

محفوظ زندگی کا پائیدار ساتھ

API

CELEBRATING
1966-2016
50 Years
Of Excellence



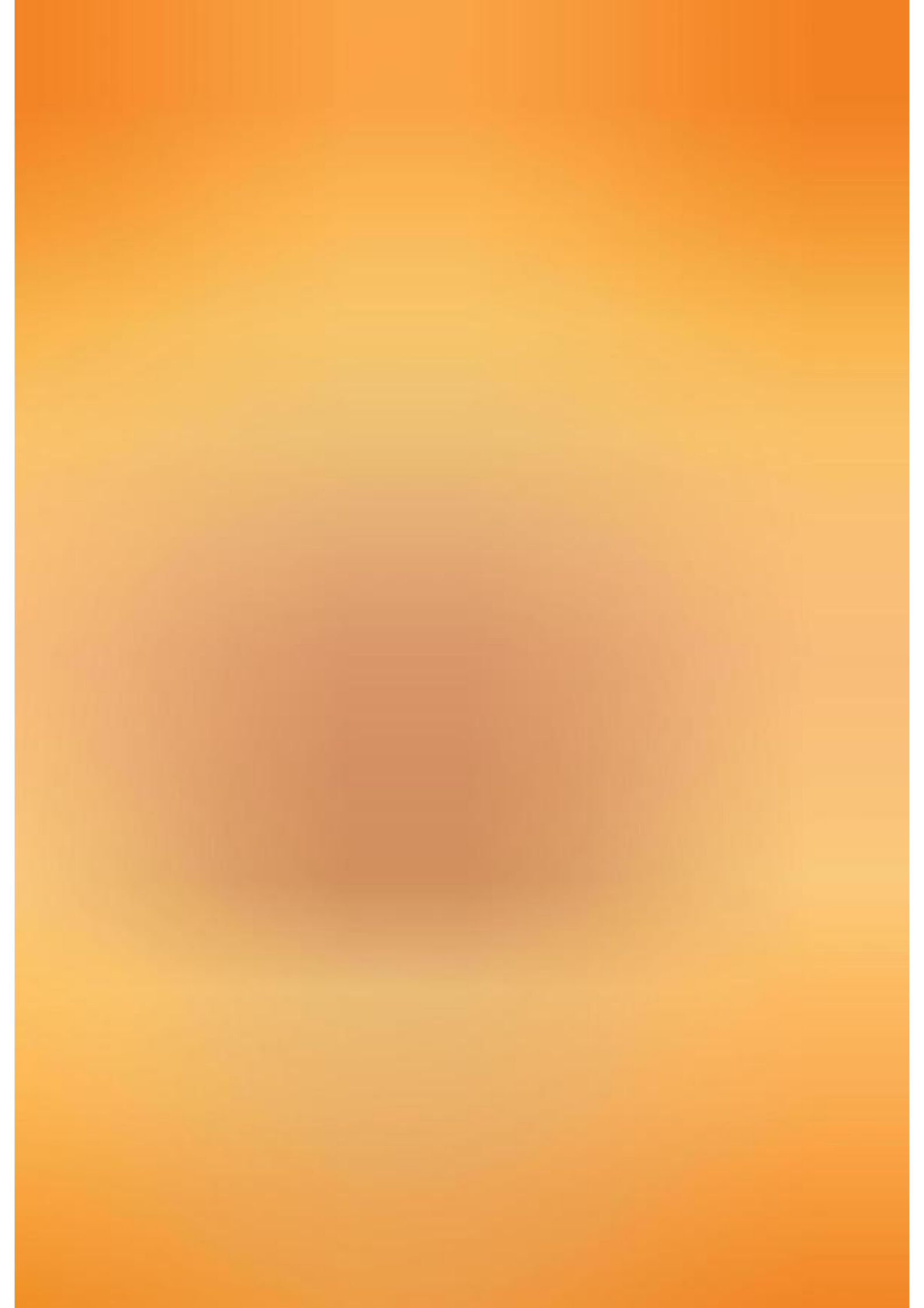
Approved



POLYMERS DIVISION



MADE IN PAKISTAN
with **CHINESE**, **KOREAN** and **JAPANESE** Technologies



Founder Message

*Dear Customers / Dealers / Distributors /
International Business Partners,
Assalam-o-Alaikum,*

*Since 1966, pioneering of my pump
business, I never saw big or high dream
but to earn Halal (legitimate) livelihood.*

*When I retrospect after so many
years, I saw special blessings of Allah
Almighty for our success. But I always get
satisfied on one thing that "we never
compromise on quality" is our
fundamental rule that company
management would restrict to follow this
rule even now.*

*I pray to Allah Kareem, may our
consumer get the best intern of their spend
amount. I congratulate the company as
well as the consumer on their success. May
our this fellowship on the code of success
continue for ever.*

معزز صارفین / ڈیلرز / ڈسٹری بیوٹرز / بین الاقوامی کاروباری رفقاء کا

اسلام و علیکم!

۱۹۶۶ میں جب میں نے پمپ بنانے کا کاروبار شروع کیا تو
اُس وقت میں نے رزق حلال کمانے کے علاوہ کوئی خواب نہیں دیکھے تھے۔

آج اتنے سالوں بعد جب میں پیچھے مڑ کر دیکھتا ہوں تو اللہ
رب العزت کے کرم کے سوا کامیابی کی کوئی وجہ دکھائی نہیں دیتی لیکن
میں ایک چیز پر ہمیشہ مطمئن رہا ہوں کہ میں نے معیار پر سمجھوتہ نہ کرنے کا
بنیادی اصول کبھی بھی نہیں چھوڑا، اور آج بھی کپن مینجمنٹ اس اصول
پر پابند ہے۔

میں اللہ کریم سے دعا کرتا ہوں کہ صارفین کو کمپنی کی جانب سے
ان کی خرچ کی ہونے والی رقم کا صحیح نفع الیون میٹر ہو اور کمپنی کے ساتھ ساتھ
صارفین بھی اس کامیابی کے سفر میں ہمیشہ کیلئے ہمارے رفقاء کار بننے
رہیں، اور ہمارے اعتماد کا سفر جاری و ساری رہے۔

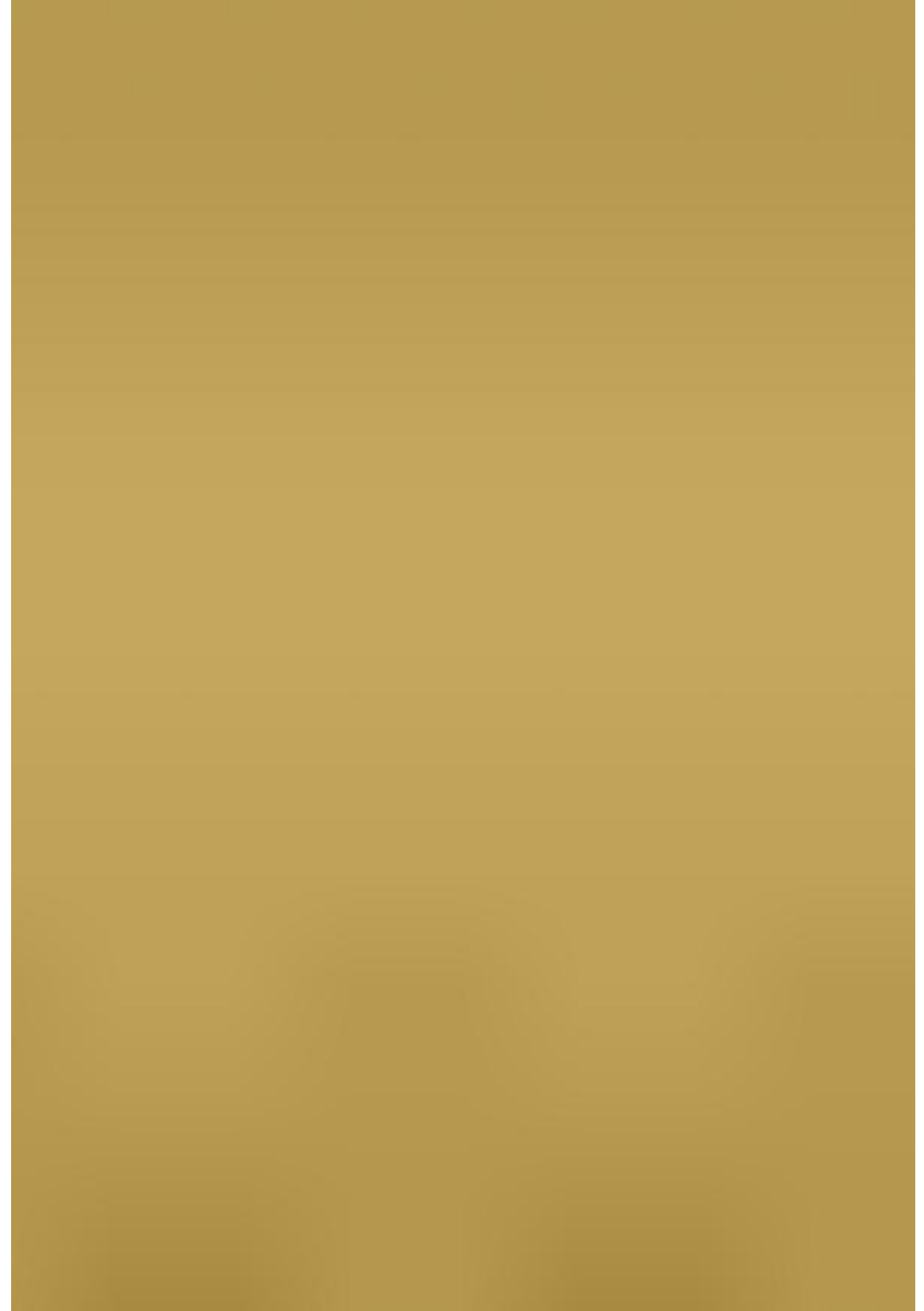
آمین ثم آمین

Signed by The Founder
(in Urdu)

محمد بشیر

محمد بشیر مغل

بانی اصلوں پنجاب انڈسٹریز (پرائیویٹ) لمیٹڈ





*From the desk of Chief Executive
My dear fellows:*

I feel immense pleasure of representing the company as Chief Executive, it is my core objective to maintain the repute, quality and vision initiated by my elders, as well as my employers of the firm working under the roof of company since several decades.

By following the rules & regulations set by the elders that are the foundation of our success. While our constant desire to improve will change some of the things we do as a company, we will always continue to exercise ethical business practices, maintain a respect for the individual and run our business in way that earn us the trust. Our people have never shied away from hard work or difficult task.

Making the most of our diversity has always been the right things and the smart thing to do. We believe, what we have in common with what each of us brings unique individual is a powerful recipe of success. We from as an organization & as people to lead new sights and an invention. We are proud of what we have achieved in our diversity journey and we are motivated by a strong sense of purpose for what is still to come. We believe diversity and inclusion strengthens us and we are committed long-term to progress in our company and the communities we serve.

I ensure the continuity of our products, and value of our customer remain the fundamental elements of our continued success of our company by devoting hard work and following the rule and regulation.

INSHALLAH



About Us

The Company was founded by Haji Muhammad Bashir Mughal in year 1966 and started to produce the water pumps in the beginning, and year-by-year the company had improved its production and the production range to Deep Well Pumps, Electric Motors, Enameled Copper Wire and Iron Casting. Now, by the grace of ALLAH, the Almighty; the company has started to produce PPR C, PE, uPVC Pipes and Fittings in Pakistan with the same Brand API in the year of 2008.

We are the first manufacturing company in Pakistan, offering multi layered PPR C and Glass Fiber Pipe. This kind of pipes is weather proof or cold and hot weather, which extend the life of pipe 40% higher than the normal one as well as the best Pumps Manufacturers offering the best products. We are leading manufacturer of uPVC pipe and are supplying a wide range of pipes. These products are developed from best material and techniques, we used in various residential, commercial and industrial purposes, our products are as per the international quality standards. We have created state-of-the-art infrastructure at prime location, which assists us in serving customers in a quick and better manner. It includes a sophisticated manufacturing unit, which is installed with advanced machinery that assists in the efficient production of uPVC and PPR-C Pipes. Our machines are operated by a team of experts having good expertise in the domain. They ensure their upkeep so as to ensure efficient semi-automatic production process.

We are registered trademark of **Asli Punjab Industries (Pvt.) Limited** in the scope of Water Supplying System. We are offering the range of deep well pumps, mono block pumps, Jet pumps as well as the pumps for tube wells. API has extended the product range to PPR-C, uPVC, PE pipes and fittings.



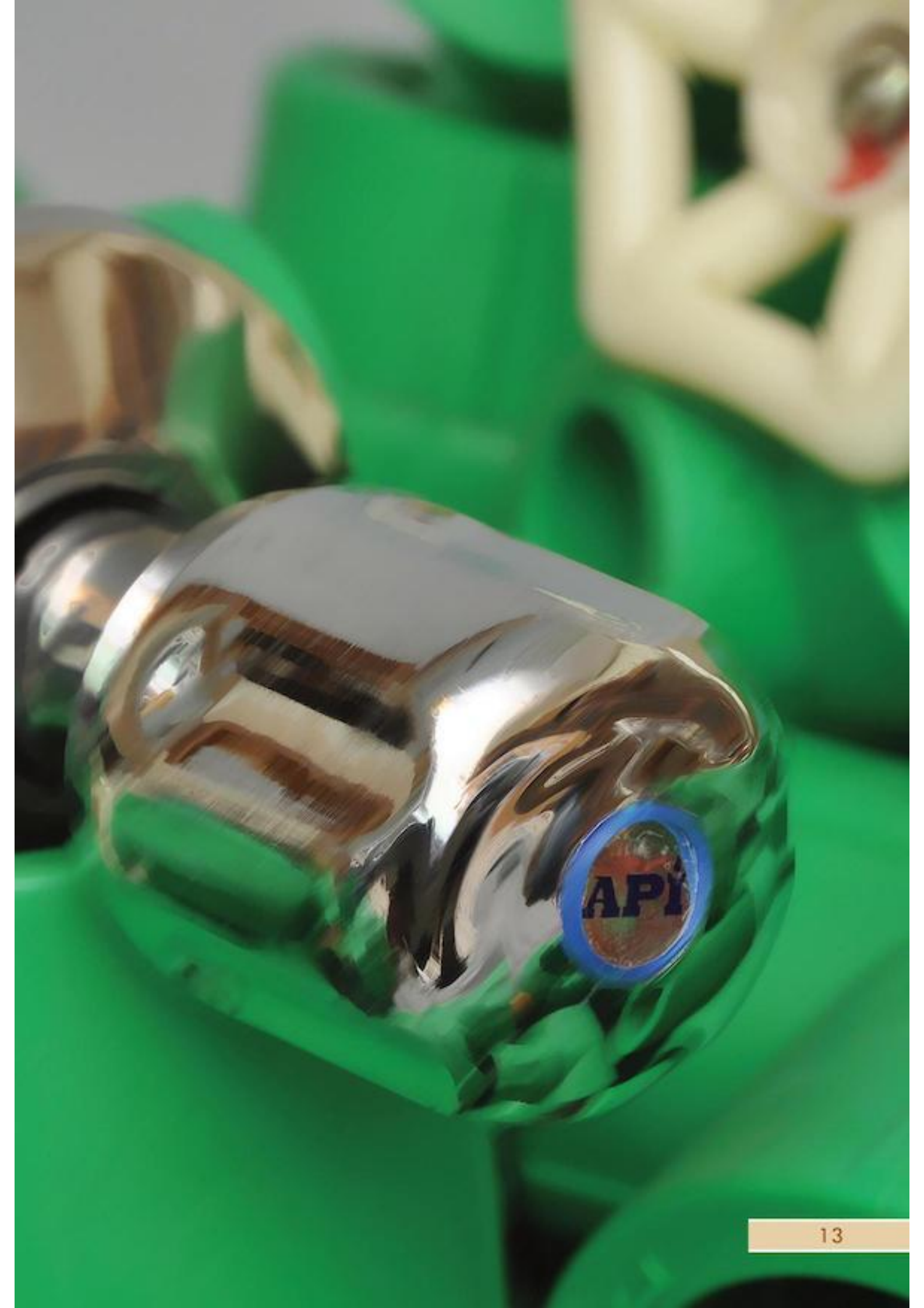
We have range of pipes is available in different sizes and specifications. These are demanded in agriculture sector for the purpose of irrigation construction in house and water drain system. Also, these meet the requirements of plumbing, industrial, domestic and technical applications. Our excellent quality and environment friendly PVC Pipes, pump and similar products are marketed in different cities of Pakistan. We give quality ensures that it are present in every aspect of our business proceedings. With an advanced quality control lab, we conduct concerned tests on the entire manufactured range. Further, our team of experts ensure strength & durability of our products; enabling us in serving our clients with nothing but the best. We give prime importance to the quality of products. We have installed an advanced in-house testing laboratory with the latest testing equipment as per the standards. The laboratory is equipped to carry all tests on raw material as well as finished products. Every batch of production is tested on different physical and mechanical parameters before they are supplied in the market. Some of these parameters are design, dimension, finish, polish and others. We are fully aware of the face that we are serving due to our customer in the market; therefore our quality policy is clearly focused on our valued customers. Low rejection rate, less customer complain and avoiding non-conformity in our products has become us a market leader.

