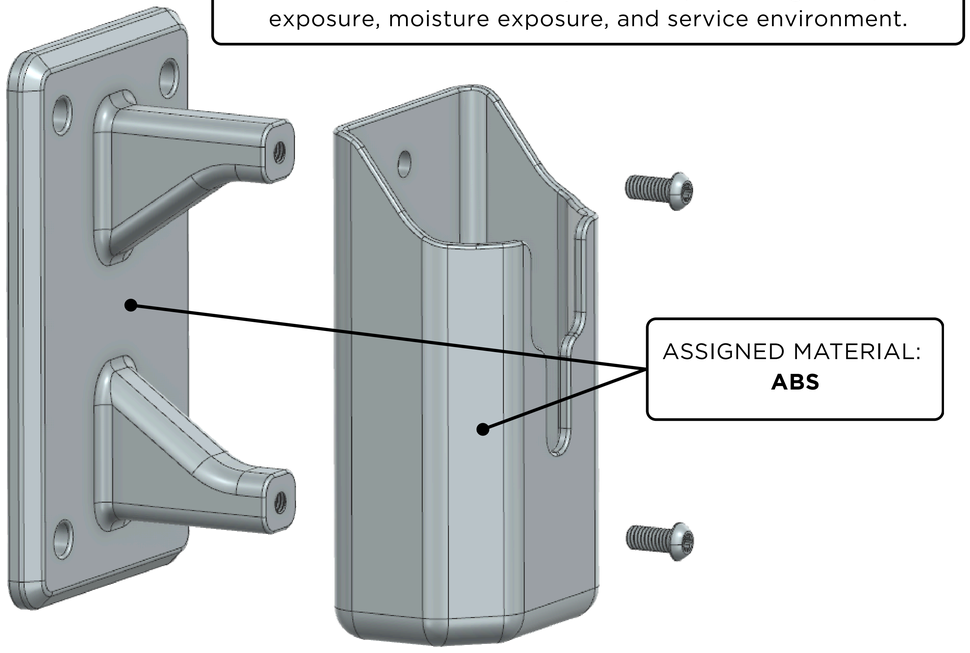
POTENTIAL IMPACTS

- **SUPPLIER CONFUSION**
- **LATE DESIGN DELAYS**
- **SUPPLIER NO-QUOTE**
- **INVALID MATERIAL**
- **PROCESS CHANGE RISK**
- **PROCESS INCOMPATIBILITY**

OBSERVED CONDITION

Submitted material and process assumptions do not currently align.

ABS is not an appropriate material callout for the selected SLS process because standard SLS production does not typically manufacture parts from ABS powder. The material should be changed to an SLS-compatible nylon, such as **PA11**. PA11 maintains the intended process direction while still supporting the stated outdoor-use requirements, including finish, UV exposure, moisture exposure, and service environment.

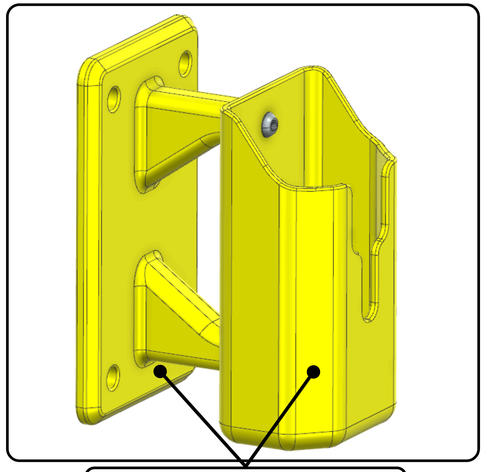


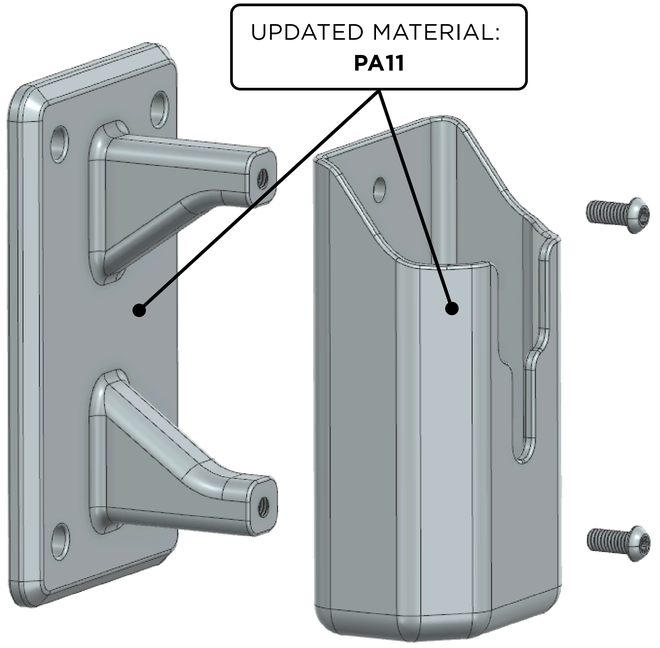
RECOMMENDED ACTION

PRIMARY ACTION: **UPDATE MATERIAL TO PA11**

EXPECTED DIFFICULTY

PA11 is a better fit because it is a common SLS nylon with good toughness, durability, and functional performance. It aligns with powder-bed fusion processing better than ABS and is a reasonable material direction.





