Palermo Plastics Pipe (P^3) Consulting

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I. Consultant Services Offered

A. Manufacturers

Palermo Plastics Pipe (P^3) Consulting will aid plastic pipe manufacturers (resin companies and pipe companies) to achieve HDB (Hydrostatic Design Basis) and MRS (Minimum Required Strength) pressure ratings through the Hydrostatic Stress Board (HSB), assist with HSB special cases, develop or revise industry standards (ASTM, CSA, AASHTO, ISO), write petitions to the DOT, and/or aid in marketing plastic pipe products to the end user.

B. End users

Palermo Plastics Pipe (P^3) Consulting will aid end users, primarily gas utilities, to evaluate or qualify plastic pipe products (primarily polyethylene and polyamide 11), revise industry standards, and/or conduct failure analysis of plastic pipe products. P^3 Consulting will also present technical seminars at gas company locations to provide background on polyethylene pipe, polyamide 11 pipe or new plastic piping materials for the gas industry.

C. Laboratories

Palermo Plastics Pipe (P^3) Consulting will work with laboratories or research organizations to keep abreast of domestic and international standard test methods and standard specifications, and/or write proposals for and then guide

research projects for plastic pipe.

D. Litigation Cases
Palermo Plastics Pipe (P^3) Consulting is available for litigation cases involving plastic pipe products, particularly plastic pipe used for natural gas distribution.

II. Dr Gene Palermo

Dr. Gene Palermo received a Bachelor of Science in Chemistry from St. Thomas College in St. Paul, MN in 1969 and a Ph.D. in Analytical Chemistry from Michigan State University in 1973.

Dr. Palermo has been in the plastic piping industry for over 30 years. He worked for the Dupont Company from 1976 to 1995 in the Aldyl "A" polyethylene (PE) pipe business for natural gas distribution. Dr. Palermo developed the initial use of polyamide (PA) 11 for high-pressure gas distribution, up to 300 psig, to replace metal pipe while with Elf AtoChem during 1995 and 1996.

Dr. Palermo was the Technical Director for the Plastics Pipe Institute (PPI) from 1996 until 2003. As Technical Director, Dr. Palermo was chairman of the Hydrostatic Stress Board (HSB) on which he has served for 20 years to develop pressure rating methods for plastic pipe; and chairman of the Technical Advisory Group for ISO/TC 138 for international plastic piping systems. Dr. Palermo has developed standards for plastic pipe and fittings in several standards bodies; ASTM F17, CSA, AASHTO, and ISO/TC 138.

Most of Dr. Palermo's expertise has been in the natural gas distribution industry. He has been a member of the AGA Plastic Materials Committee for 20 years, the Gas Pipe Technology Committee for seven years, an instructor for the DOT inspector training school for 15 years, and a member of the Plastic Pipe Database Committee since its inception four years ago. Dr. Palermo also developed PPI's one day Technical Seminar for the gas distribution industry.

Dr. Palermo currently serves as a member of PPI, HSB, AGA, GPTC, ASTM F 17 and D 20, CSA, TRB and ISO/TC 138.

III. Awards Received

Dr. Gene Palermo just received the **AGA Platinum Award of Merit** from the American Gas Association. This is the highest award given by AGA to its members. Dr. Gene Palermo had previously received the AGA (American Gas Association) Award of Merit in 1995 in recognition of several presentations made at plastic gas pipe industry meetings, and also serving as moderator at AGA Operations Conferences and Plastic Pipe Symposiums. Dr. Palermo also

received the AGA Silver Award of Merit in 2002 for having faithfully and constructively served the American gas industry, and for making continuous and extensive contributions to further the interests and promote the welfare of the gas industry and of the public.

Within ASTM F 17, Dr. Palermo has received two Awards of Appreciation in recognition of his many years of outstanding service and active participation in the plastic piping standards work of ASTM F 17, and a Special Service Award for his many technical contributions and development of plastic piping standards. Dr. Palermo received the Paul Finn Memorial Award in 1995 for his distinguished and continuous service to ASTM F 17 (plastic pipe standards), and particularly for steadfast contributions to the development of sound engineering standards, particularly for plastic gas pipe standards. Dr. Palermo received the Rinehart Kuhlmann Award in 2002 in acknowledgment of faithful and significant contributions in furthering the cause of sound and effective plastics piping standardization. Most recently, in 2005 Dr. Palermo received the ASTM **Award of Merit**, which is the highest award given within ASTM.

Dr. Palermo was also recognized by the US Department of Transportation (Transportation Safety Institute) for outstanding performance as an associate staff in the Pipeline Safety Division in teaching DOT inspectors about plastic gas pipe standards in ASTM and ISO, plastic pipe pressure ratings methods from ASTM and ISO, plastic pipe failure analysis and new plastic pipe materials for the natural gas industry.

