



**L3HARRIS™**

**CABLE/HARNESS MOLDED BACKSHELL  
DESIGN SPECIFICATION**

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## **1. PURPOSE**

This specification provides design construction details for potted, poured, or injection molded backshells used in conjunction with connectors in cable and harness assemblies. Cable and harness drawings reference this document to provide additional design details about molded backshells that would normally be provided on the drawing itself. This document provides a consistent manner of showing molded backshell construction details in a manner acceptable to manufacturing and engineering and reduces time spent duplicating information on each drawing. In addition, this document provides molding details or processes that are “approved by CSW Engineering” as stated in some CSW cable and harness heritage drawings mold notes. Some heritage mold notes do not call out specific molding materials and allowed leave-behind materials. This document also specifies those materials.

## **2. SCOPE**

This specification is intended for all CSW cable and harness drawings with molded or encapsulated connector backshells. Newer cable and harness documentation will reference this document directly. Heritage cable and harness drawings with older connector backshell molding notes will also reference this document through the use of Internal Standard IS-001. IS-001 provides for an update to the heritage mold notes to reference this document.

This document takes precedence over IS-001 for mold designs and processes only.

### 3. APPLICABLE DOCUMENTS

The following documents are referenced within this document.

#### 3.1 GOVERNMENT DOCUMENTS

<u>Document</u>	<u>Title</u>
Mil-M-24041	Molding and Potting Compound, Chemically Cured, Polyurethane

#### 3.2 OTHER PUBLICATIONS

##### Industry Standards

<u>Document</u>	<u>Title</u>
IPC/WHMA-A-620	Requirements and Acceptance for Cable and Wire Harness Assemblies

##### L3H Documents and Drawings

<u>Document</u>	<u>Title</u>
IS-001	Use of Non-Specified Hardware/Material
WS-003	Cable Harness Assembly
W-432	Practices for EMC-Electromagnetic Compatibility
W-536	Acceptable Molded Material Rework
60102381	Interpreting L3 Cable/Harness Drawings
1000419170	CSW Injection Mold Material Qualification Test - Low Operating Temperature
G-665	Incorporating Molded Backshells in Cable Designs

### 4. ACRONYMS AND DEFINITIONS

#### 4.1 ACRONYMS

CSW – L3H Communication Systems – West  
L3H – Abbreviation for L3Harris Technologies, Inc.  
N/A – Not Applicable  
P/N – Part Number

## 4.2 DEFINITIONS

<b>Backshell -</b>	An extension of a connector used to provide a banding platform, add strain relief, contact protection, and ergonomic shape.
<b>Contact -</b>	Electrically conductive metal used as a mechanical interface to form a mating junction for electrical circuits. Connectors are used to envelope and embody multiple contacts.
<b>EMI -</b>	An acronym for electromagnetic interference - an electromagnetic field that affects an electrical circuit due to either electromagnetic induction or radiation emitted from an internal or external source.
<b>First Shot -</b>	Same as Initial Molding.
<b>Initial Molding -</b>	A molding process used to encapsulate wires foil, braids or an existing form or shape and provide the basic shape for over-molding.
<b>Molding Compound -</b>	Material used to form a molded backshell.
<b>Mold Release -</b>	A compound applied to the surface of a mold to prevent sticking and deliver full recovery of the molded part.
<b>Second Shot -</b>	Same as Over-molding.
<b>Over-molding -</b>	Molding process over an existing form or shape to create a finished shape; often referred to as second shot molding or final molding. In some cases initial molding and over-molding can be combined into one operation.
<b>Thermoplastic –</b>	A polymer plastic that softens at a given temperature and solidifies when cooled.
<b>Thermoset –</b>	A temperature cured polymer that irreversibly sets when cured at a given temperature.