DESIGN FINDING

DR-02

PRIORITY

HIGH

RESTRICTED LOWER FASTENER ACCESS

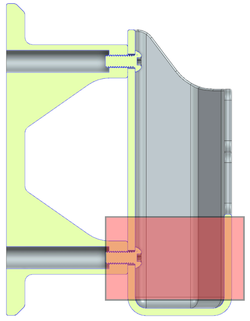
The lower cradle fastener is impossible to access. The cradle wall blocks the straight-line tool path needed to install or remove the fastener cleanly.

POTENTIAL IMPACTS

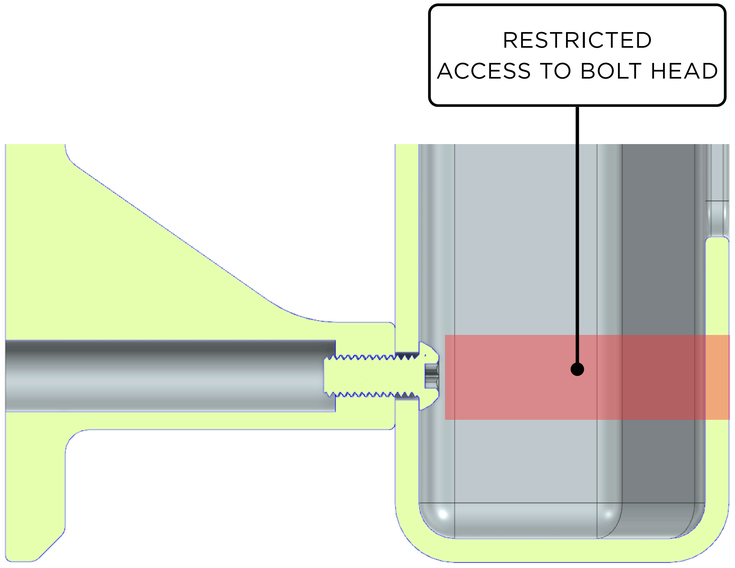
- **DIFFICULT INSTALLATION**
- **THREAD DAMAGE RISK**
- **INCREASED INSTALLATION TIME**
- **FASTENER DAMAGE RISK**
- **SERVICE ACCESS PROBLEM**
- **SPECIAL TOOL REQUIRED**

OBSERVED CONDITION

Restricted tool access at lower internal fastener.



The lower fastener is positioned inside the cradle pocket where the surrounding side walls, front retention lip, and pocket depth limit tool clearance. A screwdriver, hex key, or driver bit may not have enough straight access to engage the fastener without interference.

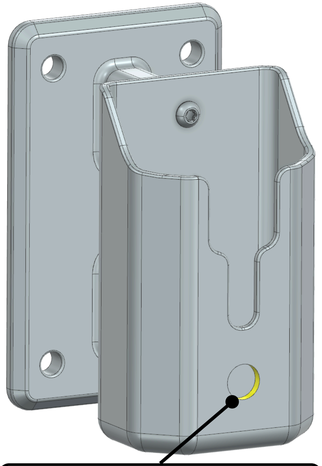


RECOMMENDED ACTION

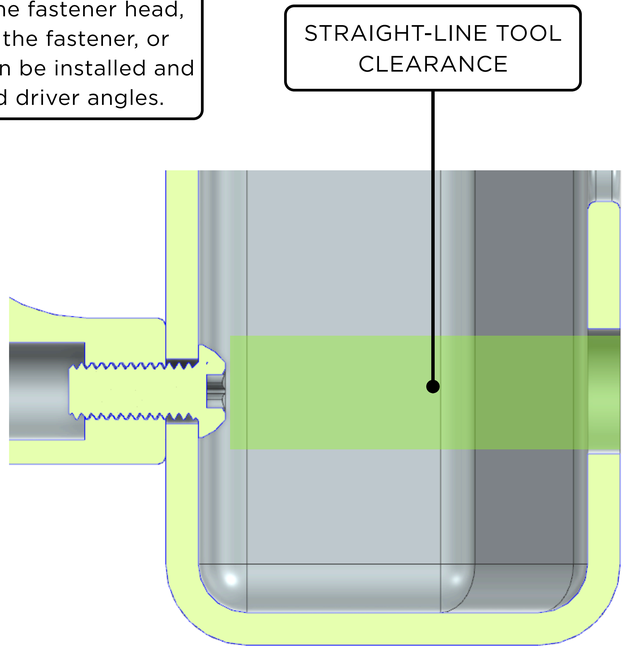
PRIMARY ACTION: **ADD DIRECT TOOL ACCESS TO LOWER FASTENER**

EXPECTED DIFFICULTY

Revise the cradle geometry to provide a clear driver path to the lower fastener. Add clearance around the fastener head, open the front pocket geometry, relocate the fastener, or change the fastening method so the part can be installed and serviced without special tools or awkward driver angles.



YELLOW:
ADD TOOL CLEARANCE HOLE IN CRADLE



DESIGN FINDING

DR-03

PRIORITY

HIGH

DRAINAGE PROVISION NOT INCLUDED

The sensor cradle is intended for outdoor use, but the current pocket geometry can collect water, dirt, and debris. No clear drainage feature is visible at the low point of the cradle.