IV. Gas Pipe Industry Experience

For over 30 years Dr. Gene Palermo has been primarily involved in plastic piping systems for the natural gas distribution industry. Most of those years were with the Dupont Company where he worked with Aldyl “A” polyethylene gas pipe. He presented several industry papers on the use of the Rate Process Method (RPM) to forecast the life expectancy of polyethylene gas pipe and fittings. At Plastics Pipe XII in Milan (April 2004) Dr. Palermo presented a paper correlating RPM projections with actual field performance for polyethylene gas pipe materials. While with DuPont, Dr. Palermo also conducted several failure analyses of Aldyl “A” polyethylene pipe components and wrote several failure analysis reports for gas companies.

Dr. Palermo was hired by Elf AtoChem in 1995 to develop an all plastic piping system made from polyamide (PA) 11 to be used for high-pressure gas distribution systems as a replacement for metal pipe. He wrote several ASTM and CSA standards for the polyamide 11 piping system. He worked with PPI member companies to develop polyamide 11 pipe, butt fusion fittings, mechanical fittings, meter risers, transition fittings, and valves and also developed a butt fusion procedure for joining polyamide 11 pipe and fittings using

the same butt fusion equipment that gas companies use for polyethylene pipe and fittings.

He has been actively involved in the AGA Plastic Materials Committee (PMC) since 1981. He presented several papers at various AGA PMC Winter Workshops. He has provided PMC members with liaison reports for PPI and ISO activities and is currently the chairman of the Code, Standards and Regulatory task group for AGA PMC. Dr. Palermo has also been an active member of the AGA Gas Pipe Technology Committee (GPTC) since 1995. He has chaired several projects in the Plastics task group and the Design task group. He is currently a voting member on the Main Body Committee of GPTC.

Dr. Palermo served on the Plastic Pipe Database Committee, which is a joint government/industry committee to develop a database of plastic pipe and fitting failures that occurred in the gas industry. This database will confirm that industry standards for plastic pipe systems used in the gas industry result in outstanding performance for the end user.

More recently, Dr. Palermo has developed a one-day technical seminar for plastic pipe materials used in the gas industry. This seminar is intended to provide a background on plastic pipe materials, primarily polyethylene, to update gas engineers on recent developments in ASTM and ISO standards for the gas industry, and to provide information on new plastic pipe materials for the gas industry. These include polyamide 11 for high pressure gas applications to replace metal pipe, crosslinked polyethylene for niche applications that require increased slow crack growth resistance, PE 100 materials that are considered the next new generation of polyethylene materials and multiplayer pipe for indoor gas applications.

V. Plastic Pipe Standards Activities

A. ASTM

1. Dr. Gene Palermo has been a member of ASTM F 17 since 1982, and D 20 since 1999. He has been primarily involved in the following F 17 plastic pipe standards subcommittees:

F17.10 Fittings
F17.20 Joining
F17.26 Olefins
F17.38 ISO
F17.40 Test Methods
F17.60 Gas
F17.61 Water
F17.90 Executive
F17.94 Terminology

Dr. Palermo has served as chairman of F17.94 on Terminology and F17.38 on ISO. He is also a member of the F17.90 Executive Committee for F17. Dr. Palermo is currently the Chairman of ASTM F17 Division I.

2. New plastic piping standards that Dr. Palermo developed or existing plastic piping standards that Dr. Palermo revised include:

- Added 80°C sustained pressure requirements to water pipe standards to assure slow crack growth resistance.
- Revised D 2513 quick burst requirement to be a ductile failure mode for polyethylene gas pipe instead of a minimum pressure because it is more meaningful.
- Developed a new annex in D 2513 for polyamide pipe and fittings
- Wrote a new standard for polyamide butt fusion fittings (F 1733)
- Added 50-year substantiation for polyethylene materials to D 2513 for gas pipe
- Included pressure design basis protocol in ASTM D 2837
- Added polyethylene validation requirement to D 2837
- Included a crosslinked polyethylene pipe material designation code in F 876
- Wrote a new ASTM standard test method for rapid crack propagation based on the ISO standard (F 1583)
- Wrote a new ASTM standard test method for an 80°C notch pipe test based on the ISO method (F 1474)
- Introduced 80°C requirements for polyethylene heat fusion socket fittings (D 2683) and polyethylene butt fittings (D 3261) consistent with ISO TC 138 requirements
- Wrote a new ASTM test method to measure slow crack growth resistance of polyethylene materials used in corrugated pipe (F 2136)

3. Dr. Palermo led an ASTM workshop to review differences and similarities between the ASTM plastic pipe pressure rating method – D 2837 and the ISO plastic pipe pressure rating method – ISO 9080.

