

Note to Bridge File 81939 – Waldo Creek

Aluminum Structural Plate Pipe inspection

location: Hwy 58 (165 km east of High Level)

Date of inspection: September 26, 2017

Inspector – David Morrison, Bridge technologist (Alberta Transportation)

Purpose/Background:s

The purpose of this inspection was to check on the performance of the solid aluminum plates in the field. This was a relatively new material type for the Department to use. The pipe consists of one 40.01 m long x 3976 mm diameter x 3.81 mm thick Structural Plate Corrugated Aluminum Pipe (SPCAP). The barrel length is 32.69 m with 3.658 m (2:1 step) bevels on each end. The upstream (north) end contains a full concrete collar.

Some of the questions that were asked are:

1. How is the coating doing? Are there signs of early failure?
2. How is the pipe doing generally?
3. Is the metal reacting with the concrete collar?

Methodology and inspection:

It was known that the site had a lot of standing water so the inspector brought along an inflatable boat. A strong light source, a 1575 mm piece of dowelling and a Disto laser distance meter were also used.

The original construction marks (used to check the deflection) were still visible (and above the water) on the side walls. They were at the 3:00 and 9:00 positions and along the ¼ and middle points of the barrel.

The span measurements could be read directly with the “Disto”. The rise measurements had to have the dowel driven into the muddy bottom until it touched the pipe and then the remainder was measured with the Disto. This made it possible for some error, as it was not possible to feel for the top of the corrugations through the mud.

Results of inspection

The depth of water was roughly 1.4 m deep and was dark due to stagnation. The strong light could only penetrate about 0.6 m into the depth so an accurate visual survey of the lower ring

segments could not be seen. What could be seen below the water line was covered in a thin layer of mud and algae. The surfaces above the waterline looked like new. No signs of deterioration. There was a few construction dents/marks noticed (but not documented) along the barrel both above and below the waterline. These did not show any signs of deterioration.

Barrel measurements were taken to check to see if there was any kind of movement since construction.

Location	Rise (Sept 26/ 17) mm	Span (Sept 26/17) mm	Rise (Nov 25/10) mm	Span (Nov 25/10) mm	Rise Diff. mm	Span Diff. mm
Start of barrel – sta. 0+003.6	No measurement	No measurement	No measurement	No measurement	N/A	N/A
¼ point – sta. 0+009.1	3980 ¹	3990 ²	3934	3922	+46	+68
Middle – sta. 0+014.6	4019 ¹	3990 ²	3951	3952	+68	+38
¼ point – sta. 0+025.6	3973 ¹	4003 ²	3939	3936	+34	+67
End of barrel Sta. 0+036.3	4100 ¹	3929	3941	3915	+159	+14

¹ these measurements were taken through the muddy bottom

² these measurements were taken between the old construction marks

The inspector does not have a lot of confidence in the rise measurements, as he was not able to accurately determine the location of the corrugations though the muddy bottom. They are supplied only for information.

The span measurements should be accurate and reproducible. They show a change of up to 1.7% since the pipe was built 7 years ago. This by itself is not yet significant. In regards to what these changes could mean, the BIM rating guidelines gives the following:

- rate 9 if new
- rate 8 if no visible signs of distortion or deformation
- rate 7 if within 5% of design
- rate 5 if within 5- 7% of design
- rate 4 if within 7- 10% of design
- rate 3 if within 10-15% of design

rate 2 if more than 15%

rate 1 if there is reverse curve.

It is also noteworthy to say that the allowable tolerance range for construction was from 3888 to 4036 mm. The existing pipe dimensions still falls within these ranges.

Conclusions and recommendations

It is the inspector's opinion that the pipe is performing as expected with no obvious problems. Routine sampling of the barrel dimensions should continue. This is part of the normal level I inspection process.