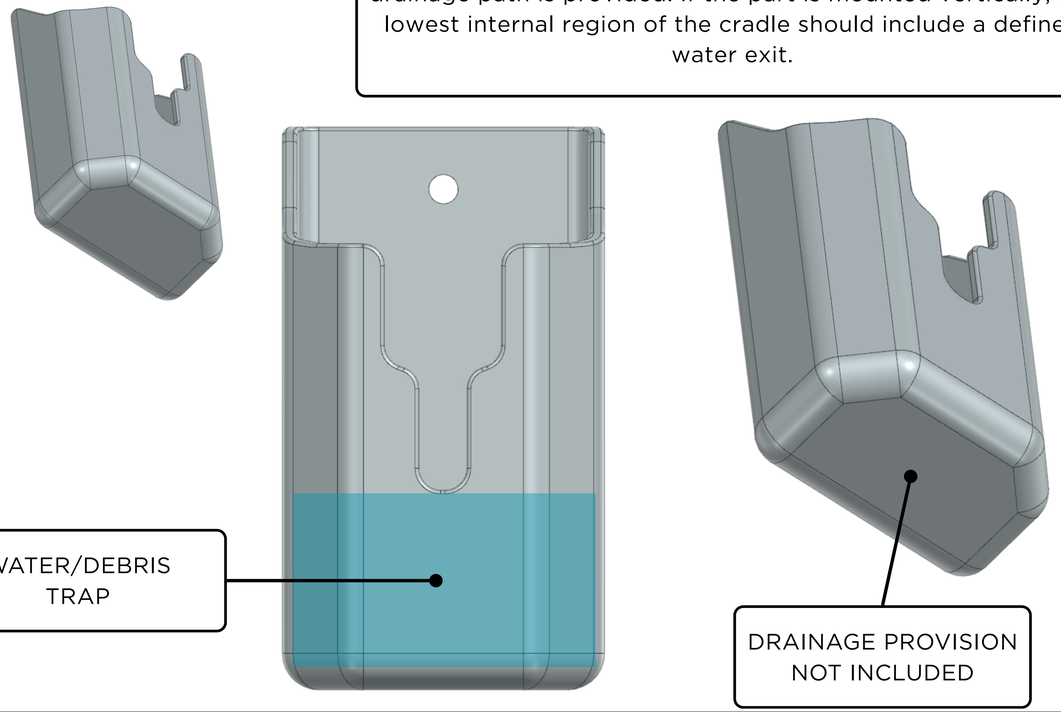
POTENTIAL IMPACTS

- **STANDING WATER IN CRADLE**
- **FREEZE / THAW RISK**
- **HARDWARE CORROSION RISK**
- **DEBRIS ACCUMULATION**
- **SENSOR CONTAMINATION RISK**
- **SENSOR RELIABILITY CONCERN**

OBSERVED CONDITION

Outdoor pocket geometry may trap water.

The cradle forms an upward-facing pocket around the sensor. In an outdoor environment, rainwater, condensation, dust, leaves, insects, and debris can settle inside the cradle if no drainage path is provided. If the part is mounted vertically, the lowest internal region of the cradle should include a defined water exit.

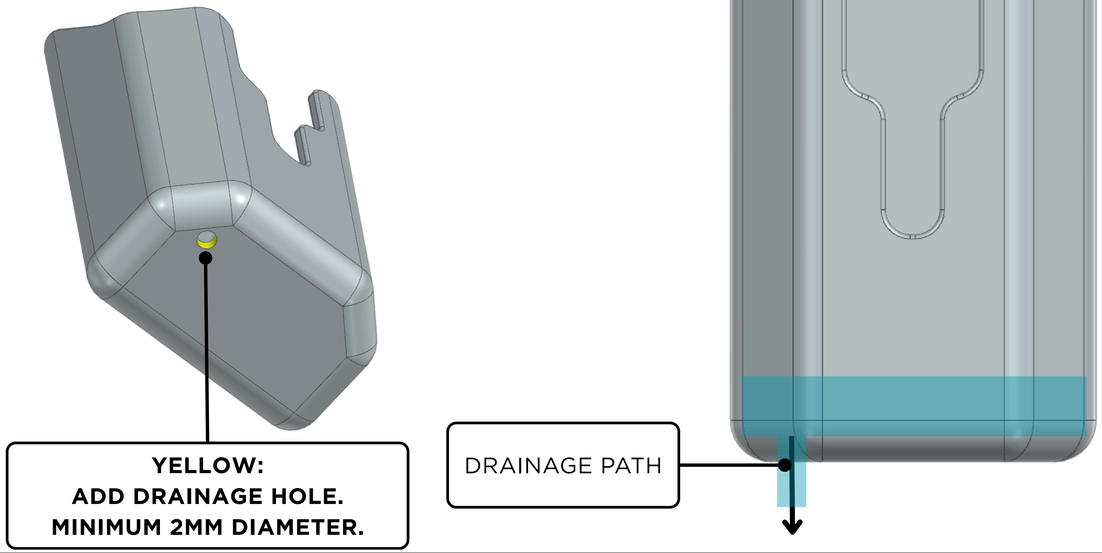


RECOMMENDED ACTION

PRIMARY ACTION: **ADD DRAINAGE FEATURE AT LOW POINT OF CRADLE**

EXPECTED DIFFICULTY

Add a drain hole, drain slot, or open relief at the lowest practical point of the cradle based on the intended installed orientation. The drainage feature should allow water and debris to exit without weakening the sensor pocket, interfering with retention, or creating a sharp stress concentration.



DESIGN FINDING

DR-04

PRIORITY

MEDIUM

BRACKET ARMS OVERBUILT

The bracket support arms appear relatively heavy for the lightweight application. This may use more material than necessary for the stated load case, especially if the part is produced using SLS PA11.

