



**BUREAU
VERITAS**

**NO. 440019-03-CT
ISSUING CENTER
BV SEOUL, KOREA**

TYPE APPROVAL CERTIFICATE

ISSUED BY BUREAU VERITAS KOREA
BV Office : Rm 1102, Keungil Tower, 677-25,
Yeoksam-dong, Kangnam-gu, Seoul, Korea

APPLYING ISO STANDARD EN 12201-3 : 2003 Plastic piping system for supply of water
supply – Polyethylene – Part 3 Fittings

CONCERNING **POLYETHYLENE ELECTROFUSION FITTINGS**

TYPE OF FITTING / SIZE / Drawing No.

COUPLER / 16 ~ 400MM/ DY-03-000-C00 rev. 0
ELBOW 90° / 16 ~ 200MM/ DY-03-000-L00 rev. 0
ELBOW 45° / 16 ~ 200MM/ DY-03-000-L45 rev. 0
EQUAL TEE / 16 ~ 200MM/ DY-03-000-T00 rev. 0
UNEQUAL TEE / 25 X 20 ~ 200 x 180MM/ DY-03-000-T00 rev. 0
END CAP / 16 ~ 200MM/ DY-03-000-E00 rev. 0
REDUCER/ 20 X 16MM ~ 200 X 180MM/ DY-03-000-R00 rev. 0
TAPPING TEE / 40 X 20MM ~ 315 X 63MM/ DY-03-000-S00 rev. 0

MATERIAL : PE 100, SDR 11

(HDPE Pipe Material P600 BL made by Korea Petrochemical Ind., Co., Ltd.)

COLOR : Black

Note : The Effect of water quality out of Material test was checked in accordance with BS6920-1:1996 and this test shall be re-performed in accordance with national standard when the above products will be used in the country who not apply BS6920

MANUFACTURER

DAEYOUN Co., Ltd.

517-7, Taejeon-Dong, Kwangji-Si,
Kyunggi-Do, Korea

We hereby certify that the type of the above mentioned commodity has been approved, tested and inspected in accordance with relevant standard.

Date : October 17, 2006

Bureau Veritas Korea

**HeeChang Shin
Surveyor**



INSPECTION REPORT

Page : 1/3

N° 440019-03-IR

Interim
 Final

Intervention Ref. : 3.30.492



PROJECT / CONTRACT : PE EF FITTING TYPE APPROVAL TEST	L/C No. :
BV Client : DAEYOUN CO., LTD. / KWANGJU, KOREA	Contract n° : N/A (client to BV)
Inspection requested by : DAEYOUN CO., LTD. / KWANGJU, KOREA	

SUPPLY / SUBJECT OF INSPECTION : POLYETHYLENE ELECTROFUSION FITTINGS Electrofusion Coupler, Elbow, Equal Tee, Reducing Tee, End Cap, Reducer, Tapping Tee Material : PE100, SDR 11 (HDPE Pipe Material P600 BL made by Korea Petrochemical Ind. Co., Ltd.) (see the detail para. 9)	ITEM/TAG N°	QTY
See continuation sheet <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Manufacturer : DAEYOUN CO., LTD. / KWANGJU, KOREA	P/o n° : (client to manufacturer)	
See continuation sheet <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

DOCUMENTS OF REFERENCE :

Title	Reference n°	Rev.	Approved by	Date
International Standard	EN 12201-3	2003	CEN	
Applied Drawing	See the para. 8	0	Daeyoun	

See continuation sheet Yes No

<p>INSPECTION</p> <p>1. INSPECTION PLACE : Daeyoun Co., Ltd. / Kwangju, Korea</p> <p>2. INSPECTION DATE/PERIOD : 17 Aug. & 11 Oct. 2006</p> <p>3. STAGE OF INSPECTION <input type="checkbox"/> Before manufacturing <input type="checkbox"/> During manufacturing <input checked="" type="checkbox"/> Final <input type="checkbox"/> Packing</p> <p>4. KIND OF INSPECTION <input type="checkbox"/> Pre-inspection meeting <input type="checkbox"/> Before manufacturing <input type="checkbox"/> During manufacturing <input checked="" type="checkbox"/> Final <input type="checkbox"/> Packing (for details see continuation sheet)</p> <p>5. DIE STAMPS : <input checked="" type="checkbox"/> NO <input type="checkbox"/>  <input type="checkbox"/> </p>	<p>6. NON CONFORMITIES (NCR) : <input type="checkbox"/> NCR's issued during reported period : <input type="checkbox"/> List of outstanding NCR's :</p> <p>7. MAIN CONCLUSIONS / REMARKS (for details see continuation sheet) : Following inspections have been carried out in accordance with above Standard, drawings and found satisfactory</p> <ul style="list-style-type: none"> • <u>Review of raw material mill test certificates</u> • <u>Witness of dimension and visual inspection</u> • <u>Review and witness of Hydrostatic strength (20°C, 100hours) test</u> • <u>Review and witness of Hydrostatic strength (80°C, 165hours) test</u> • <u>Review and witness of Hydrostatic strength (80°C, 1000hours) test</u> • <u>Witness and review of pressure drop</u> • <u>Review and witness of Melt mass-flow rate (MFR)</u> • <u>Review and witness of Oxidation induction time test (Thermal Stability)</u> • <u>Witness and review of cohesive resistance test for electrofusion socket fittings</u> • <u>Witness and review of Impact strength test</u> • <u>Review of Effect on water quality</u> • <u>Review of Manufacturer's Inspection and test reports</u> <p style="text-align: center;">--- Blank ---</p> <p>Note : Almost tests were performed from 19th Jan. 2002 and were finished and reviewed on 17th Aug and 11st Oct. 2006</p> <p>8. NEXT VISIT SCHEDULED : N/A</p>
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9. Inspection Performed

