

# FORMING

## LOCK-SEAMING STEEL SHEET AND STRIP

### TECHNICAL BULLETIN TB-F6

Rev 2, November 2003

This issue supersedes all previous issues

#### 1 LOCK-SEAM TYPES

Rectangular ductwork for heating, ventilating and air conditioning is fabricated using a longitudinal seamed joint along corners of the section. Two of the common seam types are the Pittsburgh lock-seam and the Button Punch Snap Lock seam. The machines used to make these profiles are small roll-formers which can adequately form the required seam from the specified thickness and product type provided the equipment is correctly operated and maintained.

This bulletin discusses these machine types and forming operations involved.

#### 2 PITTSBURGH LOCK-SEAM

This seam is used for steel sheet thicknesses up to 1.6 mm, above 1.0 mm thickness being formed in a seven stage unit and sheet 1.0 mm and thinner produced in a five or six stage unit. Figure 1 illustrates the shape produced at each of the five stages for a 1.0 mm thick sheet in the production of the initial lock-form (*ready for final seaming*).

Figure 1 - Pittsburgh lock-form stages Stages 1 to 5 using 1.0mm thick sheet



The joint is completed by inserting a flanged edge into the open pocket of the seam and closing the free edge of the seam over the flange. A section through the completed seam is shown in Figure 2.

Figure 2 - Completed Pittsburgh lock-seam



#### 3 MACHINES

Pittsburgh lock-forms are formed on a variety of machines, the most commonly used in Australia being Lockformer and Herless.

##### 3.1 Lockformer Machines

Lockformer Machines in Australia are available in Models 20 and 16. The identification numbers used by manufacturers refer to the maximum steel thickness capable of being formed, expressed in the old Birmingham Gauge system.

20 = Max 1.0mm G2 Base

16 = Max 1.6mm G2 Base

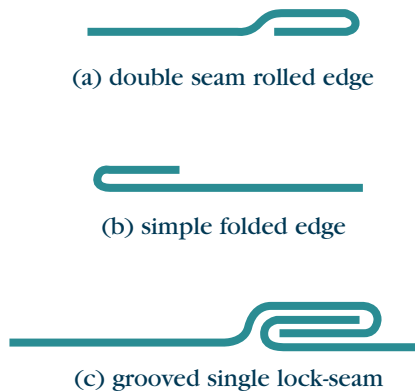
##### 3.2 Herless Lockseaming Machines

These are available in Models 16 and 20. The above models also possess outboard or extended shafts. Additional roll sets may be fitted to achieve a range of rolled profiles, such as the grooved single lock-seam, (*refer Section 4*).

#### 4 DOUBLE SEAM

A double-seam roll set can be utilised to achieve butt joints with grooved seams. One edge of the joint is roll-formed with the mating edge formed by simple folding in a conventional press or folder. The parts are then interlocked and compressed to form the joint. Refer Figure 3.

Figure 3 – Stages in making a grooved single lock-seam



## 5 BUTTON PUNCH SNAP LOCK SEAM

This seam, shown in Figure 4 has been developed to reduce the effort and time involved in manually closing the Pittsburgh seam and as illustrated in Figure 5 the seam is completed by forcing the flanged blank with the button punch locking edge, into the open seam. The flange is retained within the seam without the manual closing operation required in the Pittsburgh lock-seam.

Figure 4 – Button Punch Snap Lock formation stages



Figure 5 – Closed Snap Lock seam



### 5.1 Button Punch Snap Lock Machines

Button Punch Snap Lock nine stage seaming units producing an automatically locking seam are made by the Lockformer company of USA and are available for sheet thicknesses up to 1.0 mm.

## 6 MANUFACTURE OF DUCTWORK

Rectangular ductwork can be fabricated using a one piece wrapper with a joint in one corner or a two piece wrapper where the joints are made in opposite or adjacent corners. Alternatively, seams can be placed at four corners of the ducting. Choice will depend on the sheet sizes available and ductwork dimensions.