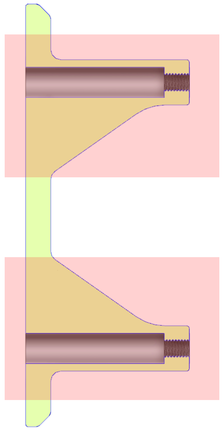
POTENTIAL IMPACTS

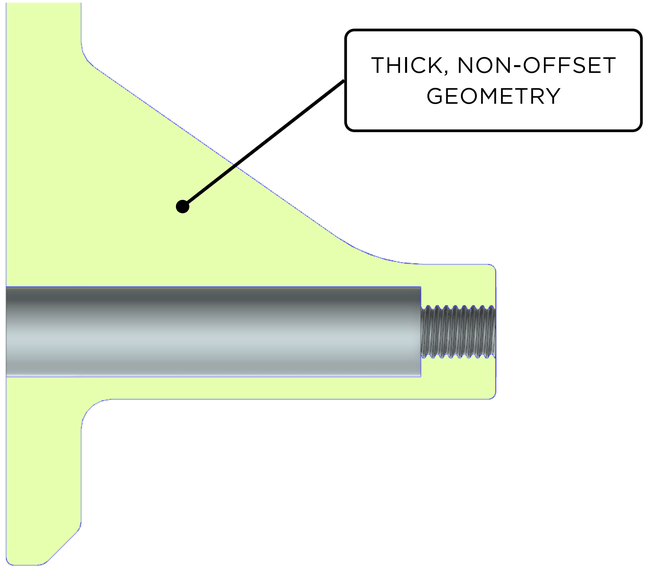
- **UNNECESSARY MATERIAL USAGE**
- **INCREASED BUILD MASS**
- **MISSED EFFICIENCY OPPORTUNITY**
- **HIGHER PRINT / PART COST**
- **LONGER PRINTING / COOLING TIME**
- **REDESIGN RISK**

OBSERVED CONDITION

Support arms appear overly thick for lightweight sensor load.

The sensor is described as lightweight, with no major cycling requirement. The current bracket uses two solid support arms between the wall plate and sensor cradle. Based on the stated use case, the arms may be stronger and heavier than necessary, increasing material usage, print time, and part cost.





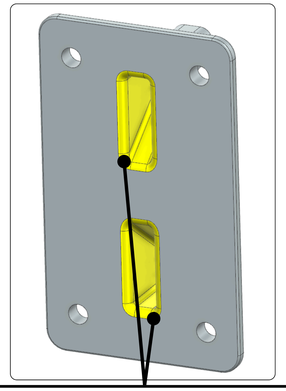
RECOMMENDED ACTION

PRIMARY ACTION: **REDUCE SUPPORT ARM MATERIAL**

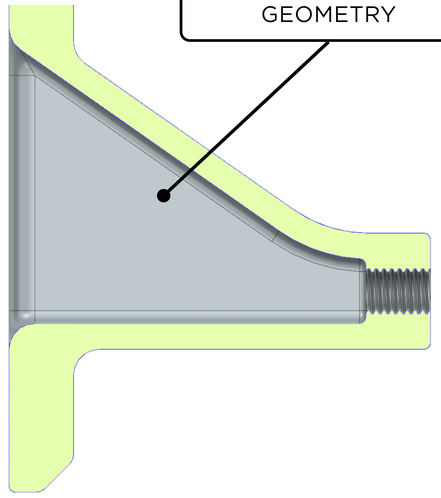
EXPECTED DIFFICULTY

SLS can feasibly build the part as designed, but the support arms appear thicker than necessary for the stated lightweight sensor load.

Add open relief geometry to reduce material usage, improve build efficiency, and lower cost while maintaining the required strength and load path from the sensor cradle to the mounting bracket.



YELLOW:
CORE OUT SUPPORT ARMS TO A MINIMUM 2MM OFFSET



DESIGN FINDING

DR-05

PRIORITY

HIGH

REVIEW THREADED MOUNTING STRATEGY

The mounting bracket appears to rely on screws threading directly into SLS PA11. Confirm thread strength, installation torque, and long-term retention before relying on printed polymer threads.

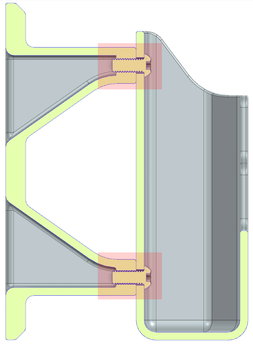
POTENTIAL IMPACTS

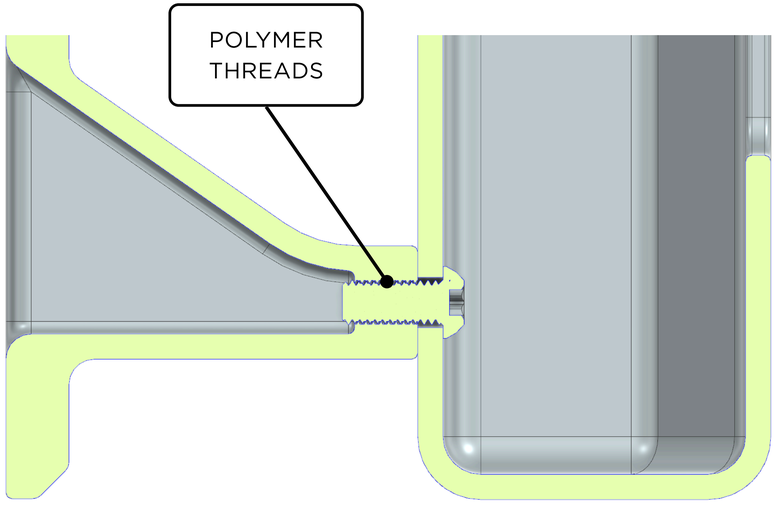
- **THREAD STRIPPING RISK**
- **INSTALLATION TORQUE SENSITIVITY**
- **OUTDOOR DURABILITY CONCERN**
- **LOW CLAMP LOAD RETENTION**
- **SERVICE / REINSTALLATION WEAR**
- **LIMITED REINSTALLATION CYCLES**

OBSERVED CONDITION

Mounting holes appear intended to be tapped directly into SLS PA11.