Achievements And Awards

Asli Punjab Industries (Pvt.) Limited is also known to first one in the country having quality certification of ISO 9001, ISO 14001, ISO 18001 standards and CE certifications.

It is indeed a matter of immense pleasure to share that **Asli Punjab Industries (Pvt.) Limited** is the one of the biggest manufacturing unit in Pakistan and in this connection it is a great honor for us that we achieve many certificates and awards that show the company quality parameters and our glory in the market.

- Excellence achievement Award and gold medal from President of Pakistan.
- Won Best Export Trophy from Prime Minister of Pakistan Mian Muhammad Nawaz Sharif.
- Company also achieved several awards in Gold Medal from the Pride of Pakistan, a senior most scientist Dr. Abdul Qadeer Khan.
- Achieve Award from Governor of Punjab.
- Brand of the year Award from Governor of Punjab.
- Won who's who recognition award from Governor of Sindh.
- Achievement Award from speaker of Punjab Assembly.
- Achievement Award from Minister of Account and Industry.
- Licensed from Pakistan standard and quality control authority.
- Registered with Govt. of Punjab.
- Corporate social responsibility Award by minister of Commerce and Industry.





With Prime Minister of Pakistan Mian Muhammad Nawaz Sharif



With Senior Most Scientist, Dr. Abdul Qadeer Khan



With Governor Punjab, Chaudhary Muhammad Sarwar



With Senior Most Scientist, Dr. Abdul Qadeer Khan



With Governor of Sindh, Dr. Ishrat-ul-Ibad & Provincial Minister



With Speaker Punjab Assembly, Rana Muhammad Iqbal



With President of Pakistan, H.E. Mamnoon Hussain & Governor Punjab, M. Raffique Rajwana



With Federal Minister for Commerce & Industry Eng. Khurram Dastgir Khan



With Federal Minister for Commerce & Industry Eng. Khurram Dastgir Khan



Our Ideology

At **ASLI PUNJAB INDUSTRIES (Pvt.) Ltd**, our prime focus is a customer satisfaction. Therefore, we are committed to meet their needs and expectations by offering a wide range of products and delivering quality within stipulated time. We strive to achieve this through:

- Manufacturing process to achieve zero defect products.
- Effective communication with customers.
- Timely dispatch.
- Ensuring employee satisfaction at all levels through motivation.
- Create the products that give customers the best satisfaction.
- Ensuring that raw materials used in our products are safe for consumers.
- Implementing materials and product designs to facilitate customer.
- Ensuring our activities remains at the forefront of environmental trends and innovation in the industry.
- We must guarantee and verify environmental compliance for all parts and components.

Vision



Since 1966 we make Water Supply System for our customer, PUMP, uPVC, PPR-C Pipes & Fittings by providing innovative and quality products to satisfied customers through continuous improvement driven by the integrity, teamwork, and creativity by giving value of money to our customer. We believe that we improve our products day by day for our customer satisfaction.

Mission



We at **Asli Punjab Industries (Pvt.) Limited** continually improve utilizing quality practices to involve in manufacture environment friendly, long lasting and rustles Pumps, Pipes & Fittings that result in customer satisfaction and deliver more then they pay.



Core Principle

Core principles guiding the company entering 21st century are as below.

- Serve the best quality goods for the people everywhere by devoting careful attention safety and to environment.
- Make our customer to our boss.
- Employees are open, candid, and truthful.
- Integrity of employees' word is their bond. They do what they say and live up to the highest standards of fairness and ethical behavior.
- Respect of employees work hard to earn business partners' trust and respect on every project they undertake.
- Dynamic Culture of employees constantly seeks new opportunities to learn, to improve, to teach, and to add value.
- Passion of employees love what they do, taking the lead, and leading by example.
- Assert the leadership in technology and customer satisfaction.
- Becoming the contributory member of the community in every nation.
- Faster corporate culture the honors individually while promoting teamwork.
- Build lasting relationship with business partner around the country.
- Availability in all over the country and outside the boundaries.
- Create value and for the society.
- Use environment friendly procedure in our production area.

Society / Community Responsibility




Strong corporate governance maintains customer confidence, whose support can help us. API implements the principles of good corporate governance into working environment life will ensure corporate success and economic growth. They are the basis on which companies can grow.

Conformity with the spirit of laws. Timely payment of all Government taxes and dues. Eliminate the release of substance that may cause environmental damage. Financial assistance for promoting education and social activities including games and donation/charity to deserving.

We are fully aware of the fact that we are surviving due to our customers in the market; therefore our quality policy is clearly focused on our valued customers. Low rejection rate, less customer complaints, and avoiding non conformity in our products has become us a market leader. For all these responsibilities we achieve a corporate social responsibility Award by hand of honorable minister of commerce and industry.

If you see around, Mother Nature is facing all kinds of troubles. Polluted air, water and land are making it difficult for the organisms of every species and not just the humans to survive and thrive.



Although we all want to do something to save Mother Nature, but many of us fail to see those small contributions which can go a long way in saving environment. One such method is to use right kind of plumbing pipes that not only provide you smooth water supply but also contribute in saving the environment. Customer will be using the pipes for inlet and outlet, hence not only their health but the health of environment is also at stake.

Safe from harmful elements: The pipe should not be manufactured using any harmful chemicals or elements. Some of the metals can be very harmful not only for humans but also for nature. Using such elements can make the surrounding poisonous for the long term.

To make sure that the pipes are not doing any harm to the nature being inside the ground, check on time to time for leaks, damages and other such aspects. This can also help in preventing contamination of water in the pipelines as well.

Even if the water in your area is sufficient, it does not mean that you can use it without any consideration. Utilize the water judiciously without wasting it, remember, there are many others out there who are not able to get water to drink as well. Using environment friendly pipes can be a major help towards saving nature. Do your bit and feel the difference.

Focus On Quality

API builds high business standards with quality pipe manufacturer in Pakistan. Different kinds of pipes are required for many indispensable works such as for plumbing and engineering of a household or office setup. Electrical circuits cannot be imagined without proper wiring and piping done. These things also have many industrial applications; be it in small or mega projects. Our Economical products bring a lot of relief to business people as they help in cut down of budgets. Things such as PPR-C pipe and uPVC pipe has to be of good quality for giving the best performances.



Our Plastic pipes have revolutionized the way certain functions take place. The steel or alloy pipes are costlier in nature as compared to plastic ones. The later, on the other hand are easier to handle and carry from place to place. Be it for fitting in underground irrigation or drainage or gas transmission or for disposal of waste; plastic has been the king so far. Our makes several innovations have taken place in piping standards by different manufacturers and suppliers.

We are engaged in production of high quality products including plumbing pipes, products for electric utilities, commercial and residential units etc. What is so special about these products? These products adhere to the highest quality of manufacturing standards. These are durable, tough and long lasting. For example, these are corrosion resistant. It means these are immune to corrosion and chemical reactions. These products are lightweight in nature. It means these are easy to carry from one place to another. These are resistant to hazardous chemicals and also resist conductivity of thermal energy. The choices are many. Different color and different shapes/ sizes are available. Besides, for large manufacturing orders, custom production is also available. Whether you are an institution or industry in Pakistan, you can find all your commercial plastic pipe needs.

Quality Assurance

An addition to installing products facilities for the various brands of products, to volume has increase as compare to preceding year. The control on the quality has become a core issue of the production system and the company has entitled a large number of technical staff to check the quality on the basis of in house inspection. It makes the complaint ratio to almost 0%.



A comprehensive and independent quality control in three vital areas namely,

- Incoming raw material including process check at vendor site.
- Component processing and assemble check at plant and machinery.
- Before final delivery of the products from production area to store room.

The role of quality assurance department has been expending to support vendor premises and also support the services department and grasping customer quality expectation and taking correction measure to meet them certification and award.

The company owns the following certificates to prove the quality standards:

- ISO 9001 Certification
- ISO 14001 Certification
- ISO 18001 Certification
- CE Certification
- PCSIR (Govt. of Pakistan) proved test
- PSQCA licensed
- Upto date calibrated in house hi-fi laboratory.

Performance



Our experienced technical staff exists to serve you in overcoming any application problem. Skilled design resources and project management capabilities enable us to become closely involved with any such queries, ensuring that the client gets the right Products for requisite purpose. Pipes that will continuously carry the required current at the specified Material/Product type in the prevailing conditions are our priority.

Where necessary we incorporate features enabling product to resist damage from threats such as impact or pressure. Our pipes are designed to resist oil, solvents or corrosive chemicals. This class of Pipes performance can be achieved only by company working in harmony with the latest developments / technology in conductor, insulation and protective materials.

We are a company which has acquired extensive knowledge of application requirements through experience with large network of Pipe users in almost every type of industry and field.



Reliability

Specifying the right Pipes for a particular application is the first step of course and key to reliability however, is in manufacturing process. The Pipes must be free from material and manufacturing defects and weaknesses so that the product delivers the ultimate and high level of results. We are constantly monitored all manufacturing processes and impose all the most stringent quality assurance procedures to produce most reliable product. It is a factor which is of vital significance where Pipes are to be installed in locations where future access will be difficult. That is when our reputation and resources give you peace of mind.

At the same time we recognize that modern commercial and industrial activities create even greater demands on performance and reliability. Consequently, our manufacturing units are under constant review to ensure that the control and monitoring of materials and processes becomes even more stringent, fully automatic and precisely documented. We believe the quality of products and the support services provided from team. This is translated in a very wide range of products that are produced with state-of- the-art machinery from the most reputed sources, and a very high-tech quality control system which ensures that this quality is always maintained in addition to well trained and highly motivated staff on all levels of the company that are always committed to premium service at any time.

Safety

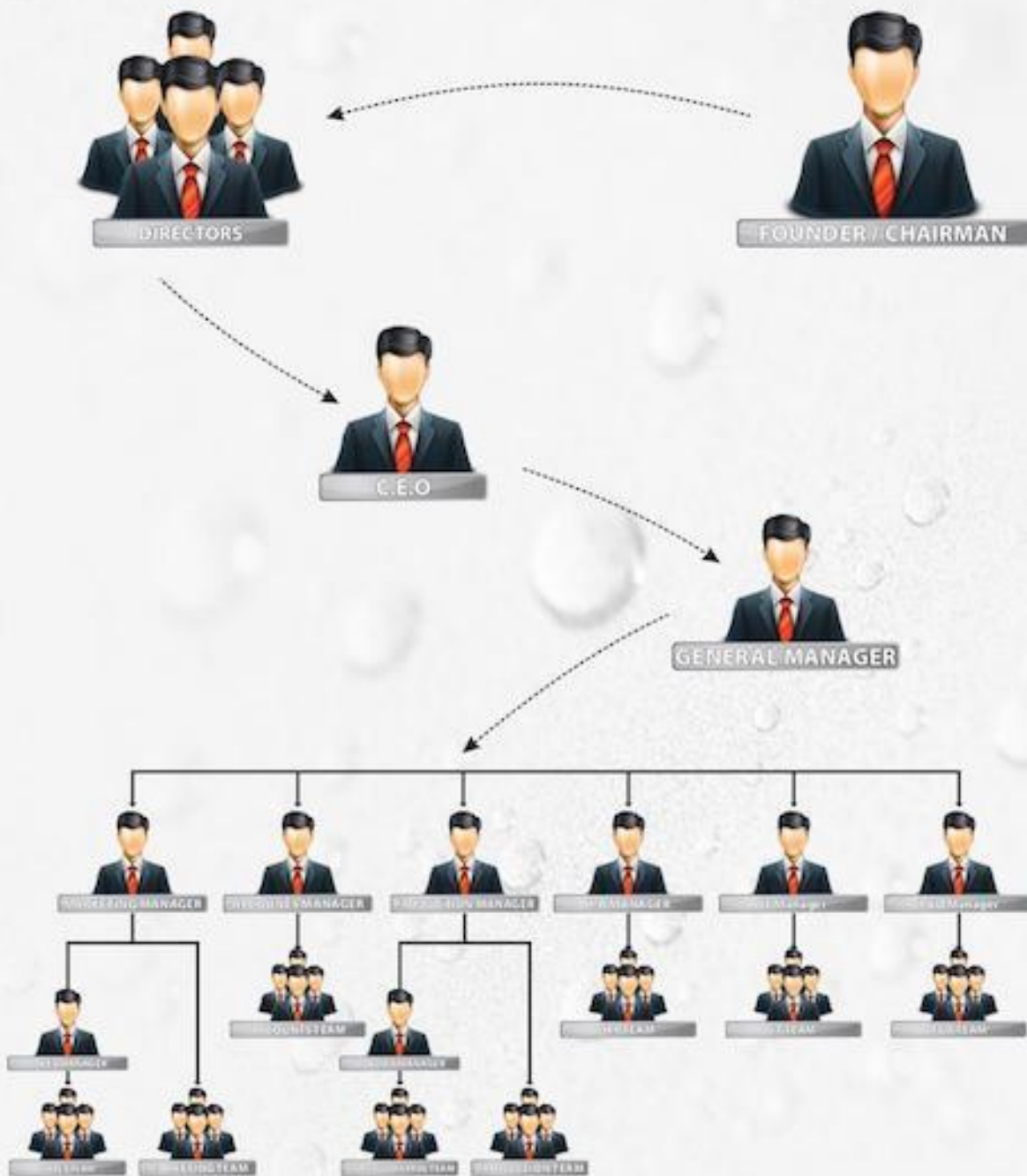


Safety is a prerequisite in our business. We can't operate without it. Our company's reliability and sustainability depends on safety. These rules inform our safety approach and create the conditions for achieving our objective of being the benchmark for safety in our industry.