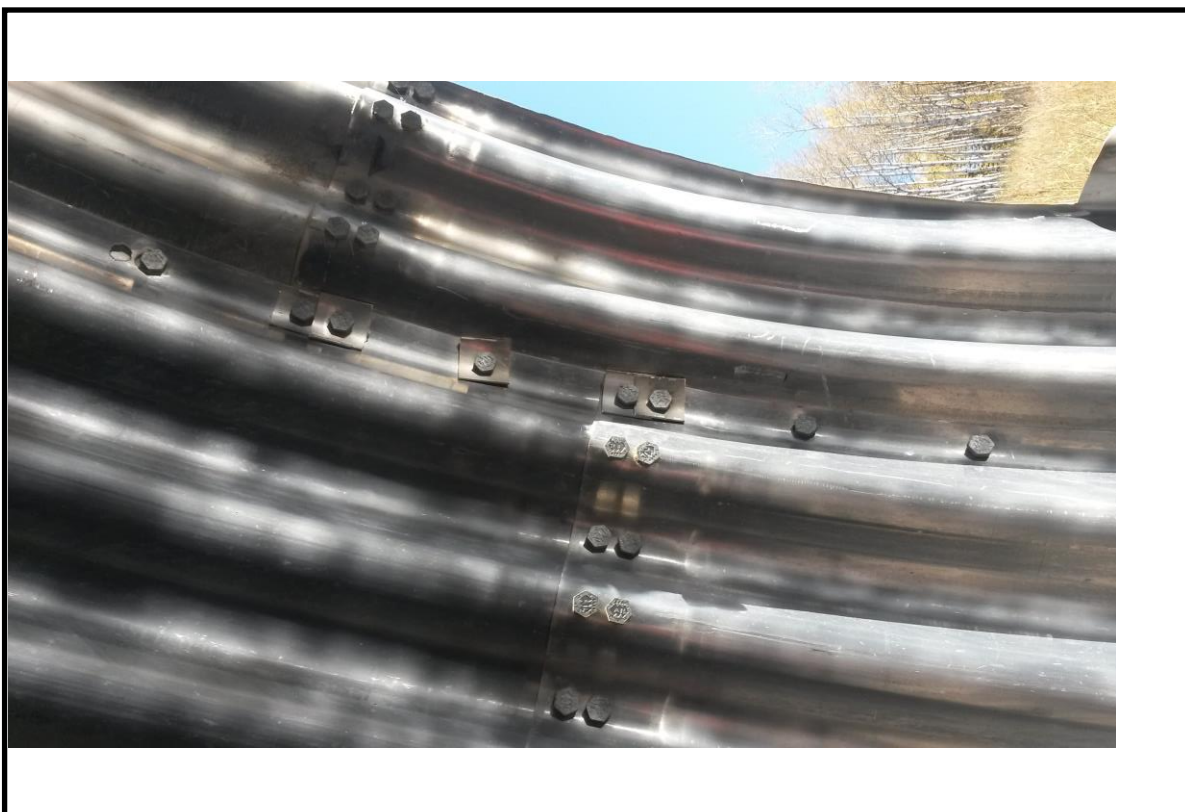
There was one issue that was raised during the construction process but not well documented and that was the possibility of a galvanic cell between the upstream concrete collar and the aluminum pipe. This was brought to the inspector's attention after his site visit. It is noteworthy to say that a solution was affected during construction. A close examination of the upstream concrete to pipe interface, should be undertaken on future field visits, to monitor this issue as well.

Report prepared by,
David Morrison
Bridge technologist
Peace Region
Alberta Transportation