For an outdoor-mounted assembly, direct polymer threads may be acceptable for light-duty use, but the design should not rely on tapped PA11 holes without confirming screw size, engagement length, installation torque, service expectations, and long-term clamp retention.
Polymer threads are highly susceptible to stripping due to over-torque.





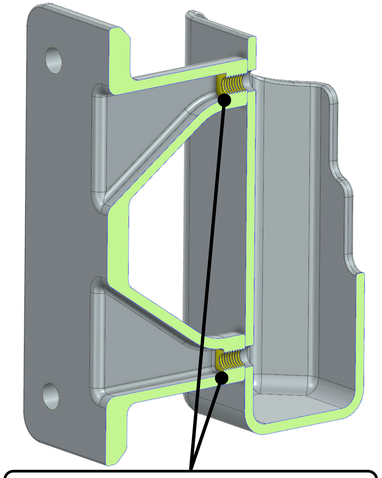
RECOMMENDED ACTION

PRIMARY ACTION:

REVISE OR VALIDATE THE THREADED FASTENING STRATEGY

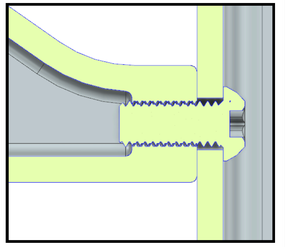
EXPECTED DIFFICULTY

Torque specification, clamp load requirements, and number of install/reinstall cycles should be finalized and verified through testing if maintaining polymer threads. Otherwise, redesign the connection to meet requirements.

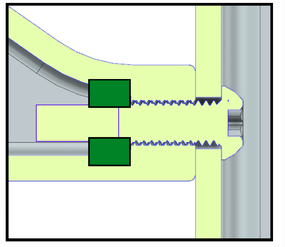


YELLOW:
CONFIRM OR REVISE CRADLE ATTACHMENT STRATEGY

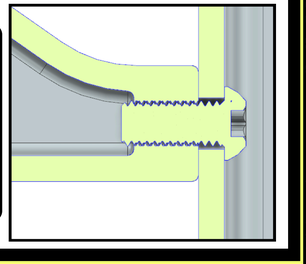
OPTION 1
SLS print small sample threaded connection that matches design intent, and test torque, pullout force, and retention strength



OPTION 2
Lengthen attachment bolt, and add custom nut-plate or trapped hex nut to provide high-strength threads



OPTION 3
Redesign attachment strategy to move away from a bolted connection
(snap-fit, slot & tab)



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PROJECT INFORMATION

REPORT ID	DATE	CLIENT / COMPANY
DRR-11-0038	11/13/2011	J. MARSTON HOME GOODS

CLIENT TYPE	PART / ASSEMBLY NAME
SMALL BUSINESS	SENSOR CRADLE ASSEMBLY

DESIGN STAGE	PART / ASSEMBLY DESCRIPTION
PRE-PROTOTYPE	SENSOR MOUNT

PLANNED MATERIAL	PLANNED PROCESS
ABS	SLS

FILES / DOCUMENTATION RECEIVED

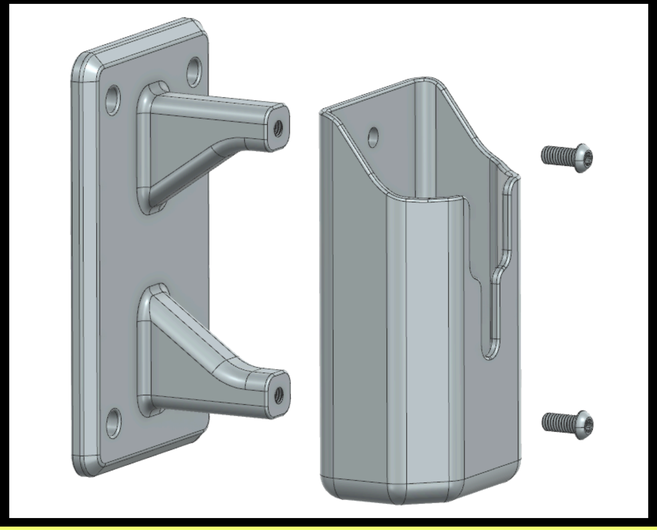
SENSOR_CRADLE_ASSEM.stp

REVIEW LEVEL

LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
SENSOR_CRADLE_ASSEM.stp	STEP	METRIC



TIER-1
DESIGN REVIEW
DRR

SECTION 4

PROCESS ALIGNMENT SCREENING

THIS SECTION SCREENS WHETHER THE PLANNED MATERIAL, PROCESS, VOLUME, PART SIZE, AND DESIGN FEATURES CREATE OBVIOUS PROCESS CONCERNS.