We understand and increase situational awareness to increase personal, staff, and project safety. Use international security standards and be able to identify weaknesses within individual organizations. Learn how to use mind maps, color coded systems to analyze risk, and risk planning matrix to design risk mitigation plans. We also understand the importance of, create, and develop Standard Operating Procedures (SOPs). Gain confidence in handling emergency situations with practical fire fighting and first-aid training and also ventilation system in our production unit.

Company has a comprehensive health, safety and environmental program, and is responsible for the execution of the program across our production unit. We focus on ensuring safe working conditions and behaviours. To ensure safe working conditions, all levels of management and complete regular workplace inspections. To ensure safe working behaviours, employees are asked to volunteer and are trained using a simplified behavioural safety model to conduct peer observations

Management



API



Quality Management



Our plastic pipe takes the quality as life, holds the quality well. In order to ensure the quality of the products, the raw material checking in entering into the factory, detection in production process and inspection in product laboratory and factory inspection before leaving off, all those are monitor in whole process, and there level testing system is in adopted. We have research and testing center which has the most advanced testing equipments and professional, main testing equipment are imported from famous companies in home and abroad, so the testing data can be guaranteed to be correct and reliable, supplying basic guarantee for excellent

Laboratory Verification

We gives prime importance to the quality of products. We have installed an advanced in-house testing laboratory with the latest testing equipment as per the standards. The laboratory is equipped to carry all tests on raw material as well as finished products. Some of these parameters are design, dimension, finish, polish and others. Owing to our quality management system, we have acquired the ISO 9001, ISO 14001, ISO 18001 standards and CE certification.



IMPACT TEST MACHINE



GRAVITY TEST MACHINE



HYDROSTATIC PRESSURE TANK



HEAT REVERSION CABINET



MFI APPARATUS



BUNKS



OPACITY TEST CABINET



FRACTURE TOUGHNESS



COMPUTERISED TENSILE TEST MACHINE



WEIGH



MICRO SCOPE



METHYLENE CHLORIDE TEST CABINET

API



API Marketing



As we are manufactures of Water Supply Systems products. For effectively serving to the distinct needs of individual clients, we have recruited a team of experts for our marketing and sales system. They ensure that our product range, pricing strategy, packaging strategy, our media campaign, product availability, is in agreement with the exact demands of our clients and end customer.

We realize about the customer and the value of the customer and continuously improvement and innovation its products just for only customer satisfaction because CUSTOMER IS OUR BOSS.

We are committed towards achieving complete customer satisfaction. We strive to build their trust and healthy relationship with them. With focus on the health & environment concerns, protection and improvement for our clients, we are always appreciated for our ability to provide a world class range of products within minimum possible time and cost. Our main focus is to achieve our targets and improve productivity by focusing on innovation of products.



Objectives

Constantly endeavor to be market leaders in terms of market share and technology trendsetter in areas of operations and to continuously improve efficiency and competitive strength.

We offer customers quality products and support services at competitive prices and to their satisfaction. By continuously improving performance, aim to generate earnings sufficient to ensure a secure future for the Company. To enhance creativity and job satisfaction, provide employees opportunity for personal development. Be an integral part of national economy with a strong sense of responsibility to society and the environment. There are many reasons why our plastic pipes are popular among the business and individual's customer alike. These are easy for using and fulfilling different day to day needs of home, office and factories.

It is common observation that our products are widely used for a number of purposes. From plumbing pipes to big industrial usage, these are known to provide advantages to the users. Many fields such as landscaping work, engineering, and irrigation extensively use these products in various applications. Our products have a lot of advantages compared to other materials. Materials such as steel and copper are costlier and also more difficult to work with. They are heavy and are good conductors of heat and electricity, which is a genuine concern while performing various tasks. Considering so many applications of these, many organizations and construction companies use these for different operations. Tools such as our products are unions can be given different desired shapes to fit the purpose of the operations.



These are used as common connecting points in various plumbing operations. From washing machines to swimming pools piping network, from bathrooms to specialized needs- these can be used with special custom designs. Other benefits of our products are that, they are lightweight and could be handled easily. Since they are non-conductors, there is no chance of accidents caused due to passage of electricity. Compared to other materials, these are durable and rust proof. When a part or portion of our products has to be replaced, it doesn't cost much. Our products provide products at affordable rates for their clients.

At the same time we recognize that modern commercial and industrial activities create even greater demands on performance and reliability. Consequently, our manufacturing units are under constant review to ensure that the control and monitoring of materials and processes becomes even more stringent, fully automatic and precisely documented.

We believe the quality of products and the support services provided from team. This is translated in a very wide range of products that are produced with state-of-the-art machinery from the most reputed sources, and a very high-tech quality control system which ensures that this quality is always maintained in addition to well trained and highly motivated staff on all levels of the company that are always committed to premium service at any time.

Strategic Planning

To maintain a strong R&D department for the development of new and the up gradation of our own technology. And also improve our production parameters to develop in house know how for a world scale petrochemical complex.



Raw Materials

As the Manufacturers of finished goods ready for consumer we emphasis on quality of raw material for the concern products we are producing.



Customer Relation

We Ensure customer satisfaction by providing quality products at competitive prices with warranty coverage and ensuring after sale service.



Market & Demand Aspects



In view of the priorities to rural water suppliers, irrigation facilities in the national planning and rapid rural electrification, the demand for rigid products is growing regularly. 60% of the total demand of our products exist today is up to 110 mm outer diameter which is very much suitable for small scale sector industries.

In our country where 80% of total population lives in rural belt, irrigation, portable water supply, electrification always occupy in the forefront of planning. About six to seven small units are manufacturing products in the state, but still there exist a very good scope of new units to meet the demand of internal and external market.

Marketing Policy

We reduce the number of intermediaries. Billing is directly done to the wholesalers and retailers. We are operating by billing directly to the customers. In the case of logistics the supply of products is done through company owned feet of vehicles for fastest delivery to our customer.



Functions



The major functions are explained below:

- Demand Forecasting
- Marketing Control
- Marketing Research

Demand Forecasting

Demand forecasting is the main function of marketing. We should be done through sales force in the company such as sales representatives' sales executives' etc. collecting information from customers. On the basis of this information demand forecasting is to be done.

Marketing Control

Various tools used for marketing control are cost control and a market share analysis. Cost control is one task for monitoring the cost of marketing and it is compared with planned cost standard, so as to identify deviations and take corrective action. Market share analysis is also used for marketing control.



Marketing Research

Marketing research is more comprehensive composing all the functions that is it covers product, price, sales, market, promotion, distribution policies. It is commonly says that marketing research begins where manufacturing ends. In fact it commences well before the product is fabricated. It goes in to operation even before erecting the factory.

Our company covers analysis of competitive advantage, market share analysis and new product development the main objectives of market research are:

- To know buyers
- To measure the impact of promotional effort
- To know consumer response
- To know market costs and profits
- To master external forces
- To design and implement marketing control

Customer Satisfaction

Our marketing activities aim at achieving customer satisfaction by offering quality products. It is also help us more increasing profit, increasing goodwill, increasing image of the organization etc. We also measures how products supplied to meet or beat a customer's expectation because it provides marketers with a metric that they can use to manage and improve their businesses. Our goal of satisfying our customers is in line with the efforts put by the team to improve the production and prevent the chances of dissatisfaction by continuous improvement philosophy. The aim of providing high quality improved products to our valuable clients through the continuous process of improvement has enhanced satisfaction via our well established standards and procedures. Right from material selection to final delivery of products and after sales services, makes the customer feels comfort at every moment. This is the reason; we have increasing number of satisfied customers across the globe. API mission of our customer service is to minimize complaints by disseminating general and technical awareness to the customers through technical people. We pledge to achieve the loyalty and permanent support of our technical experts who work as doctors in this field.

After Sales Service

This another objective of marketing, our company provides after sales services to its customers. The service of the company does not end with process of distribution the company has been waited until good result comes by giving their products to consumer and they always rendered their services at the time needed by the customers.

The marketing and sales department keeps their eyes and ears to open to know the changes in the market. The complaint and suggestions if any are well accepted by the company from their customers. There is any complaint about the sold product the company will take it back at the company's costs.

Method Of After Sales Service

For providing after sales service company may use the following methods

- Sending special staff to the customer
- Arranging service with dealers/agents
- Appointing in depending service specialists

Maintaining Price

Our company's important objective is to maintain price leadership. Company is always trying to become a price leader. It does not like become a price follower.

Market Share

Our company's emphasis on achieving maximum market share. In order to achieve maximum market share. The company focus on highest level of R&D as well as provide the best quality of the product.

Other Objectives

- Increasing company sales
- To guarantee company survival
- To fortify better resource utilization
- To meet customer needs

Present Market Condition

For our products we are facing demand higher than supply, which is a healthy situation. In case of seasonal products like suction and delivery hose, demand exceeds supply. It tries to later products to major customers. It is the main reason for expansion of production facilities.

As per the consumers, market is segmented into three:

- Household Consumers
- Builders
- Own Dealers Network
- Government Works

Promotion

Our promotion done by the, starting to recognize about the product to our customer. We use promotional tool for making a bridge between the customer and products. In case of sale and brand promotion we providing information to our customer by organize a seminar in customer territory.

We are provide full sale service by providing brochures of product information and guidance of uses of product and as well as after sales services to our dealers, distributors, and our end user for a better satisfaction. It is based on nature of product, the company offer their customer with replacement facility after checking the product.

We rely heavily on the various ways in which products, services, and even people are advertised and presented to the general public. Our Promotional campaigns are one of the most fundamental tools used to introduce or reintroduce any given product or service to a large audience over a period of time. Even before execution, a campaign we must contain certain vital elements at its foundation so that positive results will be ensured upon completion. The campaign must be formulated to reach an attainable goal, must be presented in a unique way that engages our audience, and must, throughout its course, showcase our item or service which is we focus. At its completion, the promotional campaign must bear results.

We also promote the educational sector to promote the education and also offer internship for students to train them for professional work. We offer education programs for almost all economic segments at purpose built new generation.



Advertisement

In the case of our advertisement is the most glamour element of the promotion mix. It covers all the activities connected with the giving of publicity regarding goods and services offered for sale. Advertising is transmitting through mass media such as television, Newspapers, magazines etc.

Advertisement Policy

'Each potential customer must see an advertisement'

Brand awareness is not much with the customers. Brand awareness to be created, it's in growth stage.

Advertisement focused on creating the brand image and promoting the API brand for their entire product. Presently, apart from above mentioned places, at areas of potential customers, each retail and whole sale outlet etc.

Distribution Channel

- MANUFACTURE
- WHOLESALE
- RETAILER
- CONSUMER

Mode Of Advertisement

Earlier we use wall paintings, banners etc. now changed to huge flex hoarding and electronic media.

Reason for change is:

- Attractiveness
- New technology acceptance with change in market
- Real and clear image of product
- Quality advertisement gives better company image
- Website

Pricing Strategy

Our pricing strategy is a special kind of plan formatted in order to meet the changes of external factors particularly from the policies of competitors. Pricing strategies change with competitive situation.

- Competitive pricing
- Premium pricing



Competitive Edge Of API

We are a versatile material for piping and have replaced conventional pipes made from conventional materials such as Galvanized Iron (GI), Cast Iron, Asbestos Cement and Concrete Cement. Its compatibility with most fluids, lower cost of material handling and installation, unique combination of properties and availability of highly reliable jointing system makes it an excellent competitor in the piping world.

Our low cost, versatility, unique set of properties and performance makes it the material of choice for dozens of industries such as health care, communications, aerospace, automotive, retailing, textiles and construction.



API

GRW PAK

LTD GRW PAK

API

PVC

PVC is basically the abbreviation of polyvinyl chloride and material to produce non healthy products which do not relate directly to health, for example window profile, bottles, other non-food packaging, and cards. It can be made softer and more flexible by the addition of plasticizers, the most widely used being phthalates. In this form, it is also used in plumbing, electrical cable insulation, imitation leather, signage, phonograph records and inflatable products.

PVC is produced in two general forms, first as a rigid or plasticized polymer and second as a flexible plastic. Flexible, plasticized or regular PVC is softer and more amenable due to the addition of plasticizers like phthalates (e.g. diisononyl phthalate or DINP). Flexible PVC is commonly used in construction as insulation on electrical wires or in flooring for homes, hospitals, schools, and other areas where a sterile environment is a priority, and in some cases as a replacement for rubber. Rigid PVC is also used in construction as pipe for plumbing and for siding which is commonly referred to by the term "vinyl" in the Pakistan.

Polyvinyl Chloride is a "thermoplastic" (as opposed to "thermoset") material which has to do with the way the plastic responds to heat. Thermoplastic materials become liquid at their melting point (a range for PVC between the very low 100 degrees Celsius and higher values like 260 degrees Celsius depending on the additives). A major useful attribute about thermoplastics is that they can be heated to their melting point, cooled, and reheated again without significant degradation. Instead of burning, thermoplastics like polypropylene liquefy, which allows them to be easily injection molded and then subsequently recycled. By contrast, thermoset plastics can only be heated once (typically during the injection molding process). The first heating causes thermoset materials to set resulting in a chemical change that cannot be reversed. If you tried to heat a thermoset plastic to high temperature a second time it would simply burn. This characteristic makes thermoset materials poor candidates for recycling.

Some of PVC plastic's most important characteristics include its relatively low price, its resistance to environmental degradation (as well as to chemicals and alkalis), high hardness, and outstanding tensile strength for a plastic in the case of rigid PVC. It is widely available, commonly used and easily recyclable. PVC can pose a health hazard when it is burned as it emits hydrogen chloride (HCl) fumes. In applications where the likelihood of fire is high, PVC free electrical wire insulation is sometimes preferred.

uPVC has high chemical resistance across its operating temperature range, with a broad band of operating pressures. Due to its long-term strength characteristics, high stiffness and cost effectiveness, uPVC systems account for a large proportion of plastic piping installations.

uPVC pipe is pipe that is specifically free of plasticizers and is 100% PVC. To improve flexibility it is possible to add a small amount of plasticizers in the pipe but those plasticizers tend to leach out of the pipe walls in certain applications. Because of the concerns of plasticizers being ingested by people and an animal's it is better to ensure that only uPVC pipe is used in potable water applications. For the purpose of drain pipe it is acceptable to use straight PVC pipe.



Difference Between PVC And uPVC

The term PVC stands for polyvinyl chloride, and the term uPVC stands for unplasticized polyvinyl chloride. PVC pipe is often used to distribute water that people aren't going to drink. It's also used to insulate electric cables. The uPVC versions often replace wood when building window frames and sills. The uPVC pipe variant also often replaces pipes made of cast iron for drains, waste piping, downspouts and gutters.