## 5. CSW ENGINEERING APPROVED BACKSHELL MOLDING MATERIALS

### 5.1 APPROVED INITIAL MOLDING MATERIALS

Material	L3H/Supplier & Part Number	Min Op Temp °F (°C)	Max Op Temp °F (°C)	Allowed Mold Release	Allowed Additives
<b>Polyurethane (Black)</b>	Mil-M-24041 Category B, Type I or II  Cytec EN-1556, PPG PR-1592 or PR-1547  (L3H P/N 7919399-ANY or 1000367789)	-70 (-57)	300 (149)	40015088-000	N/A
<b>Polyester (Black)</b>	40014298-004 <sup>3</sup>	Inactive for New Design			
<b>Polypropylene (Black)</b>	7192764-000	-67 (-55) <sup>1</sup>	248 (120)	7184436-ANY	N/A
<b>Black Epoxy</b>	S1125 or 7917693-ANY	-67 (-55)	302 (150)	1000371757	7181837-000
<b>Gray Epoxy</b>	7910812-002	-67 (-55)	180 (82)	1000371757	7181837-000
<b>Amber Hot Melt<sup>2</sup></b>	1000405169	-67 (-55)	300 (149)	N/A	N/A
<b>Stycast 2651/Catalyst 9</b>	1000140139	-67 (-55) <sup>1</sup>	266 (130)	N/A	N/A
<b>Stycast 2651/Catalyst 11</b>	1000157044	-67 (-55)	311 (155)	N/A	N/A
<b>Sarlink TPV 4180</b>	1000140140	-67 (-55) <sup>1</sup>	212 (100)	N/A	N/A
<b>RTV8111</b>	1000205803 <sup>4</sup>	-65 (-54)	100 (204)	N/A	N/A

If the parts list contains only one of the approved polyurethane part numbers, manufacturing may use another depending on availability. Design engineering considers these part numbers to be functionally equivalent (frozen or 2-part) in the final cured state.

1 See Test Report 1000419170.

2 Amber Hot Melt 1000405169 may reflow or soften during post processing steps. Post processing step must not adversely affect connector or contact operation.

3 Polyester 40014298-004 inactive for new design due to obsolescence of one ingredient used to prevent moisture absorption.

4. 1000205803 may be used to facilitate re-workable backshells.

## 5.2 APPROVED FINAL MOLDING MATERIALS

Material	L3H/Supplier & Part Number	Min Op Temp °F (°C)	Max Op Temp °F (°C)	Allowed Mold Release	Allowed Additives
<b>Polyurethane (Black)</b>	Mil-M-24041 Category B, Type I or II  Cytec EN-1556 or PPG PR-1592  (L3H P/N 7919399-ANY or 1000367789)	-70 (-57)	300 (149)	40015088-000	N/A
<b>Polyester (Black)</b>	40014298-004 <sup>2</sup>	Inactive for New Design			
<b>Polypropylene (Black)</b>	7192764-000	-67 (-55) <sup>1</sup>	248 (120)	7184436-ANY	N/A
<b>Stycast 2651/Catalyst 9</b>	1000140139	-67 (-55) <sup>1</sup>	266 (130)	N/A	N/A
<b>Stycast 2651/Catalyst 11</b>	1000157044	-67 (-55)	311 (155)	N/A	N/A
<b>Sarlink TPV 4180</b>	1000140140	-67 (-55) <sup>1</sup>	212 (100)	N/A	N/A
<b>Black Epoxy</b>	S1125 or 7917693-ANY	-67 (-55)	302 (150)	1000371757	N/A

If the parts list contains only one of the approved polyurethane part numbers, manufacturing may use another depending on availability. Design engineering considers these part numbers to be functionally equivalent (frozen or 2-part) in the final cured state.

1 See Test Report 1000419170.

2 Polyester 40014298-004 inactive for new design due to obsolescence of one ingredient used to prevent moisture absorption.

### 5.3 APPROVED SUPPLEMENTAL MOLDING MATERIALS

These materials may be added to the cable build when specified by an MPE in the manufacturing bill of material (MBOM) or manufacturing work instructions.

