

## Polymer Laminated CSP Guidelines

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CSPI's polymer laminate guidelines are intended to educate parties on best practices from lamination through installation stages. Well performing CSP polymer laminate pipe is expected when these best practices are respected.

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### 1 – Material Specification CSA G401 & ASTM A742

The requirements for polymer laminated steel for use in corrugated steel pipe applications are set forth in CSA G401 and referenced to ASTM A742 - Standard Specification for Steel Sheet, Metallic Coated and Polymer Precoated for Corrugated Steel Pipe. This specification includes the requirements for the type of steel which can be used, how the steel shall be prepared prior to applying the polymer film coating and the composition of the film coating.

Prior to using a specific film product, the polymer laminated steel must meet the composition requirement and it must be qualified by demonstrating that it meets the requirements of ASTM A742, which includes the following tests:

- Adhesion
- Impact Resistance
- Thickness of Coating
- Holidays
- Abrasion Resistance
- Imperviousness
- Freeze-Thaw Resistance
- Weatherability
- Resistance to Microbial Attack

Some of these tests may take several weeks or months to complete, therefore, only Adhesion, Impact Resistance, Thickness of Coating and Holidays are listed in ASTM A742 as the tests the laminator should be conducting as routine quality assurance tests on every coil of polymer coated (laminated) steel.

### 2 – Film Lamination to Steel

ASTM A742 allows for up to 3/8-inch (10 mm) of exposed steel on the edge of the coated steel coil. This edge will get buried in the lock seam and there will not be any exposed steel on the outside of the lock seam once the pipe is formed.

### 3 – Material Receiving & Inspection

Manufacturers should thoroughly inspect every coil when received to ensure there are no damages and ensure proper markings are in place as per CSA G401. In accordance with ASTM A742, certifications of conformance to A742 are available to purchasers upon request.

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### 4 – Manufacturing

- 1 Ensure dies are clean, smooth and polished. Chrome coated dies may be helpful but are not necessary. Any roughness must be removed.
- 2 Do not use any coolant or water while running the machine to prevent spinning and slippage.
- 3 Keep the cutting slag away from and off the dies. Polymer Laminated film reduces the amount of slag created, however does not eliminate it.
- 4 Adjustment of the lock seaming dies is important. The position, pressure and the helix angle of the dies, factors into producing a quality product. Use the minimum amount of pressure required to obtain a good lock seam as this will reduce damage or delamination.
- 5 Maintain proper care and maintenance on tooling and spacers to ensure production of quality polymer product. Inspect spacers for 'mushrooming' or flaring of the ends that may bring the spacers out of tolerance. Spacers out of tolerance may result in scaring of the polymer, uneven formation of the corrugations and/or difficulty in forming lock seam legs. Tooling that is pitted, worn or has galvanizing build up will also cause scaring and as a result, the mill operator may apply unwanted additional pressure on stands/material in order to achieve desired corrugation depth or lock seam leg length. This may cause a number of problems including but not limited to delamination, scaring or difficulty in controlling desired diameter of pipe.
- 6 If the mill uses flange turn over rolls on the last stand to angle the flange 45 degrees, it is recommended to look at raising the last stand and use the hand wheel turnover to obtain the desired slope. Anchor if necessary, head rolls that go off angle and if using a hold down chain, rollers should remain aligned
- 7 For 2.8 mm gauge and above, assisted rolls in the corrugator dies should be used. See Figure 1. For 3.5 mm gauge, pinch rolls (steel with polyurethane) will help push the coil through the rollers and eliminate slippage.
- 8 Ironsides suggestion to eliminate lock seam damage: Trace on the mill where the peeling/scaring is taking place, then place a 0.005" (0.13 mm) or 0.010" (0.25 mm) shim to increase the gap in the forming area. Once you do this record what size of shims you have in place on each stand and repeat that set up the next time you run polymer. This will eliminate the damage to the polymer while keeping a proper lock seam. In addition, a set of traction rolls on the mill will eliminate any scaring you have on the corrugations if the sheet is slipping as it is going through the mill. In addition, keep speed down so not to overheat the polymer at the lock seam and keep a close eye on your seaming die pressure. Control applied pressure such that it produces effective lock seams but does not heat up the poly to a level which may result in delamination.