Many people use PVC instead of metal, as PVC is much easier to cut than metal, and it's also easy to use glue together. In addition, PVC is still fairly tough, so not much strength is lost. Most plastic piping around the globe is actually uPVC because of how resistant it is to degradation caused by chemicals, high and low temperatures and various pressure points. The uPVC version of piping is less flexible than regular PVC, but it's also more recyclable.

Regular PVC is a common, strong but lightweight plastic used in construction. It is made softer and more flexible by the addition of plasticizers. If no plasticizers are added, it is known as uPVC (unplasticized polyvinyl chloride), rigid PVC, or vinyl siding.

PVC is used as a replacement for copper and aluminum pipes and is used in waste lines, irrigation systems and pool circulation systems. It is easy to cut into smaller pieces and can be fastened with glue, making it a good alternative to metal.

uPVC is used for the majority of plastic pipes in the world, as it is incredibly resistant to chemical erosion and has smoother inner walls that help to encourage water flow. It also functions well in a wide range of temperatures and operating pressures. It is incredibly strong, stiff and cost-effective, and so is often used for sewerage lines and exterior drainage pipes. Even so, where PVC piping is preferred. Neither PVC nor uPVC is used to transmit drinking water. cPVC (chlorinated polyvinyl chloride) is used instead.

Small and slender PVC pipes are sometimes found in medical equipment. PVC is also used in leather-like or waterproof clothing materials, vinyl flooring, shoes, toys, car interiors and car cables, shower curtains, and numerous other plastic products. Because uPVC has fewer health concerns associated with it, it is found in medical and dental pieces. For example, uPVC is sometimes used for dental retainers. Because it is designed to be softer and more flexible than many other plastics, PVC is less durable than uPVC. However, both plastics are resistant to sunlight, oxidation, and a variety of chemicals. PVC piping's ability to withstand sunlight sometimes makes it more useful than other pipes. It is very cheap to manufacture many PVC and uPVC products, which is why they are so ubiquitous in a wide variety of affordable products. PVC-coated wires can form HCl fumes in a fire, which can be a health hazard. Plasticizers may leach out of PVC into the environment. Phthalates are what allow PVC to be flexible. Some of the phthalates used in PVC have been restricted or banned over the years, and many others are being replaced with safer phthalates. Dibutyl, benzyl butyl, and DEHP are some of the more commonly banned or restricted phthalates. To date, there are no mainstream concerns regarding the use of uPVC, which does not use phthalates. Neither PVC nor uPVC are biodegradable. However, uPVC is recyclable and can be reshaped into new products or pipes at very high temperatures.

To the informal viewer, there's a short distinction between PVC pipe and UPVC pipe. Both are a plastic pipe used largely in the building. Further than the external similarities, the 2 types of pipe are manufactured differently and thus have different characteristics and a few different uses in the building and the other industrial work and most repairs work disclosure to the plastic pipe is to PVC rather than uPVC. Regular PVC (polyvinyl chloride) is an ordinary, physically powerful but light in weight plastic used in construction. It is made softer and extra flexible by the accumulation of (Plasticizers). uPVC stands for that (UN plasticized polyvinyl chloride) if no plasticizers are included,

rigid PVC uPVC altered its name to PVCU in Europe 1980. It is called PVCU there because most European Set the noun before and adjectives are later. Each day "PVC" is changed, it is softened to be used in the production of products. The utilization of the PVC is the most suitable for the tasks in which you are required to obtain the substitute for aluminum and copper pipe. Quite the opposite of the uPVC, the PVC is very near to the rubber by nature and thus, you are able to cut into minor pieces easily and effectively and the process of fixing it firmly with glue is not a big deal. As you know that there are huge types of elastomers are available for use in order to perform various sorts of works just the way you like. The words of the elastomer are utilized for any material which has the ability to bend when you make a force on it and after the force is released, the elastomers have the capability to regain its shape or try to do so. Due to this ability, the use of the elastomers can be seen all over the place, particularly where the process of bending and shaping is involved.

Key Differences

- PVC is used as a substitute for aluminum and copper pipe. PVC is used in irrigation systems and waste lines, pool circulation systems. It is very simple to cut into minor pieces and can be fixed firmly with glue, making it a high-quality substitute to the metal.
- uPVC is mostly used for the plastic pipes in the world, as it is extremely opposed to chemical erosion. uPVC has smoother inner walls that assist to push water flow. It also works well in a wide range of temperatures. uPVC is used to operate pressures. It is extraordinarily strong, stiff and effective cost, and so is frequently used for outside drainage pipes and sewage lines. Still uPVC piping is a lesser amount, where PVC piping is chosen. uPVC is used to transmit drinking water as well.
- PVC is not used for window frames, even though some manufacturers may use "uPVC" to prefer to their PVC windows. As a substitute, uPVC is using for pipes, as it is weather-absorbing and not decomposes.

API

3"
USA STD

Application Of uPVC Pipes

The possibilities for uPVC pipes are unlimited; irrigation, potable water, electric, drainage and sewerage are only a few of the many ways in which uPVC pipes can be used.

Water Supplies

uPVC pipes will not affect the taste, odor, or smell of drinking water. It will never corrode and is therefore extremely sanitary. Deposits and scales will not build up inside as a conventional steel pipes.



Irrigation

uPVC pipes are ideal for agricultural irrigation and sprinkler systems. Water which contains fertilizers and insect inhibitors do not attack uPVC pipes.



Industry

Resistant to most chemicals, uPVC pipes have an important role to play in the world of chemicals. Light, non-corrosive and easy to assemble, it accommodates more complex piping work than possible with steel or cast iron pipes.



Tube Wells

Free flowing anti-corrosive, easily installed; lightweight, PVC pipes are an ideal choice for strainers and casing of tube wells. Sinking of these pipes is much easier than that of other use able materials.



Sewerage

Drainage and sewerage systems for private homes, building and elevated highways, waste lines for corrosive gases and ventilation systems for office buildings and factories are few of the many possibilities where it can be used with considerable advantages.



Conduits

Since PVC pipes are themselves an integral insulator, there is an ever increasing demand for it as an electrical conduit. To facilitate wiring work, a full line of fittings are available, constructed from the same materials as the pipes.



The title 'Shipping And Storage Of PVC Pipes' is written in white, bold, sans-serif font on a dark brown, curved banner. The banner is overlaid on a photograph of a large container ship docked at a port, with numerous colorful shipping containers stacked on the deck and yellow cranes visible.

When receiving the pipe and/or fittings shipment at the job site, the contractor or purchaser should exercise established precautions. Each shipment should be inventoried and inspected with care upon arrival. It is the carrier's responsibility to deliver the shipment in good condition, and it is the receiver's responsibility to ensure that there has been no loss or damage.

The following procedures are recommended for acceptance of delivery:

- Conduct an overall examination of the load. If the pipes are intact, ordinary inspection while unloading should be sufficient to ensure that the pipe has arrived in good condition.
- If the pipes have shifted, have broken bundles, or shows rough treatment, carefully inspect each piece for damage.
- Check total quantities and details of each item against shipping documents.
- Note any damaged or missing items on the delivery receipt.
- Notify the carrier immediately and make a claim according to his instructions.
- Do not dispose of any damaged material. Ask the pipe manufacturer for instructions in case of disposal or replacement.

Unloading



The means by which pipe and fittings are unloaded in the field is the decision and the responsibility of the receiver.

The following procedures are recommended for acceptance of delivery:

- Remove restraints from the bundles. These may be straps, ropes, or chains with padding.
- Remove any boards on the top or sides of the pipes that are not part of the pipe/fittings pack-aging.
- When unloading fittings use industry accepted means. Do not drop or throw fittings into trench.
- Using a forklift (or a front-end loader equipped with forks), remove the top bundles of pipe, one at a time from the truck.
- If a forklift is not available, use a spreader bar with fabric straps capable of carrying the load. Space straps approximately 2.4 meters (8 ft) apart. Loop straps under the load.
- During the removal and handling, ensure that the bundles do not impact anything (especially in cold weather).
- Place pipe bundles on level ground.
- Do not handle bundles with individual chains or single cables, even if padded.
- Do not attach lifting cables to bundles or bands.



- Do not stack bundles more than 2.4 meters (8ft) high.
- Protect bundles with packing materials the same way they were protected while on the truck.
- To unload lower bundles, repeat the unloading process described above.
- Do not unload pipe bundles by hand.
- If unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to ensure that pipe is not dropped or damaged.
- If you're unloading single pieces by hand, be especially careful not to jostle other lengths of pipe. Begin at the topmost layer and carefully unload the units one at a time.
- In sub-zero (freezing) temperatures, use caution to prevent impact damage. Handling methods considered acceptable for warm weather are unacceptable during very cold weather.
- When distributing the pipe along a trench (stringing), place pipe on the opposite side of the trench from the excavated earth. Place pipe with bell ends in the direction of the work Progress.

Storage



The following procedures are recommended to prevent damage to the pipe:

- Store the pipe at the site in bundles.
- Store the pipe with supports that prevent the bells, spigots, couplings or any other joint surface from any contact. Use chocks (with or without fabric or rope tie downs) to prevent the pipe from rolling due to high winds, sloping ground, wash outs, flash flooding or mischief-makers.
- Avoid compression, deformation or damage to bell ends of the pipe.
- When bundles are stacked, ensure that the weight of upper bundles does not cause deformation to pipe in lower bundles.
- Support pipe bundles at 2.4 meter (8 ft) intervals (1.2 meters (4 ft) from each end) on wood blocking to prevent damage to the bottom surfaces during storage.
- Store lubricant in tightly sealed containers under cover.
- Do not store pipe/fittings where gaskets may be exposed to UV radiation, or contamination (i.e. grease, oil etc).
- Protect the interior and sealing surfaces of pipe and fittings from dirt and foreign material.
- When the bundles are stacked, ensure that the stack remains stable.
- When pipe/fittings are being stored for a prolonged period, the bundles should be covered with a translucent cover, to protect against exposure to direct sunlight.

In Cold Weather

PVC pipe exposed to freezing temperatures becomes less impact resistant and flexible, so it's important to be especially careful handling it under these conditions. Also, you may find that pipe transported at the bottom of the shipment pile has become out-of-round due to the weight of other pipes on top of it. It will return to its original shape, but this will take longer in cold weather.

Excessive Heat Or Sunlight

Like cold temperature, excessive heat can also affect PVC pipe's flexibility, and while pipe so affected will retain its long-term performance properties, it should be handled with extra care. Avoid exposing the pipe to welding torches, heaters and, if possible, excessive sunlight, which will cause the pipe to discolor. If you anticipate storing the pipe outside under strong sunlight, we advise you to cover it with canvas or other opaque material, being sure to leave adequate air circulation underneath.

Transferring Pipe

When it's necessary to transfer pipe from one area to another handle it carefully, observing the guidelines you followed to unload it. For the transport vehicle, be sure to use a truck with a long enough bed that the pipe can hang over the end no more than 2, (61 cm); or you may retrofit a short-bed truck with racks that will accommodate the pipe horizontally. Ensure that the bell end of the pipe hangs out the back of the truck bed, and that each Layer's bell ends hang out beyond those of the layer below. Do not slide or drop the pipe onto the truck as protrusions or other irregularities in the truck bed could damage it.

Underground Installation

Underground piping must be installed in accordance with any applicable regulations, ordinances and codes. Since piping is installed in a wide range of sub soils, attention should be given to local pipe laying techniques which may provide a solution to a particular pipe bedding issue.

Proper installation procedures and trench preparation are essential for successful PVC pipe performance. Trench preparation procedures for PVC pipes do not vary substantially from procedures used with other piping products. There should be no more trenches prepared than the footage of pipe which can be laid in a day.



Foundation

The foundation is the material that is in the bottom of the trench. It may or may not have a layer of bedding soil placed over it. The foundation soil may be:

- Undisturbed and remain in place.
- Unsuitable and must be removed and replaced with another material.
- So wet and soft that it must be displaced by dumping rock into the trench.
- Removed from the trench, placed back in the trench and then compacted.

Bedding

The bedding is the soil placed in the bottom of the trench on top of the foundation soil and provides uniform support for the pipe.

Pipe Embedment

The embedment is the material placed around the pipe that supports the pipe.

Haunching

Haunch area is the portion of the embedment under the pipe from the bottom of the pipe up to the springtime or horizontal center line of the pipe. This is the most critical area in providing support for the pipe.

Back Fill

The back fill is the material placed over the pipe up to the ground surface. This consists of initial and final back fill.

Cover

The cover is the depth of the back fill over the pipe and is measured from the top of the pipe to the top of the initial back fill.

Laying Of Pipe

Proper implements, tools and equipment should be used for placement of the pipe in the trench to prevent damage. Under no circumstances should the pipe or accessories be dropped into the trench. All foreign matter or dirt should be removed from the pipe interior.

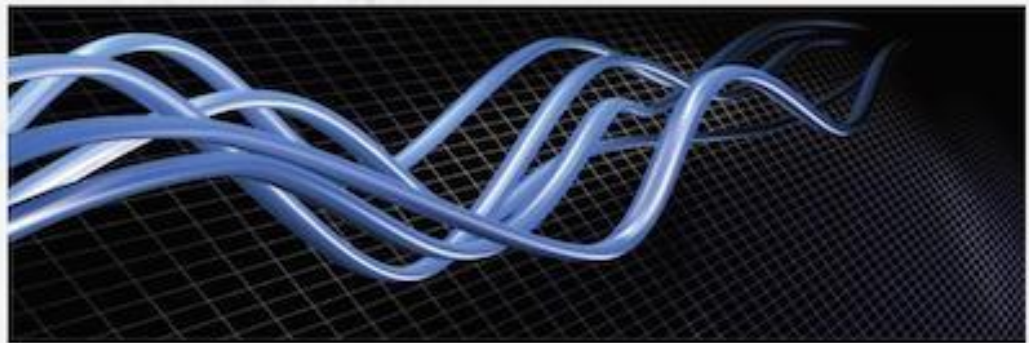
Pipe joints should be assembled with care worn pipe laying is not in progress, open ends of the installed pipe should be closed to prevent entrance of trench water, dirt and foreign matter into the line.

Advantages Of uPVC Based Piping System

PVC products offer following benefits in comparison with other materials.

Consistency/ Quality

Developed, processed, and designed to consistently meet and / or exceed industry standards for strength and durability.



Chemically Resistant

Over a broad range of chemicals, concentrations and reagent mixtures.

Strength

High tensile strength and well-balanced physical properties provides long-term pressure bearing capability for aggressive fluid handling applications.

Corrosion Resistant

Immune to electrolytic, galvanic and phase corrosion. Clean, non-contaminating materials for use in potable water and other applications where contamination of fluids conveyed are critical.

Light Weight

Minimizes labor, handling and job site mechanical equipment; greatly reducing Installation related costs.

Simple Joining Methods

Leak free dependable joints via solvent cement joining minimizes equipment requirements and reduces installation costs.

Rigid

Requires fewer hangers and supports compared to other plastic pipe materials.

Smooth Surfaces

Reduce friction loss and provide good abrasion resistance.

Low Thermal Conductivity

Provides good insulation qualities with low heat transfer less energy use overtime.

Good Electrical Insulation Ease Of Fabrication

Can be easily machined; heat formed, welded, and subjected to a variety of other joining and fabrication techniques.

Safety

Industry regulated for topological compliance (NSF STD 61); exhibit good fire performance characteristics (will not independently support combustion).