The following scope of inspection was carried out against EN 12201-3 (2003) and Manufacture ITP requirements to the satisfaction of the undersigned Surveyor;

■ APPLICABLE CODES & SPECIFICATIONS.

- EN 12201-1 (2003) – Plastic piping system for water supply - Polyethylene (PE) – Part 1 : General.
- EN 12201-3 (2003) - Plastic piping system for water supply - Polyethylene (PE) – Part 3 : Fittings

9.1 Review of Design Calculation and Drawing

9.1.1 Design Calculation

Design calculation report was reviewed based on EN 12201-3 for water supply.

Design stress, wall thickness, Maximum operating pressure, internal hydrostatic stress, Normal pressure and Standard Dimension Ratio (SDR) are reviewed with satisfactory.

POLYETHYLENE ELECTROFUSION FITTINGS

MATERIAL : PE 100, SDR 11

COLOR : Black

9.1.2 Product and Drawing Review

Drawings of PE Electrofusion Fittings were reviewed based on the design calculation report and relevant standards.

COUPLER / 16 ~ 400MM / DY-03-000-C00, rev. 0

ELBOW 90° / 16 ~ 200MM / DY-03-000-L00, rev. 0

ELBOW 45° / 16 ~ 200MM / DY-03-000-L45, rev. 0

EQUAL TEE / 16 ~ 200MM / DY-03-000-T00, rev. 0

UNEQUAL TEE / 25 x 20 ~ 200 x 180MM / DY-03-000-T00, rev. 0

END CAP / 16 ~ 200MM / DY-03-000-E00, rev. 0

REDUCER / 20 x 16MM ~ 200 X 180MM / DY-03-000-R00, rev. 0

TAPPING TEE / 40 X 20MM ~ 315 X 63MM / DY-03-000-S00, rev. 0

9.2. Review of Raw Material Certificate

Material certificate issued by Material manufacturer (Korea Petrochemical Ind. Co., Ltd) was reviewed for fusion index and thermal stability in accordance with EN12201-1.

BS6920 Test on Effect of water quality test report (WORK/MAT012) issued by WRc-NSF to material manufacturer was reviewed with satisfactory.

Tested Material : HDPE pipe Material P600 BL

Test report of PE 100 Electrofusion fitting for potable water based on KS M 3408:3.2004 issued Korea Environment & Merchandise Testing Institute was reviewed with satisfactory.

Tested Material : HDPE pipe Material P600 BL

Note : All test specified at the EN 12201-3 were performed in accordance with relevant test standard

9.3. Hydrostatic strength test (temperature 20°C, test period 100hr)

Hydrostatic strength test were performed in accordance with EN 921-1994 Method A as below test condition and No failure during the test period of any test piece

Test type : nitrogen

Circumferential (hoop) stress in pipe for PE 100 : 12.4Mpa

9.4. Hydrostatic strength test (temperature 80°C, test period 165hr)

Hydrostatic strength test were performed in accordance with EN 921-1994 Method A as below test condition and No failure during the test period of any test piece

Test type : nitrogen

Circumferential (hoop) stress in pipe for PE 100 : 5.4Mpa

9.5 Hydrostatic strength test (temperature 80°C, test period 1000hr)

Hydrostatic strength test were performed in accordance with EN 921-1994 Method A as below test condition and No failure during the test period of any test piece

Test type : nitrogen

Circumferential (hoop) stress in pipe for PE 100 : 5.0Mpa

9.6. Pressure Drop

Pressure drop test were performed in accordance with EN 12117 as below test condition and Air flow rate value was indicated at the test report.

Test type : Air

Test pressure : 25mbar

Pressure drop for $dn \leq 63mm$: 0.5mbar and for $dn > 63mm$: 0.1mbar

9.7. Melt mass-flow rate (MFR)

The test was performed in accordance with EN ISO 1133 as bellow test condition and test value was in requirements.

Loading mass : 5kg

Test temperature : 190 °C

Test period : 10 min

9.8. Oxidation induction time test (Thermal Stability)

The test was performed in accordance EN 728 as bellow test condition and test value was in requirements.

Test temperature : 200 °C

Test period : over 20 min.

9.9. Cohesive resistance test for electorfusion socket fittings

Cohesive resistance test(A) were performed in accordance with ISO 13954:1997 and adhesive resistance test(B) were performed in accordance with ISO 13955:1997 as bellow test condition and overall distance was accepted with criteria.