Appendix A - Photos

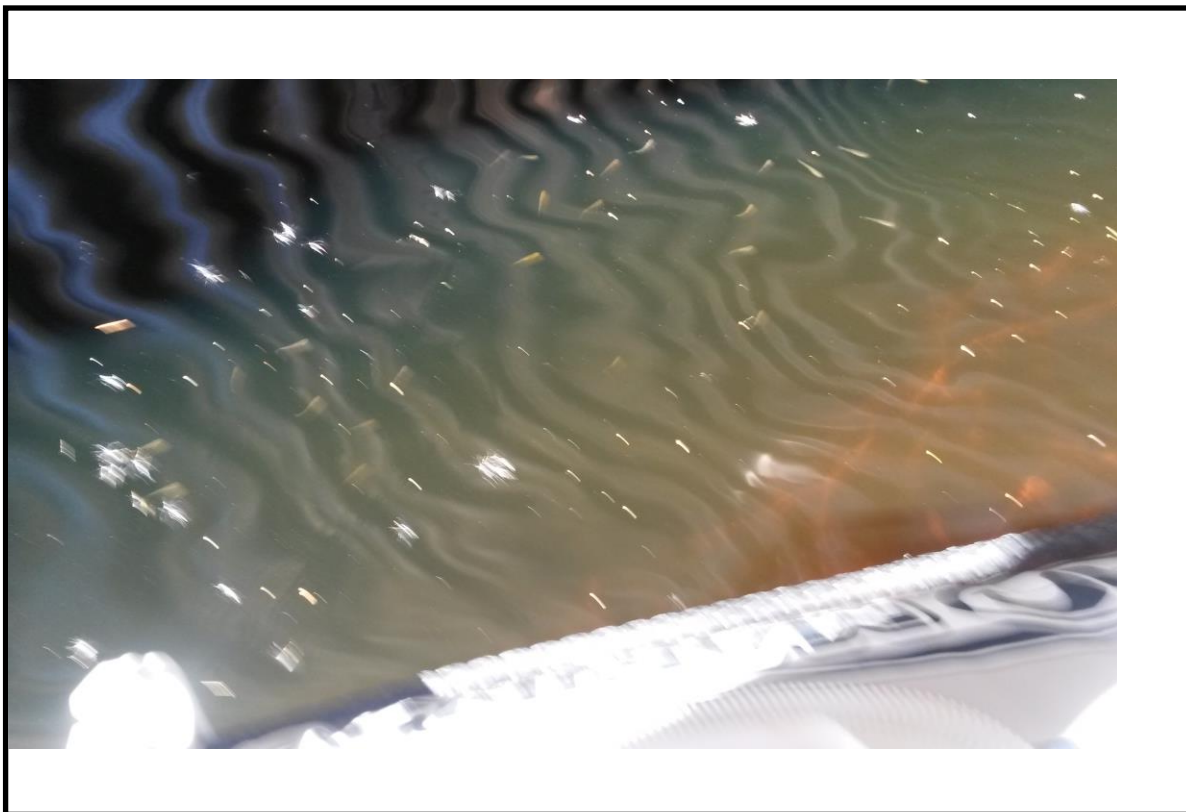


Looking upstream from the end of the barrel



Close up of the east wall near the downstream (south) end.

Looks good.



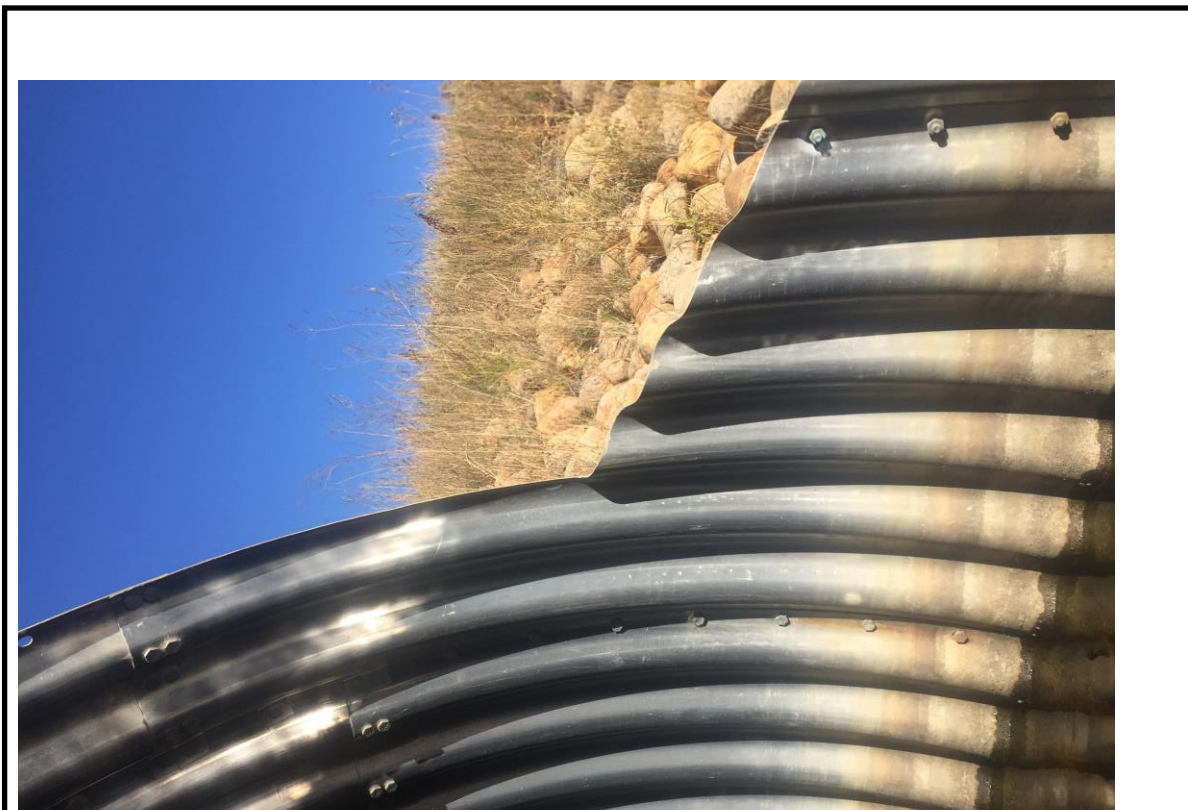
looking at the bottom. lots of minnows at this site.