Applications



uPVC piping products can be found in applications in the following industries where water, chemical and corrosive fluid production, transfer and mixing are utilized:

Chemical Processing Industrial

Chemical processing industrial waste, laboratory semiconductor pulp & paper electroplating electronics metal treating chlor alkali fertilizer color industries textile mining air pollution control photo finishing printing

Industrial Processing

Plant water distribution cooling water waste water process water reclaim waste treatments have pollution control brine production & disposal.

Power Generation

Boiler Feed Water Atomic Energy Fly Ash Slurries Coal Mining Gas Industry Oil Refining Cooling Water and Waste Water Treatment.

Food And Beverage

Potable Water - Bottled Water - Ultra Pure Water - Food Processing - Meat Packing - Poultry Farming & Processing Distilled Water - Ice Production & Equipment.

High Purity Applications

Semiconductor pharmaceutical biotechnology chemical manufacturing health care universities clean room applications wet bench construction ultra pure water

Water And Waste Water

Water Treatment Waste Water Treatment Reclaim Aeration Desalination Detention & Collection Water Resource Conservation Ground Remediation Well Casing & Well Monitoring.



Aquaculture

Life support systems public aquariums fish hatcheries lobster ponds fish ladders fish farming etc.

Recreational

Water Parks Theme Parks Fountains Water Features Swimming Pools

Agricultural/Irrigation

Commercial irrigation golf courses farming genetic engineering green houses.

General Services

Hot and cold water plumbing municipal water process water commercial roof Drain Bridge drain industrial parks shopping centers surface drainage landfill marine applications drain waste and vent.

Fire Protection

NFPA 13 Light Hazard, 13R & 13D Fire Sprinkler Systems found in High rise Office Buildings Hotels Motels Dormitories Apartments Nursing Homes Hospitals Single Family Residences.

Specialty Applications

Visual leak detection- dual containment decorative applications civil defense naval military applications fire resistive constructions.

uPVC Pipes Dimension

AS PER PS3051/BS 3505

Nominal Size in Inches	Mean Outside Diameter in mm		Class B 6-0 bar		Class C 9-0 bar		Class D 12-0 bar		Class E 15-0 bar					
			Average Value mm	Individual Value mm	Average Value mm	Individual Value mm	Average Value mm	Individual Value mm	Average Value mm	Individual Value mm				
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
3/8	17.0	17.3									1.9	1.5	1.9	
1/2	21.2	21.5									2.1	1.7	2.1	
3/4	26.6	26.9									2.5	1.9	2.5	
1	33.4	33.7									2.7	2.2	2.7	
1 1/4	42.1	42.4						2.7	2.2	2.7	3.2	2.7	3.2	
1 1/2	48.1	48.4						3	2.5	3	3.7	3.1	3.7	
2	60.2	60.5				3	2.5	3	3.7	3.1	3.7	4.5	3.9	4.5
2 1/2	75.0	75.3				3.5	3	3.5	4.5	3.9	4.5	5.5	4.8	5.5
3	88.7	89.1	3.4	2.9	3.4	4.1	3.5	4.1	5.3	4.6	5.3	6.5	5.7	6.6
4	114.1	115	4	3.4	4	5.2	4.5	5.2	6.8	6.9	6.9	8.3	7.3	8.4
*5	140.0	140	4.4	3.8	4.4	6.3	5.5	6.4	8.3	7.3	8.4	10.1	9	10.4
6	168.0	169	5.2	4.5	5.2	7.5	6.6	7.6	9.9	8.8	10.2	12.1	10.8	12.5
8	218.8	219	6.1	5.3	6.1	8.8	7.8	9	11.6	10.3	11.9	14.1	12.6	14.5
*9	244.1	245	6.7	5.9	6.8	9.8	8.7	10	12.9	11.5	13.3	15.8	14.1	16.3
10	272.6	273	7.5	6.6	7.5	10.9	9.7	11.2	14.3	12.8	14.8	17.5	15.7	18.1
12	332.4	324	8.8	7.8	9	12.9	11.5	13.3	17	15.2	17.5	20.8	18.7	21.6
14	355.0	356	9.6	8.5	9.8	14.1	12.6	14.5	18.6	16.7	19.2	22.8	20.5	23.6
16	405.9	407	10.9	9.7	11.2	16.2	14.5	16.7	21.1	19	21.9	26	23.4	27
18	456.7	458	12.3	11	12.7	18.2	16.3	18.8	23.8	21.4	24.6			
20	507.5	509	13.7	12.2	14.1	20.2	18.1	20.9						
24	609.1	610	16.3	14.6	16.8	24.1	21.7	25						

*These nominal sizes are not normally available

-Pipe lengths = 4m - 6m

- Pipes are normally socketed from one end (to suit either rubber ring or solvent cement joint)

uPVC Pipes Weight

PS 3021 (BS 3505) does not spell out any figures for weights. The pipe weights are dependent on the formulation, density and tolerances. Approximate weights for PVC pipes for transportation and other estimation purposes are given below.

Approximate uPVC Pipe Weights as per PS 3051 / BS3505

PIPE DIA. NOMINAL SIZE	CLASS B			CLASS C			CLASS D			CLASS E		
	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX	AVG
3/8										0.10	0.12	0.11
1/2							0.13	0.15	0.14	0.15	0.17	0.16
3/4							0.17	0.21	0.19	0.21	0.23	0.22
1							0.27	0.32	0.29	0.31	0.34	0.32
1 1/4							0.39	0.43	0.41	0.48	0.53	0.50
1 1/2				0.65	0.73	0.69	0.51	0.57	0.54	0.63	0.69	0.66
2				0.97	1.07	1.02	0.80	0.87	0.83	0.99	1.09	1.04
2 1/2	1.12	1.27	1.20	1.34	1.49	1.42	1.25	1.38	1.31	1.52	1.67	1.60
3	1.69	1.89	1.79	2.22	2.46	2.34	1.74	1.93	1.83	2.13	2.35	2.24
4	2.33	2.57	2.45	3.33	3.68	3.5	2.91	3.2	3.06	3.50	3.83	3.67
*5	3.3	3.68	3.69	4.72	5.29	5.00	4.36	4.76	4.56	5.30	5.81	5.55
6	4.4	4.83	4.61	6.43	7.09	6.76	6.30	6.93	6.61	7.63	8.38	8.01
8	5.09	5.57	5.33	7.4	8.15	7.77	8.33	9.13	8.73	10.11	11.03	10.56
*9	6.32	6.96	6.64	9.21	10.15	9.68	9.66	10.57	10.11	11.68	12.84	12.26
10	7.89	8.73	8.31	11.47	12.64	12.05	12.03	13.25	12.64	14.58	15.96	15.28
12	11.07	12.21	11.64	16.13	17.79	16.96	14.95	16.44	15.69	18.13	19.92	19.03
14	13.24	14.65	13.94	19.4	21.38	20.39	21.06	23.10	22.08	25.62	28.13	26.87
16	17.28	19.06	18.17	25.52	28.12	26.82	25.4	27.93	26.66	30.83	33.88	32.35
18	22.04	24.24	23.14	32.27	35.39	33.83	33.05	36.27	34.66	40.24	44.21	42.22
20	27.17	29.83	28.5	39.83	43.72	41.77	41.88	46.06	43.97			
24	39.02	43.00	41.01	57.31	62.99	60.15						

All weights are in (kg/m)

Schedule 40, 80 & 120 uPVC Pipes

Dimensions in compliance with ASTM D1785

Schedule 40 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min Wall	Nom. Wt/Ft.	Max W.P.PSI*
1/8	0.405	0.249	0.068	0.051	810
1/4	0.540	0.344	0.088	0.086	780
3/8	0.675	0.473	0.091	0.115	620
1/2	0.840	0.602	0.109	0.170	600
3/4	1.050	0.804	0.113	0.226	480
1	1.315	1.029	0.133	0.333	450
1-1/4	1.660	1.360	0.14	0.450	370
1-1/2	1.900	1.590	0.145	0.537	330
2	2.375	2.047	0.154	0.720	280
2-1/2	2.875	2.445	0.203	1.136	300
3	3.500	3.042	0.216	1.488	260
3-1/2	4.000	3.521	0.226	1.789	240
4	4.500	3.998	0.237	2.118	220
5	5.563	5.016	0.258	2.874	190
6	6.625	6.031	0.28	3.733	180
8	8.625	7.942	0.322	5.619	160
10	10.750	9.976	0.365	7.966	140
12	12.750	11.889	0.406	10.534	130
14	14.000	13.073	0.437	12.462	130
16	16.000	14.940	0.5	16.286	130
18	18.000	16.809	0.562	20.587	130
20	20.000	18.743	0.593	24.183	120
24	24.000	22.544	0.687	33.652	120

* Pressure ratings are for water no shock @ 73oF & F. Threaded Pipes require 50% reduction in the pressure rating stated for plain end pipe @ 73oF.



Schedule 80 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min Wall	Nom. Wt/Ft.	Max W.P.SI*
1/8	0.405	0.195	0.095	0.063	1,230
1/4	0.540	0.282	0.119	0.105	1,130
3/8	0.675	0.403	0.126	0.146	920
1/2	0.840	0.526	0.147	0.213	850
3/4	1.050	0.722	0.154	0.289	690
1	1.315	0.936	0.179	0.424	630
1-1/4	1.660	1.255	0.191	0.586	520
1-1/2	1.900	1.476	0.200	0.711	470
2	2.375	1.913	0.218	0.984	400
2-1/2	2.875	2.290	0.276	1.500	420
3	3.500	2.864	0.300	2.010	370
3-1/2	4.000	3.326	0.318	2.452	350
4	4.500	3.786	0.337	2.938	320
5	5.563	4.768	0.375	4.078	290
6	6.625	5.709	0.432	5.610	280
8	8.625	7.565	0.500	8.522	250
10	10.750	9.493	0.593	12.635	230
12	12.750	11.294	0.687	17.384	230
14	14.000	12.410	0.750	20.852	220
16	16.000	14.213	0.843	26.810	220
18	18.000	16.014	0.937	33.544	220
20	20.000	17.814	1.031	41.047	220
24	24.000	21.418	1.218	58.233	210

* Pressure ratings are for water no shock @ 73oF & F. Threaded Pipes require 50% reduction in the pressure rating stated for plain end pipe @ 73oF.

Schedule 120 Dimensions

Nom. Pipe Size (in.)	O.D.	Average I.D.	Min Wall	Nom. Wt/Ft.	Max W.P.SI*
1/2	0.840	0.480	0.170	0.236	1,010
3/4	1.050	0.690	0.170	0.311	770
1	1.315	0.891	0.200	0.464	720
1-1/4	1.660	1.204	0.215	0.649	600
1-1/2	1.900	1.423	0.225	0.787	540
2	2.375	1.845	0.250	1.111	470
2-1/2	2.875	2.239	0.300	1.615	470
3	3.500	2.758	0.350	2.306	440
4	4.500	3.574	0.437	3.713	430
6	6.625	5.434	0.562	7.132	370
8	8.625	7.189	0.718	11.277	380

* Pressure ratings are for water no shock @ 73oF & F. Threaded Pipes require 50% reduction in the pressure rating stated for plain end pipe @ 73oF.

STM D-2241 SDR - Series

Nominal Size Inches	Outside Dia (d) mm	Wall Thickness (S) mm	Nominal Avg. Weight Kg/m	Pressure Rating Bar
2" SDR-26	60.32	2.8	0.768	11.00
3" SDR-32.5	88.90	2.7	1.093	8.62
3" SDR-26	88.90	3.5	1.417	11.00
4" SDR-41	141.30	3.2	1.667	6.89
4" SDR-32.5	141.30	4.0	2.082	8.62
4" SDR-26	114.30	4.5	2.333	11.00
6" SDR-64	681.28	3.2	2.45	4.34
6" SDR-41	681.28	4.5	3.445	6.89
6" SDR-32.5	681.28	5.2	3.987	8.62
8" SDR-41	219.08	6.0	5.988	6.89
8" SDR-32.5	219.098	7.0	6.987	8.62

DIN 8062

For irrigation, drainage and cable ducting
Wall Thickness

Nominal Size mm	Series 2 4 bar mm	Series 3 6 bar mm	Series 4 10 bar mm	Series 5 16 bar mm
20	-	-	-	1.5
25	-	-	1.5	1.9
32	-	-	1.8	2.4
40	-	1.8	1.9	3.0
50	-	1.8	2.4	3.7
63	-	1.9	3	4.7
75	1.8	2.2	3.6	5.6
90	1.8	2.7	4.3	6.7
110	2.2	3.	5.3	8.2
125	2.5	3.7	6	9.3
140	2.8	4.1	6.7	10.4
160	3.2	4.7	7.7	11.9
200	4.0	5.9	9.6	14.9
225	4.5	6.6	10.8	16.7
250	4.9	7.3	11.9	18.6
280	5.5	8.2	13.4	20.8
315	6.2	9.2	15.0	23.8
355	7.0	10.4	16.9	26.3
400	7.9	11.7	19.1	29.7
450	8.9	13.2	21.5	-
500	9.8	14.6	23.9	-
560	11.0	18.4	26.7	-
630	12.4	18.4	30.0	-

uPVC Underground Drainage Pipe

(BS- 4660 : 1973)

Nominal Size	Mean Outside Diameter		Extreme Individual Outside Diameter		Minimum Wall Thickness other than sockets mm
	Min mm	Max mm	Min mm	Max mm	
110.0	110.0	110.4	108.0	112.4	3.2
160.0	160.0	160.6	157.1	163.5	4.1

uPVC Gravity Sewerage Pipe

(BS- 5481 : 1977)

Nominal Size	Mean Outside Diameter		Extreme Individual Outside Diameter		Minimum Wall Thickness other than sockets mm
	Min mm	Max mm	Min mm	Max mm	
200.0	200.0	200.6	196.3	204.3	4.9
250.0	250.0	250.7	245.4	255.4	6.1
315.0	315.0	315.9	309.2	321.8	7.7
355.0	355.0	356.0	348.4	362.6	8.7
400.0	400.0	401.0	392.5	408.5	9.8
450.0	450.0	451.0	441.5	459.5	11.0
500.0	500.0	501.0	490.5	510.5	12.0
560.0	560.0	561.0	549.3	571.7	13.7
630.0	630.0	631.0	617.9	643.1	15.4

Electrical Conduit

(BS 6099)