4. Dr. Palermo gave a “spotlight presentation” on ASTM F17.38 ISO standards activities during an ASTM Committee Week.

B. ISO

Dr. Palermo was chairman of the Technical Advisory Group (TAG) for ISO (International Standards Organization)/TC 138 for plastic pipe materials for over 10 years and has attended ISO meetings since 1983. As chairman, Dr. Palermo represented the US plastic pipe industry at all ISO/TC 138 meetings. Dr. Palermo also formulated the US position on all standards ballots from ISO/TC 138. Within

TC 138, Dr. Palermo was primarily active in SC 2 for water plastic pipe, SC 4 for gas plastic pipe and SC 5 for plastic pipe test methods. Dr. Palermo has provided ISO liaison reports at various ASTM F 17 subcommittee meetings, and also provided ASTM F 17 liaison reports at ISO/TC 138 meetings.

C. HSB and PPI

Dr. Palermo was chairman of the PPI Hydrostatic Stress Board (HSB) for seven years and has been a member of the HSB since 1985. HSB is responsible for establishing the policy for pressure rating of plastic pipe materials in North America. While with PPI, Dr. Palermo continually updated both TR-2 and TR-4. TR-2 is a public listing of the various ingredients that are qualified for the PPI PVC generic formulation. TR-4 is a public listing of the pressure rating of plastic pipe materials obtained using ASTM D 2837. Dr. Palermo was also instrumental in listing the pressure rating of plastic piping materials obtained using the international pressure rating system (ISO 9080) in TR-4. These MRS (Minimum Required Strength) ratings were added to TR-4 in 1999. Under his leadership, the PDB (pressure design basis) for composite or multiplayer pipes and the SDB (Strength Design Basis) for molding materials were also added to TR-4. Dr. Palermo has attended PPI meetings since 1990 and served as the PPI Technical Director from 1996 until 2003.

D. AASHTO

Dr. Palermo has also assisted with revision of AASHTO standards for polyethylene corrugated plastic pipe used in highway applications. His key contribution was development of an ASTM test method to measure the slow crack growth resistance of the polyethylene material used in corrugated plastic pipe. Through a PPI task group, round robin testing was conducted to establish the precision of the test method known as NCLS (notched constant ligament stress). AASHTO now references this NCLS test as a requirement in their M 294 corrugated pipe standard.

E. CSA

Dr. Palermo is a member of CSA (Canadian Standards Association) B137 Technical Committee for plastic piping systems and also a member of CSA Z662 Clause 12 for gas distribution piping systems. Recent projects that Dr. Palermo has chaired are the addition of the MRS (Minimum Required Strength) ISO pressure rating method for PE 100 materials to B137 and the addition of RCP (rapid crack propagation) requirements to the gas pipe standard B137.4.

F. Plastics Pipes Conferences

Dr. Palermo has served on the Organizing Committee for Plastics Pipes XII held in Milan, Italy in 2004, for Plastics Pipes XIII held in Washington DC in 2006 and Plastics Pipes XIV, to be held in Budapest, Hungary in 2008.

G. GPTC
Dr. Palermo has been a member of the Gas Piping Technology Committee (GPTC) since 1995. GPTC provides guide material for the gas industry to comply with US Federal requirements for the gas distribution industry. Dr. Palermo has chaired several projects within GPTC.

H. TRB
Dr. Palermo has been attending TRB meetings since 1999, and has made several presentations at various committee meetings. Dr. Palermo is currently a member of the Committee on Subsurface Soil-Structure Interaction, AFS40.

VI. Plastic Pipe Industry Publications

1. E. F. Palermo and M. Cassaday, “Comparison of Water/Methane Stress Rupture Testing", AGA PMC Workshop (1982).

2. E. F. Palermo, "Aging of Plastic Pipe", AGA PMC Workshop (1983)

3. E. F. Palermo and I. K. DeBlieu, "Aging of Polyethylene Pipes in Gas Distribution Service", AGA Distribution Conference (1983).

4. E. F. Palermo and I. K. DeBlieu, "Compression Ring Environmental Stress Crack Resistance (Pipe) Precision and Accuracy Round Robin", ASTM Quality Assurance Symposium (1983).

5. E. F. Palermo, "Rate Process Method as a Practical Approach to a Quality Control Method for Polyethylene Pipe", Eighth Plastic Pipe Symposium (1983).

6. E. F. Palermo, “Plastic Piping Material", South Eastern Gas Association Meeting (1984).

7. E. F. Palermo and I. K. DeBlieu, “Rate Process Concepts Applied to Hydrostatically Rating PE Pipe", Ninth Plastic Pipe Symposium (1985).