<b>Material</b>	<b>L3H Part Number</b>	<b>Min Op Temp °F (°C)</b>	<b>Max Op Temp °F (°C)</b>	<b>Notes</b>
<b>Copper Foil</b>	7184944-ANY, 1000293663, 1000293664, 1000293665	-40 (-40)	266 (130)	Foil may be substituted for braid socks.
<b>Solder</b>	7910771-004	N/A	361 (183)	SN63PB37/SN60PB40
<b>Sealing Plugs</b>	MS27488-ANY-ANY	-67 (-55)	392 (200)	Sized to fit. Use to prevent escape of molding material.
	Vendor Specified	N/A	N/A	
<b>Non-Reinforced Self Fusing Silicone Tape<sup>1</sup></b>	A-A-59163, CLASS 1, TYPE I 40014362XX 40014362-ANY	-60 (-51)	400 (204)	Sized to fit
<b>Lacing Tape<sup>1</sup></b>	7910884-ANY	-67 (-55)	325 (162)	Sized to fit
<b>Polyimide Tape<sup>1</sup></b>	7913714-000, 001	-76 (-60)	500 (260)	Sized to fit
<b>Clamping Band</b>	7185011-ANY or 7185011008 or M85049/128-ANY	-85 (-65)	392 (200)	Length and width sized to fit
<b>Primer</b>	1000290736	N/A	N/A	Promotes Adhesion
<b>Sleeving</b>	M23053/8-ANY-C	-67 (-55)	347 (175)	Sized to fit
<b>Double Layer Sleeving</b>				For injection mold applications, a second layer of sleeving can be added to insulate contacts or splices when needed to prevent shorting.

<sup>1</sup> May be used to dress cables and prevent damage. May be left behind if tape is fully encapsulated during the final molding. Otherwise, tape shall be removed after molding.

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## **6. MOLDED BACKSHELL DESIGN**

The following sections provide details on the different steps for approved CSW molded backshell designs used for cable and harness products at CSW.

### **6.1 INITIAL ENCAPSULATION**

The initial encapsulation and contact sealing processes may be used together or independently to encapsulate wires, shields, sleeves, and contacts during the over-molding process.

#### **6.1.1 CONTACT SLEEVING**

Exposed contacts not covered by seals or dielectric must be insulated to prevent shorting from contact movement, braids or foil during molding.

6.1.1.1 Use M23053/8-ANY-C to insulate contacts prior to sealing or encapsulation when needed to prevent shorting.

6.1.1.2 Use 5.1 materials (pre-initial potting) to insulate conductors prior to sealing or encapsulation when needed to prevent shorting.

#### **6.1.2 CONTACT SEALING**

Contacts shall be sealed to prevent the escape of molding material. Encapsulation of the connector contacts may be necessary to meet workmanship and design requirements using allowed materials listed in 5.1 and 5.3.

6.1.2.1 Addition of an insert support plate for sealing may be used provided it does not interfere with wire insulation or connector strain relief, is encapsulated per 6.1.1, and is defined in the build process.

6.1.2.2 Appropriate sealing plugs such as MS27488 or similar may be used to prevent escape of molding material per 6.1.2. See table in section 5.3.

6.1.2.3 Connector grommet alterations permitted providing the initial encapsulation process meets the dielectric withstanding voltages for the cable assembly.

#### **6.1.3 WIRE ENCAPSULATION OR INITIAL MOLDING**

Wires, shields, and sleeves may require initial encapsulation to complete the over-molding process of a molded connector.

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6.1.3.1 Initial encapsulation material not specified on the drawing shall use an approved material per section 5.1.

6.1.3.2 Any mold release used shall not leave a film or residue on the final product which affects performance, and as such will not be on the parts list. The use of a mold release is a manufacturing decision to be made by a trained operator. Preferred mold release for a given material is listed in section 5.1.