Nominal Inch	Mean Outside Diameter		THICKNESS mm	WEIGHT Kg/m
	Min mm	Max mm		
1/2	17.0	17.3	0.04	0.086
3/4	21.2	21.5	0.25	0.125
1	26.6	26.9	0.33	0.173
1 1/4	33.4	33.7	0.51	0.245
1 1/2	42.1	42.2	0.86	0.398
2	60.2	60.5	0.04	0.612
3	89.7	89.1	0.80	0.792
4	114.1	114.5	0.90	1.032

uPVC Chemical Resistance Chart

CHEMICAL	73°F (23°C)	140°F (60°C)	CHEMICAL	73°F (23°C)	140°F (60°C)
Acetaldehyde	N	N	Black liquor – paper	R	R
Acetaldehyde, aq 40%	C	N	Bleach, 12.5% active chlorine	R	R
Acetamide	-	-	Bleach, 5.5% active chlorine	R	R
Acetic acid, vapor	R	R	Borax	R	R
Acetic acid, glacial	R	N	Boric Acid	R	R
Acetic acid, 20%	R	R	Boron trifluoride	R	R
Acetic acid, 80%	R	C	Bromic acid	R	R
Acetic anhydride	N	N	Bromine, liquid	N	N
Acetone	N	N	Bromine, gas, 2.5%	R	R
Acetylene	C	C	Bromine, aq	R	R
Adipic acid	R	R	Butadiene	R	R
Alcohol, allyl	R	C	Butane	R	R
Alcohol, benzyl	N	N	Butantetrol (erythritol)	R	
Alcohol, butyl (n-butanol)	R	R	Butanediol	R	R
Alcohol, butyl (2-butanol)	R	N	Butyl acetate	N	N
Alcohol, ethyl	R	R	Butyl phenol	R	N
Alcohol, hexyl	R	R	Butylene	R	R
Alcohol, isopropyl (2-propanol)	R	R	butyric acid	R	N
Alcohol, methyl	R	R	Calcium salts, aq	R	R
Alcohol, propyl (1-propanol)	R	R	Calcium hypochlorite	R	R
Allyl chloride	N	N	Calcium hydroxide	R	R
Alums	R	R	Cane sugar liquors	R	R
Ammonia, gas	R	R	Carbon bisulfide	N	N
Ammonia, liquid	N	N	Carbon dioxide	R	R
Ammonia, aq	R	R	Carbon dioxide, aq	R	R
Ammonium salts	R	R	Carbon monoxide	R	R
Ammonium fluoride, 25%	R	C	Carbon tetrachloride	R	N
Amyl acetate	N	N	Casein	R	R
Amyl chloride	N	N	Castor oil	R	R
Aniline	N	N	Causticpotash (potassium hydroxide)	R	R
Aniline chlorohydrate	N	N	Caustic soda (Sodium hydroxide)	R	R
Aniline hydrochloride	N	N	Cellosolve	R	C
Aniline dyes	N	N	Cellosolve acetate	R	-
Anthraquinone	R	R	Chloral hydrate	R	R
Anthraquinone sulfonic acid	R	R	Chloramine	R	-
Antimony trichloride	R	R	Chloric acid, 20%	R	R
Aqua regia	C	N	Chlorine, gas, dry	C	N
Arsenic acid, 80%	R	R	Chlorine, gas, Wet	N	N
Aryl-sulfonic acid	R	R	Chlorine, liquid	N	N
Barium salts	R	R	Chlorine water	R	R
Beer	R	R	Chlorobenzene	N	N
Bum sugar liquor	R	R	Chlorobenzyl chloride	N	N
Benzaldehyde, 10%	R	N	Chloroform	N	N
Benzaldehyde, above 10%	N	N	Chlorosulfonic acid	R	N
Benzene (benzol)	N	N	Chromic acid, 10%	R	R
Benzene sulfonic acid, 10%	R	R	Chromic acid, 30%	R	C
Benzene sulfonic acid	N	N	Chromic acid, 40%	R	C
Benzoic acid	R	R	Chromic acid, 50%	N	N

R= generally resistant

C= less resistant than R but still suitable for some conditions N= not resistant

This table is meant to aid designer in decisions as to transporting / conveyance of undiluted chemicals, and fittings).

uPVC Chemical Resistance Chart

CHEMICAL	73°F (23°C)	140°F (60°C)	CHEMICAL	73°F (23°C)	140°F (60°C)
Citric acid	R	R	Gas, natural, methane	R	R
Coconut oil	R	R	Gasolines	C	C
Coke oven gas	R	R	Gelatin	R	R
Copper salt, aq	R	R	Glycerine (glycerol)	R	R
Corn oil	R	R	Glycols	R	R
Corn syrup	R	R	Glue, animal	R	R
Cottonseed oil	R	R	Glycolic acid	R	R
Cresol	N	N	Green liquor, paper	R	R
Cresylic acid, 50%	R	R	Galic acid	R	R
Croton aldehyde	N	N	Heptane	R	R
Crude oil	R	R	Hexane	R	C
Cyclohexane	N	N	Hydrobromic acid, 20%	R	R
Cyclohexanol	N	N	Hydrochloric acid	R	R
Cyclohexanone	N	N	Hydrofluoric acid, 10%	R	C
Diazo salts	R	R	Hydrofluoric acid, 60%	R	C
Diesel fuels	N	N	Hydrofluoric acid, 100%	R	C
Diethyl amine	N	N	Hydrocyanic acid	R	R
Diethyl phthalate	N	N	Hydrogen	R	R
Disodium phosphate	R	R	Hydrogen peroxide, 50%	R	R
Diglycolic acid	R	R	Hydrogen peroxide, 90%	R	R
Dioxane-1,4	N	N	Hydrogen sulfide, aq	R	R
Dimethylamine	R	R	Hydrogen sulfide, dry	R	R
Dimethyl formamide	N	N	Hydroquinone	R	R
Detergents, aq	R	R	Hydroxylamine sulfate	R	R
Dibutyl phthalate	N	N	Hydrazine	N	N
Dibutyl sebacate	C	N	Hypochlorous acid	R	R
Dichlorobenzene	N	N	Iodine, in KI, 3%, aq	C	N
Dichloroethylene	N	N	Iodine, ale	N	N
Ethers	N	N	Iodine, aq, 10%	N	N
Ethyl esters	N	N	Jet fuels, JP-4 and JP-5	R	R
Ethyl halides	N	N	Kerosene	R	R
Ethylene halides	N	N	Ketones	N	N
Ethylene glycol	R	R	Kraft paper liquor	R	R
Ethylene oxide	N	N	Lacquer thinners	C	N
Fatty acids	R	R	Lactic acid, 25%	R	R
Ferrio salts	R	R	Lard oil	R	R
Fluorine, dry gas	C	N	Lauric acid	R	R
Fluorine, wet gas	C	N	Lauryl chloride	R	R
Fluoboric acid, 25%	R	R	Lauryl sulfate	R	R
Fluosilicic acid	R	R	Lead salts	R	R
Formaldehyde	R	R	Lime sulfur	R	R
Formic acid	R	N	Linoleic acid	R	R
Freon-F11, F12, F13, F14	R	R	Linseed oil	R	R
Freon-F2 1, F22	N	N	Liqueurs	R	R
Fruit juices and pulps	R	R	Liquors	R	R
Fuel oil	C	N	Lithium salts	R	R
Furfural	N	N	Lubricating oils	R	R
Gas, coal, manufactured	N	N	Machine oil	R	R

R= generally resistant

C= less resistant than R but still suitable for some conditions N= not resistant

This table is meant to aid designer in decisions as to transporting / conveyance of undiluted chemicals, and fittings).

uPVC Chemical Resistance Chart

CHEMICAL	73°F (23°C)	140°F (60°C)	CHEMICAL	73°F (23°C)	140°F (60°C)
Magnesium salts	R	R	Oil, Vegetable	R	R
Maleic acid	R	R	Oils and fats	R	R
Malic acid	R	R	Oleic acid	R	R
Manganese sulfate	R	R	Oleum	N	N
Mercuric salts	R	R	Olive oil	C	-
Mercury	R	R	Oxalic acid	R	R
Mesityl oxide	N	N	Oxygen, gas	R	R
Metallic soaps, aq	R	R	Ozone, gas	R	C
Methane	R	R	Palmitic acid, 1 0%	R	R
Methyl acetate	N	N	Palmitic acid, 70%	R	N
Methyl bromide	N	N	Paraffin	R	R
Methyl cellosolve	N	N	Pentane	C	C
Methyl chloride	N	N	Peracetic acid, 40%	R	N
Methyl chloroform	N	N	Perchloric acid, 10%	R	C
Methyl cyclohexanone	N	N	Perchloric acid, 70%	R	N
Methyl methacrylate	R	-	Perchloroethylene	C	C
Methyl salicylate	R	R	Petroleum, sour	R	R
Methyl sulfate	R	C	Petroleum, refined	R	R
Methyl sulfonic acid	R	R	Phenol	C	N
Methylene bromide	N	N	Phenylcarbinol	N	N
Methylene chloride	N	N	Phenylhydrazine	N	N
Methylene iodide	N	N	Phenylhydrazine HCl	C	N
Milk	R	R	Phosgene, gas	R	C
Mineral oil	R	R	Phosgene, liquid	N	N
Mixed acids (sulfuric & nitric)	C	N	Phosphoric acid	R	R
Mixed acids (sulfuric & phosphoric)	R	R	Phosphorus, yellow	C	R
Molasses	R	R	Phosphorus, red	R	R
Monochlorobenzene	N	N	Phosphorus pentoxide	R	C
Monoethanolamine	N	N	Phosphorus trichloride	N	N
Motor oil	R	R	Photographic chemicals, aq	R	R
Naptha	R	R	Phtalic acid	C	C
Napthalene	N	N	Picric acid	N	N
Nickle salts	R	R	Plating solutions, metal	R	C
Nicotine	R	R	Potassium salts, aq	R	R
Nicotinic acid	R	R	Potassium alkyl xanthates	C	C
Nitric acid, 0 to 50%	R	C	Propane	R	X
Nitric acid, 60%	R	C	Propylene dichloride	N	N
Nitric acid, 70%	R	C	Propylene glycol	R	R
Nitric acid, 80%	C	C	Propylene oxide	N	N
Nitric acid, 90%	C	N	Pyridine	N	N
Nitric acid, 100%	N	N	Pyrogllic acid	C	N
Nitric acid, fuming	N	N	Rayon coagulating bath	R	R
Nitrobenzene	N	N	Sea water	R	R
Nitroglycerine	N	N	Salicylic acid	R	R
Nitrous acid	R	C	Salicylaldehyde	C	C
Nitrous oxide, gas	R	C	Selenic acid	R	R
Nitroglycol	N	N	Sewage, residential	R	R
Nitropropane	C	C	Slicic acid	R	R

R= generally resistant

C= less resistant than R but still suitable for some conditions N= not resistant

This table is meant to aid designer in decisions as to transporting / conveyance of undiluted chemicals and fittings).

uPVC Chemical Resistance Chart

CHEMICAL	73°F (23°C)	140°F (60°C)
Silicone oil	R	N
Silver salts	R	R
Soaps	R	R
Sodium salts, aq, except	R	R
Sodium Chlorite	R	R
Sodium Chlorate	R	C
Sodium dichromate, acid	R	R
Sodium perborate	R	R
Stannic chloride	R	R
Stannous chloride	R	R
Starch	R	R
Stearic acid	R	R
Stoddard solvent	N	N
Sulfite liquor	R	R
Sulfur	R	R
Sugars, aq	R	R
Sulfur dioxide, dry	R	R
Sulfur dioxide, wet	R	C
Sulfur trioxide, gas, dry	R	R
Sulfur trioxide, wet	R	C
Sulfuric acid, up to 70%	R	R
Sulfuric acid, 70 to 90%	R	C
Sulfuric acid, 90 to 1 00%	C	N
Sulfurous acid	C	N
Tall oil	R	R
Tannic acid	R	R
Tanning liquors	R	R
Tartaric acid	R	R
Tetrachloroethane	C	C
Tetraethyl lead	R	C
Tetrahydrofuran	N	N
Thionyl chloride	N	N
Thread currant oils	R	-
Terpineol	C	C
Titanium tetrachloride	C	N
Toluene	N	N
Tributyl phosphate	N	N
Tributyl citrate	R	-
Tricresyl phosphate	N	N
Trichloroacetic acid	R	R
Trichloroethylene	N	N
Triethanolamine	R	C
Triethylamine	R	R
Trimethyl propane	R	C
Turpentine	R	R
Urea	R	R
Urine	R	R
Vaseline	N	N

CHEMICAL	73°F (23°C)	140°F (60°C)
Vegetable oil	R	R
Vinegar	R	R
Vinyl acetate	N	N
Water, distilled	R	R
Water, fresh	R	R
Water, mine	R	R
Water, salt	R	R
Water, tap	R	R
Whiskey	R	R
Wines	R	R
Xylene	N	N
Zinc salts	R	R



R= generally resistant

C= less resistant than R but still suitable for some conditions N= not resistant

This table is meant to aid designer in decisions as to transporting / conveyance of undiluted chemicals, and fittings).

Set Time

The initial set times shown below are the recommended waiting periods before handling newly assembled joints. After initial set, the joints will withstand the stresses of normal installation. (A badly misaligned installation will cause excessive stresses in the joint, pipe

Temp. Range	Pipe Size 1/2" - 1-1/4"	Pipe Size 1-1/2" - 2"	Pipe Size 2-1/2" - 8"	Pipe Size 10" - 15"	Pipe Size 16" - 24"
60°- 100°F	2 Min	5 Min	30 Min	2 Hrs	4 Hrs
40°- 60°F	5 Min	10 Min	2 Hrs	8 Hrs	16 Hrs
0°- 40°F	10 Min	15 Min	12 Hrs	24 Hrs	48 Hrs

Cure Time

The cure time is the recommended waiting period before pressurizing newly assembly joints. These times depend on type of cement used, pipe size, fit, temperature, humidity and pressure. Follow appropriate cure times carefully. Allow longer cure periods for high humidity and/or cold weather consult solvent cement manufacture. Avoid puddling of cement or primer on or within fitting and pipe that causes excess softening of the material and could cause damage to the product. and fittings).

Thrust Blocking

Concrete reaction or thrust blocking should be provided at each hydrant, valve, bend, tee and at reducers or fittings where changes occur in pipe diameter or direction. Concrete thrust blocks shall be cast in place, poured against undisturbed soil. Precast blocks are not permitted.

- Through line connection (tee)
- Through line connection (cross used as tee)
- Direction change (elbow)
- Change line size (reducer)
- Direction change (tee used as elbow)
- Director change (cross used as elbow)
- Hydrant Tee
- Hydrant Boot
- Valve Anchor
- Vertical direction change (bend anchor)

Deflecting The Joint At



FITTINGS

PVC pressure fitting joints by nature of their gasket design and insertion depth cannot accommodate large deflection angles. The maximum deflection should be 1° for all sizes of PVC pressure fittings. This is equivalent to 100mm (4in) of deflection over 6.1 meters (20 ft) length of pipe. If the deflection exceeds 1° , failure is characterized by a crack in the lip of the bell of the fitting which propagates back towards the gasket causing a failure of the fitting.

When deflecting the pipe/fitting joint, use the following procedure.

- When assembling the pipe/fitting joint, push the spigot into the bell until the assembly line on the spigot is 13mm (1/2in) short of the lip of the bell. The 13mm gap allows for more movement at the end of the pipe being inserted.
- Shift the end of the pipe being inserted by 100mm (4in) for a 6.1 meter (20 ft) length. This is equal to 1° of deflection.
- If a large resistance force to the insertion of the spigot is felt by the installer, it could mean that the gasket has become dislodged.
- In this case, disassemble the joint and re-assemble as per the instructions above.