Test temperature : 23 °C

9.10. Cohesive resistance test for electorfusion saddle fittings

Cohesive resistance tests were performed in accordance with ISO/DIS13956:1996 as bellow test condition and overall distance was accepted with criteria.

Test temperature : 23 °C

9.11. Impact resistance of tapping tees

Impacting resistance test were performed in accordance with EN 1716 as bellow test condition and leakage was not found

Test temperature : 0 °C

Falling height : 2m

Mass of striker : 2.5kg

9.12. Effect on water quality

BS6920 Test on Effect of water quality test report (WORK/MAT012) issued by WRc-NSF to material manufacturer was reviewed with satisfactory.

Tested Material : HDPE pipe Material P600 BL

Test report of PE 100 Electrofusion fitting for potable water based on KS M 3408-3:2004 issued Korea Environment & Merchandise Testing Institute was reviewed with satisfactory.

Tested Material : HDPE pipe Material P600 BL

9.13. Visual and dimension inspection

Appearance and color (black) of fitting, internal & external surface, dimension of each fitting were checked in accordance with relevant drawings.

ANNEXES Yes (Total number of pages :) NoSurvey carried out by : Hee Chang Shin
NameReport issued by : Hee Chang Shin
Name
SignatureDate: 17 / Oct. / 2006
Inspection Centre : BV-KoreaDiffusion : Client



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BV SEOUL, KOREA

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ISSUED BY BUREAU VERITAS KOREA
BV Office : Rm 1102, Keungil Tower, 677-25,
Yeoksam-dong, Kangnam-gu, Seoul, Korea

APPLYING ISO STANDARD EN 12201-3 : 2003 Plastic piping system for supply of water
supply – Polyethylene – Part 3 Fittings

CONCERNING **POLYETHYLENE ELECTROFUSION FITTINGS**

TYPE OF FITTING / SIZE / Drawing No.

COUPLER / 16 ~ 400MM/ DY-03-000-C00 rev. 0
ELBOW 90° / 16 ~ 200MM/ DY-03-000-L00 rev. 0
ELBOW 45° / 16 ~ 200MM/ DY-03-000-L45 rev. 0
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END CAP / 16 ~ 200MM/ DY-03-000-E00 rev. 0
REDUCER/ 20 X 16MM ~ 200 X 180MM/ DY-03-000-R00 rev. 0
TAPPING TEE / 40 X 20MM ~ 315 X 63MM/ DY-03-000-S00 rev. 0

MATERIAL : PE 100, SDR 11

(HDPE Pipe Material P600-BL made by Korea Petrochemical Ind., Co., Ltd.)

COLOR : Black

Note : The Effect of water quality out of Material test was checked in accordance with BS6920-1:1996 and this test shall be re-performed in accordance with national standard when the above products will be used in the country who not apply BS6920

MANUFACTURER

DAEYOUN Co., Ltd.

517-7, Taejeon-Dong, Kwangji-Si,
Kyunggi-Do, Korea

We hereby certify that the type of the above mentioned commodity has been approved, tested and inspected in accordance with relevant standard.

Date : October 17, 2006

Bureau Veritas Korea

HeeChang Shin
Surveyor





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NO. 440019-02-CT
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BV SEOUL, KOREA

TYPE APPROVAL CERTIFICATE

ISSUED BY BUREAU VERITAS KOREA
BV Office : Rm 901, Poonglim bldg., 823,
Yeoksam-Dong, Kangnam-Gu, Seoul, Korea

APPLYING STANDARD pr EN 1555-3 :1999 Plastics piping systems for supply of gaseous
fuel – Polyethylene – Part 3 Fittings

CONCERNING **POLYETHYLENE ELECTROFUSION FITTINGS**

KIND OF FITTING / SIZE / Drawing No.

COUPLER / 16 ~ 400MM/ DY-03-000-C00 rev. 0
ELBOW 90° / 16 ~ 315MM/ DY-03-000-L00 rev. 0
ELBOW 45° / 16 ~ 315MM/ DY-03-000-L45 rev. 0
EQUAL TEE / 16 ~ 200MM/ DY-03-000-T00 rev. 0
UNEQUAL TEE / 25 x 20 ~ 200 x 180MM/ DY-03-000-T00 rev. 0
END CAP / 16 ~315MM/ DY-03-000-E00 rev. 0
REDUCER / 20 X 16MM ~ 315 X140MM/ DY-03-000-R00 rev. 0
TAPPING TEE / 40 x 40MM ~315 x160MM/ DY-03-000-S00 rev. 0

MATERIAL : PE 100 AND PE 80, SDR 11

COLOR : Yellow and Black

MANUFACTURER

DAEYOUN Co., Ltd.

517-7, Taejeon-Dong, Kwangji-Si,
Kyonggi-Do, Korea

We hereby certify that the type approval of the above mentioned commodity has been approved,
tested and inspected in accordance with relevant standard.

Date June 10, 2004

Bureau Veritas Korea

HeeChang Shin
Surveyor