Water staining on the side of the pipe.



Looking u/s at the west wall of the pipe.

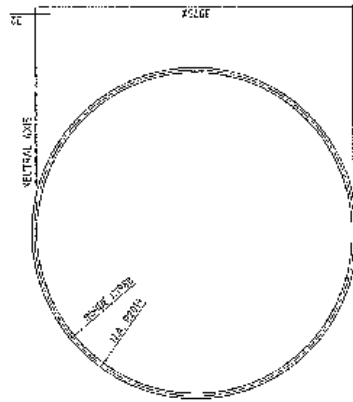


looking at the east wall of pipe at the d/s step bevel end

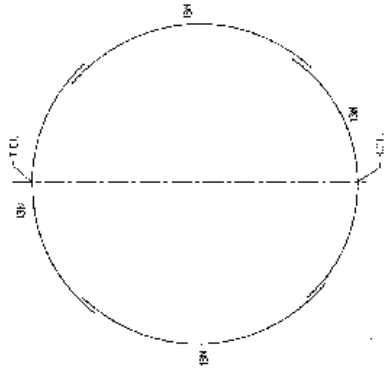
Appendix B - Drawings

ROAD EPAC

ALL S/R C/R-A-S/R-F
ROUND S/P
ENC AREA = 10,000



P.P.F. ARCH GEOMETRY
SCALE: 50



A SECTION - PLATE LAPPING
SCALE: 100



LONGITUDINAL VIEW
SCALE: 1:50

FIELD NOTES:

1. SPAN AND RISE DIMENSIONS ARE NOMINAL AND ARE SUBJECT TO SHALLOWS AND/OR TO ADJUSTMENTS.
2. PLACE NOTES ON THE DRAWING TO REFLECT ANY CHANGES.

GENERAL NOTES:

1. ALL DIMENSIONS ARE TO THE INSIDE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO THE CENTERLINE UNLESS OTHERWISE NOTED.
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West of Hwy 58 R2 Trwp 11
water course
BF 81339
AMEC Sherwood Park
Roxxy 2400
464 4850 Ext 230

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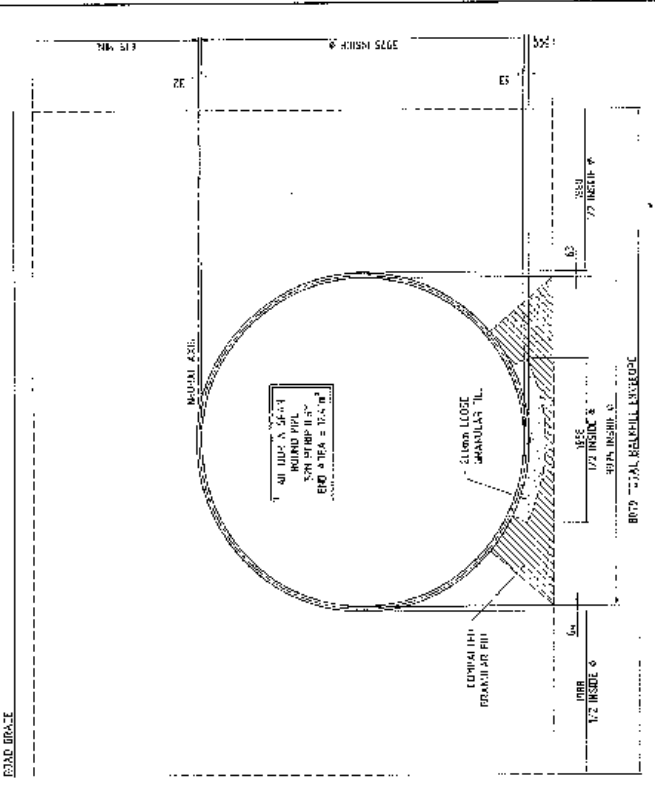
NO. OF REVISIONS: 01
 DATE: 06-05-03
 DRAWN BY: J. L. L. L.
 CHECKED BY: J. L. L. L.
 APPROVED BY: J. L. L. L.