PROCESS ALIGNMENT OVERVIEW	4-1
PROCESS ALIGNMENT FACTORS	4-2

SECTION 4
PROCESS ALIGNMENT SCREENING

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PLANNED MANUFACTURING PROCESS

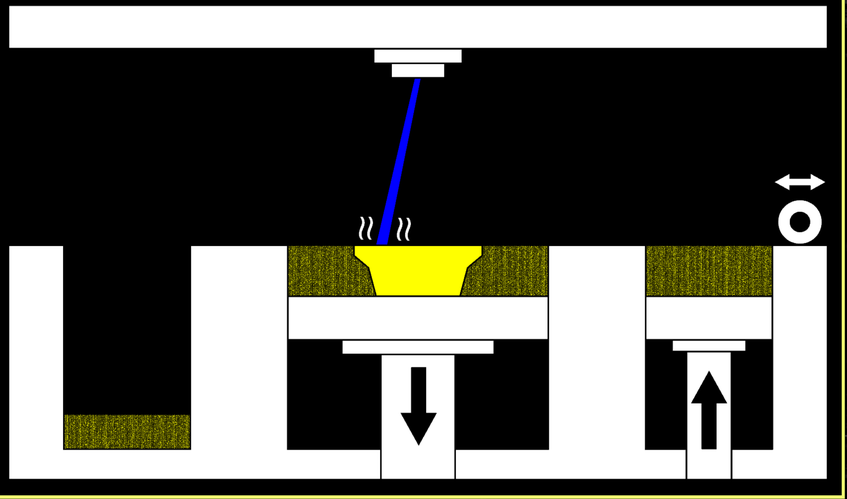
SLS
SELECTIVE LASER SINTERING

ANNUAL PRODUCTION CAPABILITY
1 - 50,000

PART SIZE CAPABILITY
10 - 400+ MM

PART COMPLEXITY CAPABILITY
VERY HIGH

SURFACE FINISH CAPABILITY
MODERATE



PROCESS SCREENING PARAMETERS

PARAMETER	CURRENT DESIGN ALIGNMENT		
	GOOD	MARGINAL	POOR
PLANNED MATERIAL: ABS			●
ESTIMATED ANNUAL PRODUCTION: 25	●		
PART SIZE (MM): MOUNT - 84x50x33 / CRADLE - 77x44x28	●		
PART COMPLEXITY: LOW	●		
SURFACE FINISH / COSMETIC REQUIREMENTS: RAW / AS-PRINTED	●		
SPECIAL FEATURES: TAPPED HOLES		●	

PROCESS ALIGNMENT ASSESSMENT

The selected SLS process appears directionally reasonable for the submitted sensor cradle assembly based on the small part size, low estimated annual volume, low part complexity, and lightweight static-use application. SLS is a practical process direction for early functional prototypes or low-volume production because it avoids dedicated tooling and can produce the submitted geometry without traditional molding constraints.

The primary process alignment concern is the planned ABS material. ABS does not align with standard SLS production and should be revised to PA11 or another SLS-compatible nylon before prototype or supplier review. This material change preserves the intended additive manufacturing direction while improving material/process compatibility.

The submitted geometry appears generally suitable for SLS, but several process-sensitive details should be reviewed before moving forward. The support arms appear heavier than necessary for the stated load case, which may increase material use, print time, and part cost. The tapped-hole strategy also requires review because printed polymer threads can be sensitive to torque, engagement length, and repeated installation.

Overall, the process direction is **mostly aligned once the material is corrected**. Before prototyping, the design should confirm PA11 suitability for outdoor use, review the fastening strategy, add drainage, and reduce unnecessary support mass where practical.

PROCESS ALIGNMENT RATING

MOSTLY ALIGNED

DESIGN REVISIONS NEEDED?
YES
SEE NEXT PAGES

SECTION 4
PROCESS ALIGNMENT SCREENING

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PROCESS ALIGNMENT FACTORS

PLANNED MATERIAL

ABS

**ABS LISTED;
PA11 NEEDED FOR SLS**

ABS DOES NOT ALIGN WITH THE SELECTED SLS PROCESS. REVISE MATERIAL DIRECTION TO PA11 OR ANOTHER APPROVED SLS NYLON BEFORE PROTOTYPE OR SUPPLIER REVIEW.

ALIGNMENT: POOR

PART COMPLEXITY

LOW

SIMPLE BRACKET / CRADLE GEOMETRY

OVERALL GEOMETRY IS PRACTICAL FOR SLS, BUT SUPPORT ARMS AND FASTENING FEATURES SHOULD BE REVIEWED FOR MATERIAL EFFICIENCY AND INSTALLATION RELIABILITY.

ALIGNMENT: SUITABLE

ESTIMATED ANNUAL USAGE

25 UNITS

PRACTICAL SLS PRODUCTION VOLUME RANGE

1 — UNITS — 1000

ESTIMATED ANNUAL VOLUME IS WELL ALIGNED WITH SLS. LOW QUANTITY SUPPORTS DIRECT DIGITAL PRODUCTION WITHOUT DEDICATED TOOLING OR HIGH UPFRONT PROCESS COST.

ALIGNMENT: SUITABLE

COSMETIC REQUIREMENTS

NONE ASSIGNED

**NONE ASSIGNED
ASSUMED: RAW / AS-PRINTED**

RAW SLS FINISH MAY BE ACCEPTABLE, BUT OUTDOOR APPEARANCE, TEXTURE, COLOR, COATING, AND LONG-TERM EXPOSURE EXPECTATIONS SHOULD BE CONFIRMED.

ALIGNMENT: SUITABLE

PART SIZE

MOUNT: 84x50x33
CRADLE: 77x44x28

PRACTICAL SLS PART SIZE RANGE

10 — MM — 400

OVERALL PART SIZE IS COMPATIBLE WITH SLS. THE MOUNT AND CRADLE APPEAR SMALL ENOUGH FOR PRACTICAL PRINTING, HANDLING, AND POST-PROCESSING.