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### 4 – Manufacturing

- 9 Protective materials should be used on all rails, racks, bars, etc. which the polymer laminated pipe may strike or roll across. Use a nylon strap or rope for bracing on the saw box if using rollers as they must remain straight. This is especially beneficial in the area where the pipe is rolled from the dump table to the racks.
- 10 The work area should be kept clean. This is especially important when fittings are being fabricated on the floor. Polymer laminated metal parts are only to be worked with on clean floors. Care should be taken to prevent hot metal filings from saws, grinders and torches from contacting the coating.
- 11 Cover prongs on fork lift truck to prevent internal scarring. Plastic tubes may also be used.
- 12 It is recommended that all pipe should be set on dunnage with a minimum of 4" (100 mm) depth and long enough to fully support the pipe to allow sufficient room to remove the forks.
- 13 Rerolling of the pipe ends can be accomplished with coating damage occurring only at the lock seam area. The most important step to reducing coating damage in this area is the incorporation of a rubber tire turning assist. Without the tire assist the forming dies must not only reform the ends, but also turn the pipe. In applying this turning force the shear on the pipe surface can damage the coating. When a rubber tire is mounted on the reformer, the force required to turn the pipe is spread over a greater area and virtually no damage results except at the seam. This seam area is routinely touched up as described in the section on repairs.
- 14 One may need to address the film splices in a coil of polymer laminated steel, as it is impossible to match up the length of the film rolls with the length of the steel coils, as the length of the coil will vary depending on the thickness of the steel. Therefore, at some point during a lamination campaign, the laminator will have to splice in a new roll of film. When that happens, there can be some inconsistency in how the film is laminated to the steel (either some area of uncoated steel between the ends of the two film rolls or the film can wander a little bit resulting in it being slightly off center, so one edge of the steel is exposed). When the film splice occurs, the laminators will place a flag on the edge of the steel coil so the pipe fabricator can identify where the splice is located. The material should be inspected in the area of the splice to make sure it is suitable for use. If not, the area should be repaired as per section 6, or if the area is too large for tape than the area of the splice should be cut out and the ends of the coil should be welded back together and the weld covered with tape.

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### 5 – Transporting, Handling & Installation

- 1 Belts or straps are to be used at all times. Chains are forbidden. Padding (dimpled membrane sheets, protective dunnage) should also be used between nested pipes and the pipe and trailer bed, racks, blocks or other hard objects. It is recommended that a 1 m long roll of Denso Butyl 35 tape be included with each load.
- 2 Handling sticker should prominently be displayed on every load and a copy included in the Bill of Lading. See Figure 2.
- 3 Unloading should be exercised with care to avoid impacting hard objects. Nylon straps should be used or protection to the forks on the lift truck is required in lifting of the pipe from the trailer and placing it on padding on the ground or on timbers. This is the preferred method of unloading. Rolling the pipe off the trailer is not acceptable.
- 4 Nesting of pipe – the space between the nested pipes should not be less than those expected in accordance with the following Table:

#### Nesting of Pipes (Standard Lengths)

Diameter	Into	Diameter	Into
300	500	1600	1800
400	600	2000	2200
600	800	2200	2400
800	1000	2400	2700
1000	1200	2700	3000
1200	1400	3000	3300
1400	1600	3300	3600

- 5 During backfilling, care should be exercised to prevent dumping of large aggregate material onto the pipe. Contractor should be instructed to follow CSPI and designer guidelines.
- 6 Corrosion and abrasion guidelines for Polymer Laminated pipe are found in Technical Bulletin #1.
- 7 Damage incurred during installation is to be repaired using the guidelines under section 6.

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### 6 – Quality Control and Repair

Polymer laminated pipe should be inspected and repaired as required at each stage of the pipe's life (fabrication, handling, installation).