Service Connections

Service lines are connected to water mains by either:

- Direct Tapping
- Saddle Tapping
- Tapping Sleeve and Valve
- Direct tapping is restricted to PVC pipe sizes 6" through 12". The size of tap is restricted to 3/4" or 1"
- "Wet" (under-pressure) or "dry" (no-pressure) taps are permitted.
- Saddle tapping is restricted to a maximum corporation stop of 2 inches.
- Saddles must be sized to provide even support around the full circumference of the pipe.
- Tapping sleeves and valves are used when service connections larger than 2" are required.
- The strapping must provide a minimum of bearing width of 50mm (2in) along the axis of the pipe.
- The design of the saddle should not have lugs that will indent the pipe when the saddle is tightened.

PIPE SIZE	US. Gal. / 100 Ft.	Litres / 100 Ft.	Meters* / 10 Meters
4"	70	220	0.07
6"	153	579	0.19
8"	259	980	0.32
10"	405	1533	0.50
12"	573	2169	0.71
14"	810	3066	1.01
16"	1050	3974	1.30
18"	1315	4977	1.63
20"	1615	6113	2.01
24"	2305	8724	2.84
30"	3554	13418	4.40
36"	5078	19220	6.31



PIPE WITH ELASTOMERIC JOINTS U.S GALLONS PER HOUR (LITERS PER HOUR)

NORMAL PIPE SIZE INCHES	Average Test Pressure in Line P.S.I.				
	50	100	150	200	250
	Allowable Leakage Per 1,000 Ft. or 50 Joints				
4"	0.19 (.72)	0.27 (1.02)	0.33(1.25)	0.38(1.44)	0.43(1.63)
6"	0.29 (1.10)	0.41 (1.55)	0.50(1.89)	0.57(2.16)	0.64(2.42)
8"	0.38 (1.44)	0.54 (2.04)	0.66(2.50)	0.76(2.88)	0.84(3.22)
10"	0.48 (1.82)	0.68(2.57)	0.83(3.14)	0.96(3.63)	1.07 (4.05)
12"	0.57 (2.16)	0.81 (3.07)	0.99(3.75)	1.15(4.35)	1.28 (4.84)
14"	0.67 (2.54)	0.95 (3.60)	1.16 (4.39)	1.34(5.07)	1.50 (5.68)
16"	0.76 (2.88)	1.08 (4.09)	1.32 (5.0)	1.53(5.79)	1.71 (6.47)
18"	0.86 (3.26)	1.22 (4.62)	1.49 (5.64)	1.72(6.51)	1.92 (7.27)
20"	0.96 (3.63)	1.35 (5.11)	1.66 (6.28)	1.91(7.23)	2.14 (8.10)
24"	1.15 (4.35)	1.62 (6.13)	1.99 (7.53)	2.29(8.67)	2.56 (9.69)
30"	1.43 (2.41)	2.03 (7.62)	2.48 (9.39)	2.87(10.86)	3.20(12.11)
36"	1.72 (6.51)	2.43 (9.20)	1.98(11.28)	3.44(13.02)	3.85(14.57)

**Customer Guideline****THE ONLY PIPE MATERIALS YOU SHOULD BUY**

Most people think that buying pipes, pipe accessories or pipe materials is a matter of just going to the market or hardware store and laying hands on anything that catches their eyes. But, this is never the case. Pipes, products materials or pipe accessories are actually difficult to buy. It is quite tricky to choose the type of pipe materials that are worth buying and the choice of pipe manufacturers to deal with.

A lot of reasons can account for this. But, it is mainly because different pipe materials and accessories offer different levels of performance. Based on this, it is always a perfect idea to choose materials that are good enough to meet very high performance standards. If you want to buy pipes and pipe materials which are good enough to satisfy very high performance standards, you can do well to consider the following information.

Low Friction Factors

The best polypropylene pipe or pipe materials worth going for are those whose friction factors are very low. Most people do not understand this technical aspect of water transport and distribution. But, it often affects the performance of any pipe to a very significant extent. This actually applies to all transport and water distribution systems including the domestic and industrial types. When a pipe network is using pipe materials whose friction factor are low, it will not attract many losses. The losses in the system will be minimized leading to high efficiency.

Eco-friendly



The eco-friendly nature of the products materials will affect the environment in which they have been laid. Thus, it is always vital to search for pipe materials that are as environmentally friendly as required. Our products materials that are environmentally friendly are those which do not also affect the nature of the surroundings in which they have been laid. Further, they are also now supposed to affect the nature of the water they are transporting and distributing. For example, they are not supposed to be toxic in nature and neither should they make the water toxic.

In case of damage and subsequent disposal, they should not breakdown and form substances that are toxic to the environment. When it comes to disposal, they are also not supposed to remain in the environment for many years without losing their natural state. These are some of the major attributes of a material that is environmentally friendly.

Durable

Imagine having to replace pipes over a time frame as short as a few weeks. Without any doubt, you will find it unbearable to use such pipes or piping materials. To avoid such issues, it is often a good idea to go for choices of pipes that are durable. Our products must also be easy to maintain in case the need arises.





Water is the most basic necessities of our life. You can live without food for a few weeks if needed but living without water more than a few days is impossible. Nature has provided us with example sources of water including ground water but in the process of transferring water from one place to another, it can get contaminated rendering it impossible to drink. You can prevent it using high quality PVC plumbing pipes for your water supply. As compared to other materials used for making plumbing pipes, PVC is proven to be most health friendly due to its additional properties.

Anti Bacterial

Harmful bacteria are one of the major causes of ailments especially stomach related. PVC plumbing pipes are safe from

Anti Fungal

PVC tubes and pipes are safe from any kind of fungal growth. Polyvinyl chloride or PVC as we know it does not allow any fungal growth on the pipe or inside the pipes. It is very essential for long distance water supply as well as water supply pipelines coming from basement to your water outlet.

Safe Environment

The inside of PVC pipes provide a safe environment for the water supply free of any external factor that might contribute in contamination of water. However, you will have to make sure that the pipe joints are sealed properly using an approved sealant free from harmful chemicals. With regular maintenance and care, you can enjoy the supply of clean water free from any contamination. Make sure to choose the PVC pipes that follow all the standards set and approved by the government. The health of your family is in your hands!



Right Plumbing Contractor

A construction project involves many professionals from various fields of operation. A number of professionals are required to provide their personal input before a construction project can be completed. The number of professionals required depends on the size of the project. For a house, you need to have builders, structural engineers, plumbers and electricians. The importance of each professional cannot be overstressed. Plumbers are quite important as they make it possible for water to successfully reach the structure especially after completion or even before. But, you have to hire the right contractor if you are to achieve excellence in as far as plumbing is concerned. Here are some important reasons that account for this.

Choose The Right Pipes And Tool

Did you know that choosing the right pipes for a specific plumbing project can prove to be challenging? Of course! There is a lot of work that is involved. You have to be an expert to specify certain tools and pipes. This applies to all plumbing tools including pipe fittings and joints. It also applies to the other components of a plumbing system such as geysers and ground pipes from the main distribution network. The choice of pipes and several other components of a water plumbing network matters a lot. It will determine the efficiency of the taps, the pipes and even the geyser. As a lay person, you may not have the much needed expertise to choose the right pipes, the right PVC pipe manufacturers and other components of a plumbing network. Rather, a plumbing contractor will use experience and technical knowledge to choose them for you.



Cost Effective

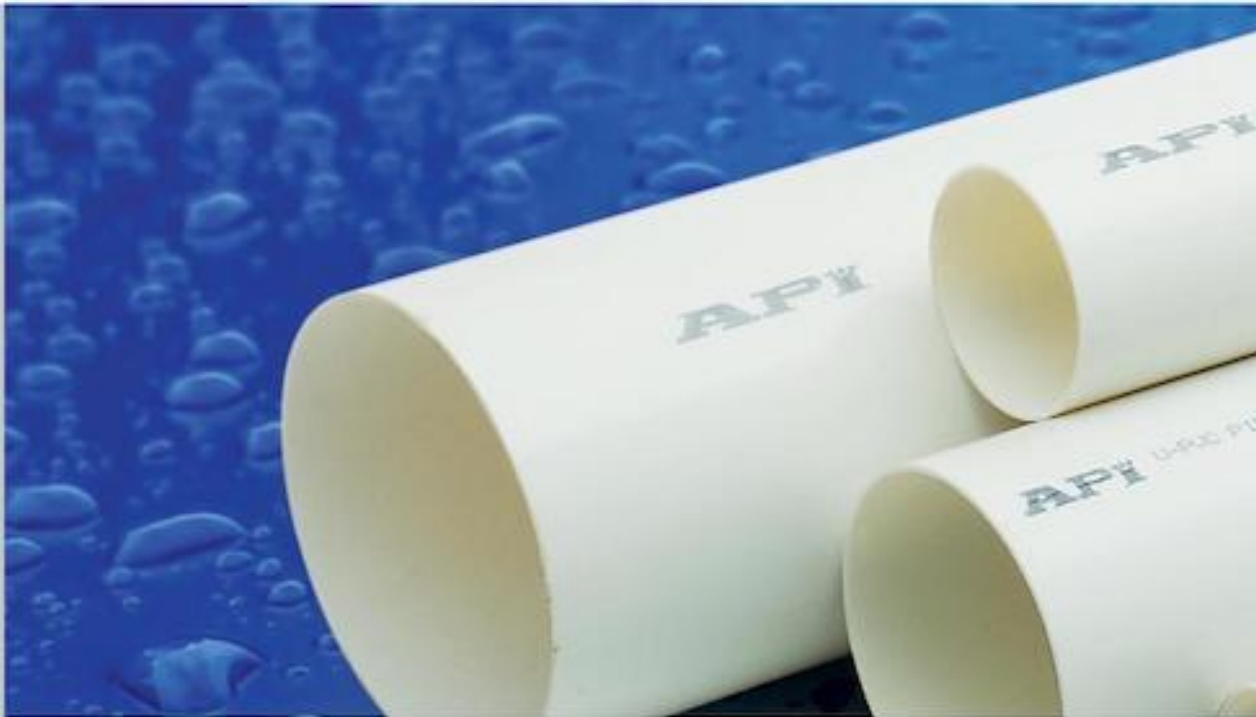
Repair works often arise due to pipe bursts, leakages and several other issues such as corrosion of pipes or wearing out of taps. This is often inevitable and unavoidable. Therefore, it is not something that you can avoid. But, it is something that you can minimize by a significant extent. One of the best ways to achieve this is to take advantage of plumbing contractors that are reliable. They have the capacity to choose the best plumbing tools and components of a piping network such as Plumbing Fittings. This is what will help you to minimize the cost of repair works. Further, you will also be able to avoid huge costs on maintenance works. Your plumbing contractor will help you to check the piping network as often as required.

High Quality Plumbing Works

If you want to spend money on plumbing works which match the value of your money, you have to hire the right plumber. This is the only way you can guarantee the high quality of the plumbing installation process.

Highly Trained Plumbers

One of the most notable reasons that make high profile plumbing contractors worth hiring is the fact that they are in possession of highly trained plumbers. Since plumbers are the ones that do the work, they will be able to plumbing works in an exceptional manner leading to lasting results. Provided you hire the right plumbing contractor, you will be able to realize your desired results.



Avoid Major Damages

Are you seeing a wet patch on the wall or roof? No matter how many times or how much you try to dry it or air it, the wet patch never seem to go away? Maybe it is because of the leakage in the plumbing pipes. Several home owners tend to neglect the minor drips or leaks occurring in plumbing or taps. It might seem nothing but over a period of time, the drips can seep into your walls or roof, causing serious damage to the structure of the house. Moreover, damp floors or walls can also give rise to unwanted creatures such as molds, fungus, and algae growing in your house. A black or green patch on your wall can be a bothering factor, isn't it?

Keep An Eye On Plumbing

Keeping an eye on plumbing pipes can help in avoiding any damage. Even if your pipes are underground or attached in the wall, try to look for the signs of leakage. You might see a little damp patch on the wall or sound of dripping. If any of these occur, look of the damage and get it repaired.

Keep Your Pipes Clean

Often debris and dirt that come along water supply can also cause damage to your plumbing system. It is wise to clean your pipes on a regular period to avoid debris and dirt getting accumulated in the pipes. They can not only make your pipes heavy but can also affect the water pressure in them. Most of the plumbing related troubles can be sorted by buying good quality pipes from PVC pipe manufacturers. Contract your contractor now.



Importance Of uPVC Pipes

When we are working on the plumbing of the house, a building or a construction project, choosing PVC plumbing pipes is pretty normal. It comes to our mind the first thing when you are off to select the material of the plumbing. Easily available, built in multiple sizes and with the possibility to reduce or increase the diameter with simple plumbing practices are just a few of the pointers that influence our choice. Apart from all this, there is one very obvious reason that has been influencing our choice of plumbing pipes and that is the strength of the PVC plumbing pipes.

PVC has a long lasting Hydrostatic design basis which is about 4000 psi and surely it is one of the highest one among the rest of them. Other pipes need additional material for attaining the same pressure capacity. This means that the cost of making is quite low in comparison to other plumbing pipes. Low production cost means low buyer's cost hence it affects your budget directly.

Apart from this, with low material and higher hydrostatic design basis makes PVC pipes light in weight. Your overall plumbing structure will be light and durable all at the same time. Being light, PVC will not add any additional pressure on the building structure which is great for you and your building.

This also affects the flow area in the pipes which can be rather low in average plumbing pipes. With higher material used for adding strength to the pipes, the flow area reduces significantly. This is not a matter of concern with the PVC pipes with its high psi. With all these qualities and few more added to its structure by PVC pipe manufacturers, PVC is definitely right choice for all your plumbing needs.

Tighten Up The Nuts And Bolts

A necessity for the efficient lifestyle, plumbing fittings have had their own importance. They tend to include a wide range of hardware like pipes, joints and even faucets. Each and every part has its own significance. Well, the most important thing is that a person should use high quality plumbing system to avoid water logging and enjoy uninterrupted functioning of water drainage system. With the increasing necessity, websites are coming forward to extend a helping hand. They provide good quality fitting products at reasonable rates. In fact, a wide variety of plumbing products are available that makes a person select the ones needed. These days, the scenario is such that people fall for qualitative products. But, this does not mean that reasonably priced ones are fake. It is the magic of plumbing company websites that offer exclusive discounts.

There are numerous people, who happen to lay emphasis on internal plumbing gears and keeps on avoiding the use of basic plumbing pipelines that act as the lifeline of a particular house. They do not completely understand the prominence of having an innocuous and strong plumbing mechanism. Everyone is aware of the fact that improper functioning of such fittings will surely become the reason of leakage. On being undetected, these leakages turn out to be fatal for the life of walls and ceilings. It is because the walls will get cracks and the entire appeal of a room becomes shabby. Moreover, the result could be serious that the foundation will become weak leading to collapsing of the wall. For sure, no home owner would like to experience it. This mandates for continuous check-up as well as maintenance of the fittings. These fittings have the ability to link pipes and other joints.

One of the prominent parts of selecting the right fitting accessory is that they should be branded. By this, it means that the parts should be company manufactured and not any kind of replica. In this manner, one should select the type of fitting as well as PPR pipe after a little bit of research on the product.

Water Supply In Summers

Summer season can be ruthless sometimes especially if the water supply is not proper. Whether you are living in city, suburban or outskirts, proper water supply keeps you going on through the season without any issue. It is not only important for your survival but also for your plants and growth of your crops, if you are into farming. Not just the household owners but for the owners and farmers of livestock, fish farmers, for floriculture and horticulture, it is crucial for the business to maintain smooth water supply. With good quality plumbing pipes, you can make this possible along with regular maintenance. Choose plumbing pipes that are of right diameter and material, hence it can bear the pressure of water supply in the fields and in your dorms of your animals. You may not need water supply throughout the day but whenever it is required, the pipes should be able to withstand the pressure.