6.1.3.3 Shield and over-braid terminations at foil/solder may be installed after initial encapsulation provided 6.2 is not violated.

6.1.3.4 Use solder 7910771-004 when molding.

## **6.2 MAINTAINING SHIELD INTEGRITY IN BACKSHELL**

Molded backshell designs shall maintain full shield coverage (faraday cage) over the signal wires and shields of the cable/harness, as required by the drawing. The wiring diagram on the cable/harness drawing will depict shielding requirements.

If the metal portion of the backshell (faraday cage) is exposed, the metal backshell shall use the same base material and finish as the connector or galvanically equivalent (maximum anodic index delta of 0.25 volts) material and finish.

If the metal backshell (faraday cage) is not exposed (fully over molded), base material and finish do not need to be the same as the connector.

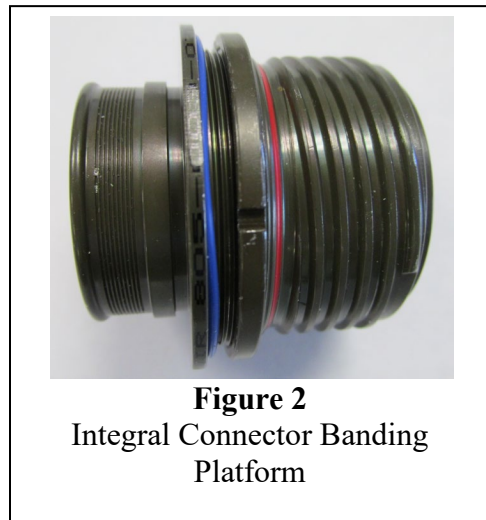
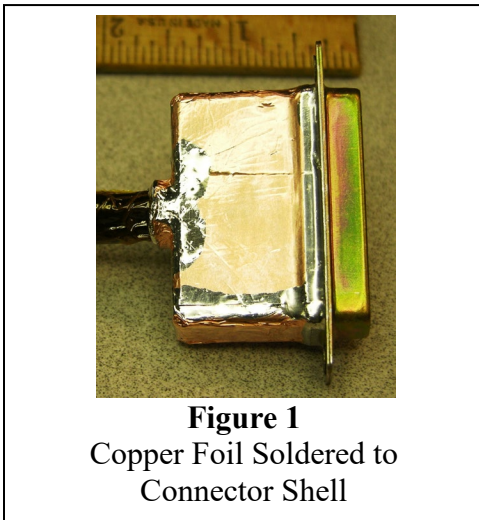
If the backshell is threaded, it shall be torqued per 60083155 or the manufacturer's recommendations.

### **6.2.1 SHIELDED CABLE AND HARNESS ASSEMBLIES**

6.2.1.1 Molded backshells shall continue the electrical shielding enclosure of the over-braid to fully surround the shielded portion of the cable and harness assembly with an electrically conductive material. The backshell shield completes an electrical grounding connection from

the over-braid through the backshell (adapter or platform) to the connector shell using an approved termination method listed below:

- 6.2.1.1.1 Copper foil P/N 7184944-ANY shall be soldered directly to connector shell (reference figure 1).
- 6.2.1.1.2 Integral connector banding platform (reference figure 2).
- 6.2.1.1.3 Threaded banding platforms (reference figure 3).
- 6.2.1.1.4 Custom threaded banding platforms (reference figure 4).
- 6.2.1.1.5 Custom threaded solder platforms (reference figure 5).
- 6.2.1.1.6 Copper foil to threads with solder and clamps 7185011 or M85049-125-sized to fit (reference figure 6). When using this method, fold the foil (two layers, adhesive in, under the clamp) to make contact with the threads.