#### Acceptable polymer laminate repair materials

- Polymer damage: RanVar TPC-515-7 is available from Elantas PDG Company in large quantities or available from Precoat Metals, Granite City, IL, Phone: (618) 219-3431 in 5 gallon quantities.
- Polymer damage: Denso Butyl 35 Tape is readily available and in rolls of 50 mm, 100 mm and 150 mm widths.
- Metallic coating damage: Zinc-rich coating complying with CAN/CGSB-1.181.

#### Polymer laminate repair material application methods

##### RanVar

- 1 RanVar can be applied by either brush, roller, or when diluted with xylene can be sprayed onto the pipe surface.
- 2 Before applying the coating, make sure the surface to be coated is free of debris, oil, grease, etc. and that the surface is dry.
- 3 Follow the application instructions for the coating as provided by the supplier and on the container labels. A relatively heavy coating (thicker than polymer laminate) is necessary to provide complete protection. Note application temperature limitations and shipping restrictions.

##### Denso Butyl 35 Tape

Tape should extend beyond all sides of the damaged area by a minimum of ½" (12 mm). Due to its high adhesive properties, Denso Butyl 35 Tape does not require a Butyl Primer for repairs of damaged coating on new polymer laminated CSP. Application instructions are as follows:

##### Application (New Installations)

- Prepare pipe surface in damaged area by making sure it is clean and dry.
- Cut tape to length required to cover damaged area.
- Remove interleafing.
- Press adhesive side of tape firmly over damaged area.

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### 6 – Quality Control and Repair

#### Application (Existing Installations)

- Prepare pipe surface in damaged area by removing any rust and roughening the polymer surface with an abrasive pad. Make sure the area is clean and dry.
- Spray the repair area with Denso Butyl Spray Primer.
- Cut tape to length required to cover damaged area.
- Remove interleaving.
- Press adhesive side of tape firmly over damaged area.

#### Zinc-rich Coating

Thoroughly clean the damaged area and follow with application of the zinc-rich coating to a minimum dry thickness of 50 µm.

#### Repair of damaged polymer coatings

Damage to metal coating underneath the polymer laminate shall be repaired as per CAN/CSA G401, cl. 6.2. Damage to any polymer coating shall be repaired as noted in points (a) through (b). Factory saw-cut ends are not considered damaged and shall be excluded from any repair requirements.

- a) Uncoated surfaces of width up to 50 mm shall be repaired as follows:
- Plant: Outside (external side) of Pipe Repairs – using RanVar TPC-515-7 or Denso Butyl 35 Tape
  - Plant: Inside (internal side) of Pipe Repairs – Denso Butyl 35 Tape
  - Field: Inside/Outside of Pipe Repairs – Denso Butyl 35 Tape

RanVar is permitted for plant repairs on the outside of the conduit. It is not recommended for field repairs due to hazardous material shipping restrictions, nor is it recommended on the inside of the pipe as RanVar has demonstrated low abrasion resistance. Denso Butyl 35 tape has demonstrated improved abrasion resistance and is to be used for repair on inside of pipes. Simpler shipping/installation requirements and no temperature restrictions make Denso Butyl 35 tape the preferred field repair.

- b) Uncoated surfaces of width greater than 50 mm shall be rejected in the plant. In the field, engineering judgment shall be used to determine whether to repair the pipe using Denso Butyl 35 Tape. Extensive research over 40 years indicates damage to the polymer coating typically remains localized and does not expand significantly to contribute to accelerated deterioration of the pipe. Soil and atmospheric environments are typically less aggressive than abrasive water environments.

## Polymer Laminated CSP Guidelines

Figure 1 – Assisted Rollers



Figure 2 – Handling Sticker

**Handling polymer laminated CSP / Manutention des TTOG à strates de polymère.**

<b>AVOID IMPACT/ ÉVITER LES IMPACTS</b>	<b>DO NOT ROLL/ NE PAS FAIRE DÉBOULER</b>	<b>NO CHAINS/USE STRAPS PAS DE CHÂÎNES/UTILISER COURROIES</b>
	<b>DO NOT DRAG/ NE PAS TRAÎNER AU SOL</b>	<b>REPAIR DAMAGE/ RÉPARER LES DOMMAGES</b>

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