8. E. F. Palermo, “Battelle Slow Crack Growth Test - DuPont Technical Position", AGA PMC Workshop (1986).

9. E. F. Palermo, “Impact Tests on Saddle Fittings to Determine Conformance to ASTM F905”, AGA Distribution Conference (1986).

10. E. F. Palermo, "New ASTM D 2513 Outdoor Storage Requirements", AGA PMC Workshop (1987).

11. E. F. Palermo, “Polyethylene Pipe for Gas Distribution - That Was Then, This is Now”, Irish Gas Association Centenary Conference (1987).

12. E. F. Palermo, “Plastic Pipe/Fitting Failure: Cause and Prevention", Pacific Coast Gas Association Workshop (1987).

13. E. F. Palermo, K. G. Toll, G. T. Appleton, "Using Laboratory Tests on PE Piping Systems to Solve Gas Distribution Engineering Problems", Tenth Plastic Pipe Symposium (1987).

14. E. F. Palermo, “Critical Evaluation of Rate Process Method 'Anomalies’”, AGA PMC Workshop (1988).

15. E. F. Palermo, K. Gunther, and M. Kanninen, "Progress Toward Designing PE Gas Pipe Against RCP (Rapid Crack Propagation)", AGA PMC Workshop (1989).

16. E. F. Palermo, "Large Diameter Plastic Pipe Damage Investigation", Midwest Gas Association Meeting (1989).

17. E. F. Palermo, K. Gunther, and D. VanDeventer, "Squeeze-Off of Large Diameter Polyethylene Pipe", AGA Distribution Conference (1990).

18. E. F. Palermo, “ASTM/ISO Rating Methods – bridging the gap across the waters”, Plastics Pipes IX (1995)

19. E. F. Palermo, “High Pressure Gas Distribution Piping System”, AGA Distribution Conference (1996).

20. E. F. Palermo, “Plastic Pipe Design Equation Update”, AGA Distribution Conference (1997).

21. E. F. Palermo and D. B. Edwards, “An Alternate Method for Determining the Hydrostatic Design Basis for Plastic Pipe Material”, Plastics Pipes X (1998)

22. E. F. Palermo, “Comparison of ASTM and ISO Gas Pipe Standards”, AGA Distribution Conference (2001).

23. E. F. Palermo, “PPI Adopts International Pressure Rating Method for Plastic Piping Materials”, Plastics Pipes XI (2001)

24. E. F. Palermo, “What’s New with ASTM, DOT and ISO?”, AGA Distribution Conference (2003).

25. E. F. Palermo, “Correlating Aldyl ‘A’ and Century PE Pipe RPM Projections With Actual Field Performance”, AGA Distribution Conference (2004)

26. E. F. Palermo and Jimmy Zhou, “Can ISO MRS and ASTM HDB Rated Materials be Harmonized”, Plastics Pipes XII (2004)

27. E. F. Palermo, “Correlating Aldyl ‘A’ and Century PE Pipe RPM Projections With Actual Field Performance”, Plastics Pipes XII (2004)

28. E. F. Palermo, “High Performance Bimodal PE 100 Materials For Gas Piping Applications”, AGA Distribution Conference (2005)

29. E. F. Palermo and Steve Swanstrom, “Reinforced Thermoplastic Pipe (RTP) for High- Pressure (800 psig) Gas Piping Applications”, AGA Distribution Conference (2006)

30. E. F. Palermo and E. Lever, “Innovative Methodology for Fitting Lifetime Prediction and Process Control by Correlating Rate Process Method Analysis of Molded Fittings with Notch Ring Test Data”, Plastics Pipes XIII (2006)

31. E. F. Palermo et al, “New Test Method to Determine the Effect of Recycled Materials on the Life of Corrugated HDPE Pipe as Projected by the Rate Process Method”, Plastics Pipes XIII (2006)

32. E. F. Palermo, “Using the CRS Concept for Plastic Pipe Design Applications”, Plastics Pipes XIII (2006)

33. E. F. Palermo and J. M. Kurdziel, “Stress Crack Resistance of Structural Members in Corrugated High Density Polyethylene Pipe”, Transportation Research Board (2007)

34. E. F. Palermo et al, “Effect of Elevated Ground Temperature (from Electric Cables) on the Pressure Rating of PE Pipe in Gas Piping Applications”, AGA Distribution Conference (2007)

35. E. F. Palermo and S. Chung, “Rate Process Method Applied to Service Life Forecast of PE Molded Fittings”, AGA Distribution Conference (2008)

36. E. F. Palermo, “What’s New With Plastic Pipes – An Overview”, Plastics in Underground Pipes 2008.