**Figure 3**  
Threaded Banding Platform



**Figure 4**  
Custom Threaded Banding Platform



**Figure 5**  
Custom Threaded Solder Platform



**Figure 6**  
Copper Foil to Threads with Solder and Clamps

**6.2.2 UNSHIELDED CABLE AND HARNESS ASSEMBLIES**

6.2.2.1 Connectors not fully shielded shall be over molded per the drawing.

**6.3 FINAL MOLDING**

The final molding material defines the finished form of the connector backshell and is exposed to the environmental conditions of the cable and harness assembly. There are two types of final moldings that are used by CSW; Injection molding and pour/potted molding. The material selected will dictate which molding method is used.

### 6.3.1 FINAL INJECTION MOLDING

Injection molding is a high-pressure mold process that uses a thermoplastic type of mold material.

6.3.1.1 Molding material not specified on drawing shall use an approved material per section 5.2.

6.3.1.2 Refer to section 5.3 for materials that may be used to meet engineering requirements or to aid manufacturability.

6.3.1.3 Mold profiles shall not interfere with hardware operation.

### 6.3.2 FINAL ENCAPSULATION (POUR/POTTED) MOLDING

Encapsulation molding is a low pressure mold process that uses a thermoset type of mold material.

6.3.2.1 Molding material not specified on drawing shall use an approved material per section 5.2.

6.3.2.2 Refer to section 5.3 for materials that may be used to meet engineering requirements or to aid manufacturability.

6.3.2.3 Any mold release used shall not leave a film or residue on the final product which affects performance, and as such will not be on the parts list. The use of a mold release is a manufacturing decision to be made by a trained operator. Preferred mold release for a given material is listed in section 5.2.

6.3.2.4 Mold profiles shall not interfere with hardware operation.

## 7. REVISIONS

Changes to this specification were controlled by paragraph rather than by document up through revision G. The document moved from PAL to Teamcenter, and revision is now controlled at the document level for revision H and following revisions.

REV	DATE	ENGINEER	DESCRIPTION
-	3/29/2013	Benjiman Potter	Initial Release
A	4/15/2013	Benjiman Potter	Add P/N 7181837 to section 6.1.1 & 6.1.2
B	6/6/2013	Kim Riding	Added mold release to section 5.1 and 5.2. Revised section 6.1.1.
C	5/12/2014	M. Byrne	Added clarity to mold release usage, updated sections 4.2, 5.1, 5.2, 6.1.3, 6.3.2.

D	3/3/2016	K. Bockholt	Revised low temp properties in 5.1 and 5.2 per Test Report 1000419170. Revised 6.1.1 to convey functional requirements.
E	7/5/2016	K. Bockholt	Added Category A and PR-1547 to Polyurethane in 5.1. Added Amber 1000405169 to 5.1. Reformatted 5.1 and 5.2 swapping columns/rows. Created Additive column for 5.1 (thickener) and 5.2. Deleted previous paragraphs 6.1.2.1, 6.1.2.2, 6.1.3.1.1, 6.2.1.1.3.1, 6.2.1.1.3.2, 6.2.1.1.4.1, 6.2.1.1.4.2, 6.2.1.1.5.1, 6.2.1.1.5.2, 6.2.2.2.1.1 and 6.2.2.2.1.2. Changed text under Figures 1 thru 5 to focus on materials. Added two paragraphs to 6.2.
F	5/3/2018	K. Bockholt	Added approved mold materials to 5.1 and 5.2. Added new sections 6.3.1.3. and 6.3.2.4
G	6/12/2020	K. Bockholt	Added approved mold materials to 5.1 and 5.2. Added new backshell FIGURE 6 and related items. Added sealing plugs and grommet alterations. Added solder part number.
H	1/29/2026	K. Bockholt	Document released in Teamcenter rather than PAL. Updated L3Harris Proprietary mark and logo. Minor formatting updates throughout. Updated wording from 'document' to 'specification'. Updated approval assignments. Updated documents list and acronyms. Made headings on tables 5.1 and 5.2 consistent. Added section 5.3 and modified later paragraphs to refer to section 5.3.

## 8. RECORDS

There are no records associated with this document.