ALIGNMENT: SUITABLE

SPECIAL FEATURES

TAPPED HOLES

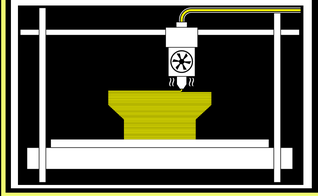
THREADED FASTENING FEATURES

TAPPED PA11 HOLES MAY BE POSSIBLE, BUT THREAD STRENGTH, TORQUE LIMITS, ENGAGEMENT LENGTH, AND OUTDOOR CLAMP RETENTION SHOULD BE REVIEWED.

ALIGNMENT: MARGINAL

REASONABLE ALTERNATIVE PROCESSES

FDM



FDM MAY BE A PRACTICAL LOW-COST ALTERNATIVE FOR EARLY PROTOTYPES OR LOW-QUANTITY USE. HOWEVER, LAYER STRENGTH, OUTDOOR DURABILITY, AND SURFACE FINISH SHOULD BE REVIEWED

PROS:
**FAST; VERY LOW COST
GOOD FOR LOW EAU
MULTIPLE MATERIAL OPTIONS**

CONS:
**WEAKER LAYER ADHESION
MARGINAL SURFACE FINISH
LOWER DURABILITY**

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PROJECT INFORMATION

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DRR-11-0038	11/13/2011	J. MARSTON HOME GOODS

CLIENT TYPE	PART / ASSEMBLY NAME
SMALL BUSINESS	SENSOR CRADLE ASSEMBLY

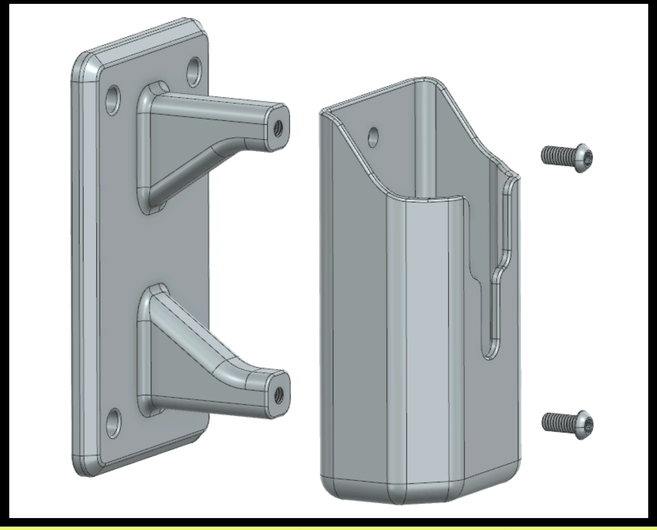
DESIGN STAGE	PART / ASSEMBLY DESCRIPTION
PRE-PROTOTYPE	SENSOR MOUNT

PLANNED MATERIAL	PLANNED PROCESS
ABS	SLS

FILES / DOCUMENTATION RECEIVED	REVIEW LEVEL
SENSOR_CRADLE_ASSEM.stp	LEVEL 1

DESIGN UNDER REVIEW

CAD FILE	FILE TYPE	UNITS
SENSOR_CRADLE_ASSEM.stp	STEP	METRIC



TIER-1
DESIGN REVIEW
DRR

SECTION 5

NEXT STEPS & REVIEW CLOSEOUT

THIS SECTION PROVIDES THE FINAL DESIGN REVIEW DISPOSITION, RECOMMENDED ACTION ORDER, NEXT-STEP GUIDANCE, AND OFFICIAL REVIEW CLOSEOUT STATEMENT.

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

SECTION 5
NEXT STEPS & REVIEW CLOSEOUT

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FINAL DESIGN DISPOSITION

The submitted sensor cradle assembly is generally workable for the stated outdoor sensor-holder intent. However, the current design **should not be considered ready for prototyping** until the design findings outlined in this report are considered and addressed.

PRACTICAL NEXT STEP — **REVISE DESIGN, AND MOVE TO PROTOTYPING**

DESIGN INTENT ALIGNMENT RATING

MOSTLY ALIGNED

DESIGN INTENT

PROVIDE A LIGHTWEIGHT OUTDOOR WALL-MOUNTED CRADLE THAT SECURELY HOLDS A SMALL SENSOR WHILE ALLOWING SIMPLE SCREW INSTALLATION