## 7 MACHINE SETTINGS

The art of roll-forming involves passing steel strip through rolls so that the shape is produced by bending with a minimum of transverse strain. To achieve this the rolls not only must be correctly designed but correctly set up. Set-up work involves the correct tensioning on the head-securing studs.

Where the rolls are given excessive intermesh or the forming radii are smaller than specified, local thinning can result in the top seam which may result in failure as the seam is finally closed in the later stages.

## 8 GENERAL

The feed guide on the entry end determines the width of the turnover edge and this guide would be set so that it is parallel to the axis of the machine. When feeding, the strip edge should be held against the guide to keep it in a straight line as it progresses through the former.

The angle gauge on the exit end of the machine is not intended to bear against the existing seam and should be positioned just clear of the seam.

## 9 FORMING PROBLEMS

Splitting of the top seam of the form can occur if the profile of the forming rolls is causing excessive thinning of the base as it is formed over the initial rolls in the forming unit.

This critical top seam is produced by bending the sheet around the marked radii of the bottom rolls and if these are excessively sharp, failure will occur at the final stage.

Radii can be increased to at least 1.5 mm without problems in forming. In addition, the knurled surface of Roll 1 can be removed in the area of the critical radius to prevent damage to the sheet surface.

### 9.1 Investigation of lock-forming problems

In order to investigate a lock-forming problem, samples should be provided to assist evaluation of the steel and also allow comment to be made on the machine performance. A sample 600 mm by full width would be sufficient to check steel quality. In addition, by making a lock-form on one edge and providing a progressively formed section taken out of the machine, information can be provided on the machines performance.

Sectioning of this stage profile allows each section of the forming stage to be quickly evaluated. In this way factors such as sharp forming radii can be readily identified.

## 10 STRIP PRODUCT FOR LOCK-SEAMING

GALVABOND® G2, up to and including 1.60 mm thick, is the product recommended for lock-seaming applications. This steel is processed to minimise effects of strain ageing in storage. However, because some strain ageing will occur, it is an advantage to use GALVABOND® G2 as soon as possible after manufacture.

Consequently, stocks should be turned over to ensure that the oldest sheet is used within a period of three months.

## ACKNOWLEDGMENT

BlueScope Steel Limited wish to acknowledge the contributions made to this document by Kleen Sales and Service – Brisbane and Herless Pty Ltd – Melbourne.

The information and advice contained in this Bulletin is of a general nature only, and has not been prepared with your specific needs in mind. You should always obtain specialist advice to ensure that the materials, approach and techniques referred to in this Bulletin meet your specific requirements.

BlueScope Steel Limited makes no warranty as to the accuracy, completeness or reliability of any estimates, opinions or other information contained in this Bulletin, and to the maximum extent permitted by law, BlueScope Steel Limited disclaims all liability and responsibility for any loss or damage, direct or indirect, which may be suffered by any person acting in reliance on anything contained in or omitted from this document.

GALVABOND<sup>®</sup> is a registered trade mark of BlueScope Steel Limited.  
BlueScope is a trade mark of BlueScope Steel Limited.

*Please ensure you have the current Technical Bulletin as displayed at [www.bluescopesteel.com.au](http://www.bluescopesteel.com.au)*

## BlueScope Steel

Copyright<sup>©</sup> 2003 BlueScope Steel Limited  
BlueScope Steel Limited ABN 16 000 011 058  
BlueScope Steel (AIS) Pty Ltd ABN 19 000 019 625



<b>AUSTRALIA</b>	SYDNEY	Telephone: (02) 9795 6700
	MELBOURNE	Telephone: (03) 9586 2222
	BRISBANE	Telephone: (07) 3845 9300
	ADELAIDE	Telephone: (08) 8243 7333
	PERTH	Telephone: (08) 9330 0666

<b>OVERSEAS</b>	BlueScope Steel (Malaysia) Sdn Bhd	Telephone: (603) 3250 8333
	BlueScope Steel (Thailand) Limited	Telephone: (66 38) 685 710
	PT BlueScope Steel Indonesia	Telephone: (62 21) 570 7564
	BlueScope Steel Southern Africa (Pty) Limited	Telephone: (27 21) 555 4265