PROJECT NO.: 06-05-033-01
 SHEET NO.: 06-05-033-01

DATE: 06-05-03

RECOMMENDED BACKFILL BEDDING MATERIAL

1. MATERIAL REQUIREMENTS
 - 1.1 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.2 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.3 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.4 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.5 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.6 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.7 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.8 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.9 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
 - 1.10 THE SOIL SHALL BE FREE FROM ORGANIC MATTER AND OTHER CONTAMINANTS WHICH WOULD BE DETRIMENTAL TO THE STRUCTURE AND SHALL NOT BE AFFECTED BY WEATHERING, DRYING, SATURATION, FREEZING, THAWING, OR FLOWING WATER.
2. SOIL CLASSIFICATION REQUIREMENTS
 - 2.1 THE SOIL SHALL BE CLASSIFIED AS SUITABLE FOR BACKFILLING.
 - 2.2 THE SOIL SHALL BE CLASSIFIED AS SUITABLE FOR BACKFILLING.
 - 2.3 THE SOIL SHALL BE CLASSIFIED AS SUITABLE FOR BACKFILLING.
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 - 2.9 THE SOIL SHALL BE CLASSIFIED AS SUITABLE FOR BACKFILLING.
 - 2.10 THE SOIL SHALL BE CLASSIFIED AS SUITABLE FOR BACKFILLING.
3. ORGANIC MATTER REQUIREMENTS
 - 3.1 THE ORGANIC MATTER SHALL NOT EXCEED 5% BY WEIGHT.
 - 3.2 THE ORGANIC MATTER SHALL NOT EXCEED 5% BY WEIGHT.
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 - 3.9 THE ORGANIC MATTER SHALL NOT EXCEED 5% BY WEIGHT.
 - 3.10 THE ORGANIC MATTER SHALL NOT EXCEED 5% BY WEIGHT.
4. FROZEN MATERIAL REQUIREMENTS
 - 4.1 FROZEN MATERIAL SHALL NOT BE USED.
 - 4.2 FROZEN MATERIAL SHALL NOT BE USED.
 - 4.3 FROZEN MATERIAL SHALL NOT BE USED.
 - 4.4 FROZEN MATERIAL SHALL NOT BE USED.
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 - 4.9 FROZEN MATERIAL SHALL NOT BE USED.
 - 4.10 FROZEN MATERIAL SHALL NOT BE USED.
5. QUALITY CONTROL REQUIREMENTS
 - 5.1 THE SOIL SHALL BE TESTED FOR ORGANIC MATTER AND FROZEN MATERIAL.
 - 5.2 THE SOIL SHALL BE TESTED FOR ORGANIC MATTER AND FROZEN MATERIAL.
 - 5.3 THE SOIL SHALL BE TESTED FOR ORGANIC MATTER AND FROZEN MATERIAL.
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 - 5.8 THE SOIL SHALL BE TESTED FOR ORGANIC MATTER AND FROZEN MATERIAL.
 - 5.9 THE SOIL SHALL BE TESTED FOR ORGANIC MATTER AND FROZEN MATERIAL.
 - 5.10 THE SOIL SHALL BE TESTED FOR ORGANIC MATTER AND FROZEN MATERIAL.



RECOMMENDED BACKFILL FIVE-PPF

SCALE 1/8" = 1'-0"

<p>Atlantic Industries Limited 10000 W. 10th St., Suite 100, Edina, MN 55425 Phone: (763) 851-1000 Fax: (763) 851-1001 www.atlanticindustries.com</p>		<p>PROJECT NO. 06-DS-033-03 DATE 10/23/06 ISSUED BY J. J. JENSEN SCALE AS SHOWN</p>		<p>CUSTOMER NO. PROJECT NO. DATE SCALE</p>	
<p>PROJECT NAME 10000 W. 10th St., Suite 100, Edina, MN 55425</p>		<p>PROJECT NO. 06-DS-033-03</p>		<p>CUSTOMER NO.</p>	
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<p>PROJECT DESCRIPTION 10000 W. 10th St., Suite 100, Edina, MN 55425</p>		<p>PROJECT NO. 06-DS-033-03</p>		<p>CUSTOMER NO.</p>	