PROCESS ALIGNMENT RATING

MOSTLY ALIGNED

PLANNED PROCESS
SLS

ALTERNATIVE PROCESS
FDM

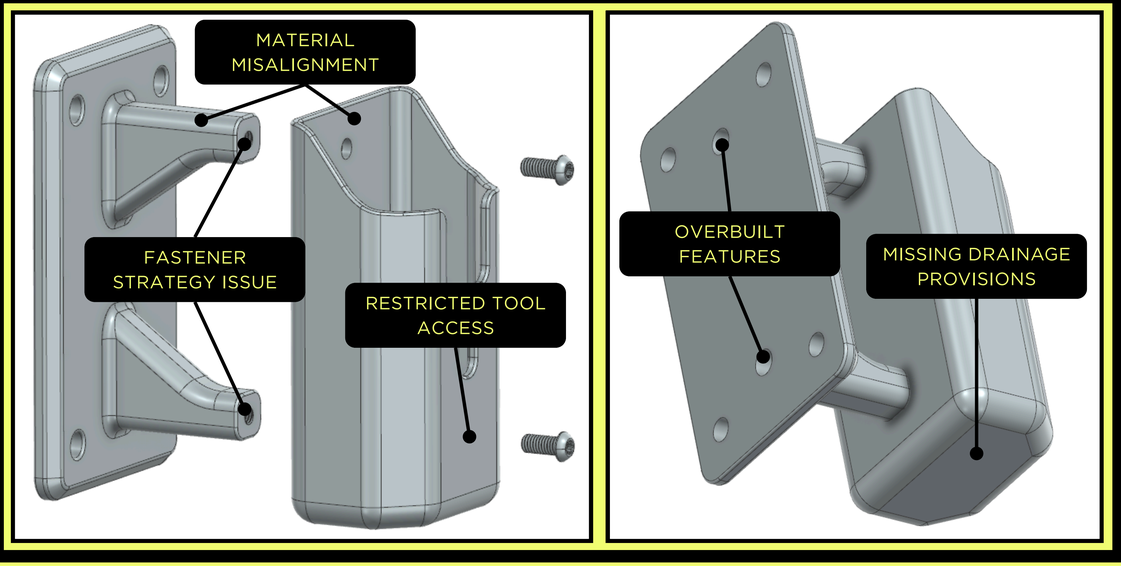
CURRENT DESIGN MATURITY

NOT READY FOR PROTOTYPING

PROJECTED DESIGN MATURITY

SUITABLE FOR PROTOTYPING AFTER DESIGN REVISIONS

RECOMMENDED DESIGN ACTIONS



FIX ORDER	ID	FINDING	RECOMMENDED ACTION	PAGE
1	DR-01	MATERIAL MISALIGNMENT	UPDATE MATERIAL TO PA11, ALIGNING WITH SLS	3-2
2	DR-05	REVIEW THREADED MOUNTING STRATEGY	REVISE OR VALIDATE THE FASTENING STRATEGY	3-6
3	DR-03	DRAINAGE PROVISION NOT INCLUDED	ADD DRAINAGE FEATURE AT LOW POINT OF CRADLE	3-4
4	DR-02	RESTRICTED LOWER FASTENER ACCESS	ADD DIRECT TOOL ACCESS TO LOWER FASTENER	3-3
5	DR-04	BRACKET ARMS OVERBUILT	REDUCE SUPPORT ARM MATERIAL	3-5

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

*Optional clarification meeting available to review DRR 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.
DR@TIER1ENGINEER.COM

SECTION 5
KEY TERMINOLOGY

TERM	DEFINITION
ABS	A common thermoplastic used in many manufacturing processes, but not generally used as a standard SLS powder material.
Action Priority	The importance of addressing a finding based on design risk, next-step impact, and project intent.
Assembly Requirement	A condition related to how the part or assembly is put together, fastened, installed, or serviced.
CAD Data Usability	The practical usefulness of the submitted CAD file based on file condition, geometry clarity, units, completeness, and accessibility.
Clamp Load	The force created by a tightened fastener that holds parts together.
Design Finding	An observed design issue, concern, or condition identified during the Design Review.
Design Intent	The stated purpose, function, use case, and constraints the design is expected to satisfy.
Design Maturity	How developed the submitted design is based on completeness, clarity, risk level, and readiness for the next project step.
Design Revision	A change to CAD, geometry, material, documentation, or design assumptions made to address review findings or improve readiness.
Design Risk	A design condition that may create fit, function, assembly, cost, manufacturability, durability, or next-step problems.
Drainage Path	A designed feature that allows water, dirt, or debris to exit a part instead of collecting inside pockets or low areas.
Expected Difficulty	The estimated effort required to address a finding, from simple design update to major redesign or added review.
Fastener Access	The space and tool path needed to install, tighten, remove, or service a fastener.
Function Requirement	A condition the design must satisfy in order to perform its intended job.
Geometry Review	A review of the submitted shape, features, access, fit, assembly, usability, and visible design concerns.
Installation Requirement	A condition related to how the product is mounted, attached, adjusted, removed, or used in the field.

TERM	DEFINITION
Interface	A contact, fit, attachment, or interaction point between the reviewed design and another part, user, tool, surface, or environment.
Loading Requirement	The expected force, weight, pressure, torque, impact, or repeated use condition the design must withstand.
Material / Process Alignment	The fit between the selected material and the intended manufacturing process.
Material Direction	The recommended material family or material path based on the design use case, process, environment, and project stage.
Open Relief Geometry	A cutout, slot, or open feature used to reduce material while avoiding trapped powder, sealed cavities, or unnecessary solid mass.
PA11	A nylon material commonly used in SLS applications and often selected for functional parts requiring toughness, durability, and flexibility.
Part Complexity	The overall difficulty of the part based on geometry, features, interfaces, manufacturing constraints, and review risk.
Process Alignment	The degree to which the planned manufacturing process appears suitable for the submitted design and project assumptions.
Process Screening	A high-level review of whether the planned material, process, volume, part size, and design features create obvious process concerns.
Prototype	An early physical version of the design used to evaluate fit, function, installation, appearance, or basic performance.
Recommended Action	The suggested design change, verification step, or next move intended to address a review finding.
Review Scope	The approved boundary of what the Design Review evaluates and what it does not evaluate.
Serviceability	The ability to install, remove, inspect, repair, adjust, or replace the design or its components after assembly.
SLS	Selective Laser Sintering, an additive manufacturing process that builds parts from powdered material using a laser.
Supplier Review	The process of sending design information to a manufacturer, prototype shop, or supplier for feedback, quotation, or manufacturability input.
Thread Engagement	The amount of thread contact between a screw and the material it fastens into.