Clean

Clean your PPRC pipes regularly to get rid of any dirt or debris that might accumulate in the pipelines, hence disrupting the entire supply. If too much, dirt and debris can also cause pipe to burst during peak supply hours.

Check Leaks

You need to check for regular leaks throughout the plumbing line to maintain the uPVC and PPR-C pipes. A small crack or loose fitting can damage entire line.

Right Pressure

Do not force your pipes to their threshold with too much water pressure. You might wish to complete your work in no time, but plumbing line and pipes might not be able to withstand the pressure. Keep it right and proper as per the tips given by the manufacturer.

Plumbing pipes with good quality and regular maintenance can ensure smooth water supply not only throughout the summer season but entire year and times to come.

Work On Plumbing To Avoid Leakage In The House

Are you facing leakage problems in the house every often? Have you tried to repair it but it helps nothing? Maybe the problem is with the plumbing of your house. Plumbing is designed very carefully keeping the usage of water in every part of the house. Some parts need more water such as your bathroom and kitchen compared to the other parts like the outlet in your garden or garage. If the pipes are not selected carefully as per the water requirement of the household, it might cause undue pressure on the pipes leading to leakage. You can surely avoid all these issues with these simple pointers:

Choose Design As Per Outlet

Make sure that the plumbing design allows smooth inlet and outlet of water from every place. You need to focus on avoiding undue pressure on the pipes, especially during peak hours.

Right Size Pipes

Never ever use pipes which are small for bathrooms or places with high water usage. This might cause pipe bursting or leakage in the joints. You need to use the right size pipe as per the usage. This goes for uPVC as well as PPR-C pipes for varied usage.

Sealant For Joints

To make sure all your joints in the plumbing design are secured, use a good sealant for the joints. This will prevent any leakage around the joints which might occur during high usage.

Regular Repairs

Repair the pipes regularly to avoid any major damage. If you see a pipe dripping or any tap leaking, it is advisable to repair it as soon as possible.

Good Pipes

Always go with good quality pipes from a certified company. Certified companies abide by all the standards given by the government for making and choosing material for the plumbing pipes. You need to discuss all the issues with your plumber for understanding all these aspects. It is better to be well aware of all the problems which might occur as well as how to deal with it when it occurs. Water pump extracting its supply from ground water often pull of soil and debris along with water. This soil and debris can settle at the bottom of the pipe, causing blockage or reduction in proper supply. However, it might not happen in a day or too but these soils and debris be able to disrupt your water supply.

- Leaves or debris getting collected in swimming pool pipes is very common. These can damage your entire plumbing system as well as water pumps.
- During rains or storm, leaves and debris can enter your main water line causing blockage.
- You will have to maintain the health of your PPR-C pipes and uPVC pipes through very simple steps.
- Keep your swimming pool covered when not in use. You can also hire professionals for regular cleaning thus maintaining the health of plumbing.
- Make sure to clean your overhead tanks or any such water storage to avoid blockage by soil and debris.
- Keep your gutters clean and plumbing pipes covered.



Plumbing Solution

Are you looking for a reliable plumbing solution for your house? Among the long list of options available for plumbing solutions, PVC and PPR are considered best plumbing pipes. From household to factories, they are suitable for a lot of scenarios and landscapes. What makes them best is their endless list of qualities which are not available in other pipes. Durability of PPR-C and uPVC pipes, both of them are very strong if compared to other pipe fittings. They can bear extreme pressures as well as heat lasting for a long time. If you are looking for something that is suitable for your household plumbing, these are the best options you have got. Some might think that iron and steel pipes are also durable but they do not have additional qualities as these two.

Antifungal Or Bacterial Surface

Fungal and bacterial growth on or in the pipes can be dangerous for your family's health. After all, these pipes are responsible for water inlet as well as outlet. uPVC and PPR-C pipes are made with such material that prevents all kinds of bacterial and fungal growth. You can use it for drinking water supply as well throughout the house along with drainage.

Able To Bear Pressure

uPVC and PPR-C pipes are capable of sustaining under pressure throughout the year during water supply. During winters, water tends to expand and in summers, the requirement of water is more hence plumbing solutions should be capable of functioning in all situations. Everyone house has a different water need hence they require a unique plumbing solution accordingly. Discuss your requirement with plumber while finding out the best plumbing solution.



Maintain Your uPVC Fittings

No matter if it is the building or a car, with regular maintenance, you can increase their life. Maintenance is not only about repairing the damages once in a while but ensuring every minor to major details that can also lead to damage in the coming future. The first step towards it is to buy high quality plumbing fittings and electrical fittings.

The better the quality is the higher are the chances of the fittings to last long. A good quality PVC fitting stands on all the government norms for strength and durability. It is made with finest of products in a superior product facility ensuring all the standards. These PVC fittings can bear humidity, pressure, heat and such other factors easily lasting for a long time. Just by buying a superior quality fitting, you can reduce the damages and maintenance costs by half. Apart from buying a good quality PVC plumbing and electricity fitting, you also need to follow these simple maintenance steps:

Check Them Time To Time

Once the fittings are installed, try to keep an eye on them looking for damages or possible causes for damages. If the pipes are installed deep into floors or walls, you can look for cracks or leakage signs around them.

Hire Professionals

Every 5-10 years, you need to hire professionals and do a minor check up of all the installations. With this, you can ensure that the fittings are working properly and do not need any changes or repairs.

Immediate Repair

If your house or office building has faced a natural calamity such as earthquakes, torrential rains, and floods, look for possible damages and repair them quickly.

With the above mentioned tips and by buying very high quality PVC plumbing and electricity fittings, you can ensure the lasting life of your fitting. Invest smartly and enjoy lasting benefits.

Failures



When things go wrong it is important to fix the failure, but it is even more important to find the cause. The cause most times is not simply a defective part, but more often the effect of another problem. Good design practice is to incorporate piping and fittings with a reasonable service factor for system reliability. As an example, pipe with a pressure rating of 200 psi, should not be used in a system with a 175 psi working pressure. System pressure needs to include both static and expected surge pressure.

When systems have repeated failures it may take some extensive investigative analysis of the entire installation to find the cause. Many times the closeness of the failures to each other could show the existence of pressure surges, or water hammer. It could be the consequence of the system installation, revision or repair at a different time than the rest of the site. In above ground piping, exposure to the ambient conditions could encroach on the life or service factor of the system.

The recent changes to a system, such as expansion or revision, have many times had a direct connection with system failures. Experience has shown that the increased flow rates, entrapped air from system restart have been the culprit in more than a few installations. These failures like those mentioned above tend to be clustered, but not necessarily in the new part of the system. Often the older piping suffers the damage because of these revisions.

A comprehensive check of the system operational modes, including cycle time, pressure surge frequency and amplitude can provide valuable information in finding the cause of piping failures. The use of most pressure recorders although helpful, cannot provide precise data on the damaging effects of pressure surges, air slugs or water



hammer. In these cases the unusually high pressure spike the system experiences is of such short duration, milliseconds, that the recording mechanism cannot react quickly enough to record its peak. The pressure peak travels through a PVC system at roughly 1400 ft/sec. so the recorder only sees it for 0.7 milliseconds.

Before and after the pressure spike, the system pressure would be close to normal and only a small "blip" would have been recorded, with the amplitude many times removed from the true value.

A simple but often overlooked piece of evidence in tracking the source of a failure is to go over all the failed components to look for similarities. On more than one occasion a manufacturer has been accused of a defective product only to have a group of components of differing brands or configurations on the same system failing. The common denominator would likely be the system and not the manufacturer.

Any failure that is the result of external stress or loads will reoccur if the stress is not removed. If you need to install extra supports or restraints to remove the external stress, make sure you do it before making repairs. With external failures, a crack or break will progress from the outside of the pipe or fitting toward the interior.

A simple method can help you decide if a failure is external. Try to open the crack or make it wider. This will show where the external loads were applied. It is also important to know that cracks and splits are perpendicular to the producing load. For example when paper is torn, pulling horizontally causes it to tear vertically. Each has a set of characteristics that can be used to help find the source of the problem.

Cause Of Failure In PVC System

Short Term (Burst)

- Hydrostatic (Liquids)
- Pneumatic (Air/Gas)

Long Term Failure

Surge (Water Hammer)

- Air Slugs/Entrapped Air

Cyclic (Fatigue)

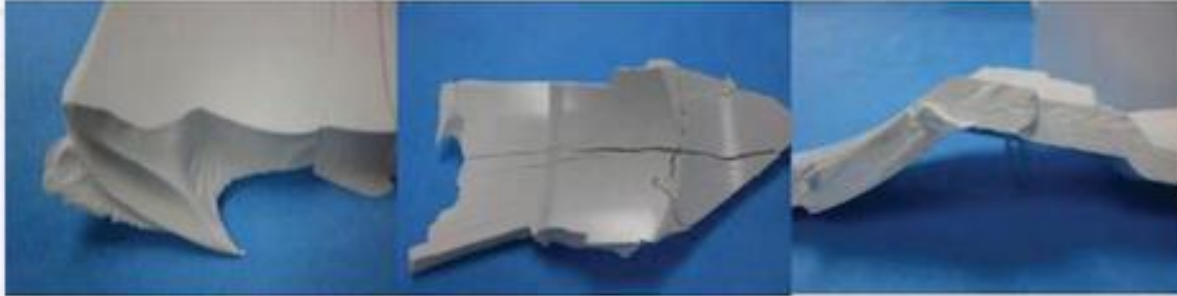
Freeze

Mechanical

- Bending
- Flange Installation
- OverTightened threads

Solvent Welding





Short Term (burst) Failure

The failure of a pipe or fitting from exceedingly high pressure over a short period, usually defined as less than a minute, would be classified as a burst or short term failure.

The more common evidence for these failures is sharp edged cracks and fragments, similar to glass. If these fragments are not contained or entrapped during the failure they can be dangerous. This is the foremost reason that PVC piping and fittings are NOT to be used to transport or to be tested with compressed air.

A short term or brittle failure shows no visible, to the naked eye, material deformation, stretching, elongation or necking down close to the break.

Air

Except under very special circumstances, PVC piping is not to be tested or used with compressed air or gases. The catastrophic failure of a PVC air assembly, with its sharp shrapnel pieces is dangerous, and can be deadly. Water and most liquids are not compressible, but air and gases are. The potential energy stored in a compressed air piping system at about 100 psi has propelled sharp edged fragments hundreds of feet in all directions.

Because a compressed air failure is almost instantaneous, the failure surfaces are reminiscent of brittle and freeze type failures. Cracks or breaks are somewhat straight with tributaries that merge and create sharp edges.



Long Term Failure

A fitting or pipe that has failed from exposure to high pressure over a long time will not generally shatter. The failure will show evidence of stretching or deformation especially at the extremes of any crack or split. Generally, a magnified examination of the failure will show material that has tapered off shoots, whitened surface or "stretch marks" (a necked down cross section) past the end of the crack. Long term failures are most commonly found in the high stressed areas of a fitting, such as the inside corner or "crotch" of an Elbow or Tee. A long term failure shows material deformation, stretching, elongation or necking down, along the edges of the crack.



Surge (water Hammer)

There are many similarities between surge pressure and short term failures. In most instances the part breaks down after repeated exposures to high and short duration pressure applications. The repetitive surges tend to significantly degrade directional fittings considerably more than pipe or couplings. The failures tend to appear first in the high stress areas or crotch of Tees and Elbows. A simple vector analysis shown in Fig. 4 suggests that the stress in the crotch of an elbow (or tee) is 1.4 times that found in the body of the fitting.

This simple vector analysis is conservative and does not consider the extra stress of outward bulging that is clear in 3D vector analysis, Finite Element Analysis (FEA) and laboratory testing. Some industry testing has shown that the stress in the crotch area of a 90 degree elbow, or Tee to be about 2.8 times the stress of the rest of the fitting.

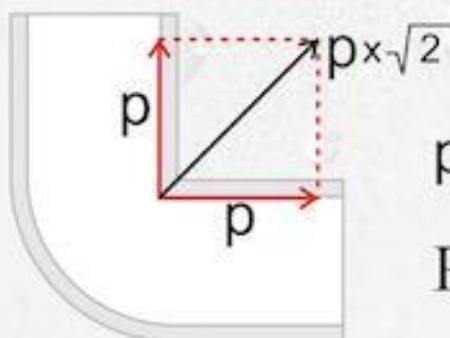
Differences in the design, configuration, dimensions or special working conditions of a fitting will lead to deviations in the stresses applied. It is the responsibility of the user to conduct tests to assure suitability of the fitting for each purpose.

So, with the extraordinarily high surge pressure a system experiences, the crotch of a Tee or an Elbow could sense a force that is about 2.8 times greater than the body of the same fitting. Why fittings have even higher stresses applied in the crotch (estimates upwards of 3.5 times the stress in the body).

A pocket of air within a piping system can create the same shock pressure as water hammer. Air pockets occur from improper design, system filling or undulating terrain.

As air separates from the liquid, a bubble or air slug slowly builds creating a restriction. This restriction in turn creates an increase in velocity directly underneath the air pocket. Once the air pocket reaches a critical size it is swept downstream leading to high fluid velocities where none existed before. To prevent this scenario the system design needs to accommodate the ability to remove air from high points in a system.

Water has a density about 800 times of air. Because of this, and its smaller molecular size (compared to a molecule of water), air can be expelled through an opening, nozzle or spray head several times faster than water. The actual difference in velocity depends on several factors but a rough estimate is 10 times faster. This means that the velocity of water behind a slug of air moving thru a system can be about 10 times faster than just water moving through a system with no air slugs. When the last of an air pocket or slug of air is expelled through an orifice the moving water is decreased in velocity by 10 times almost instantaneously as it seeks unsuccessfully to move through the same orifice. This rapid change in fluid velocity creates a large pressure surge or water hammer condition.



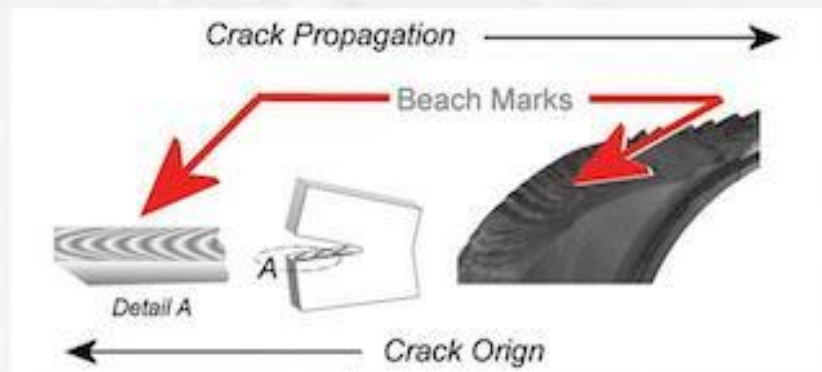
$$p_2 + p_2 = P_2$$

$$P = 1.414p$$

Cyclic Fatigue

Similar to surge, cyclic failures are a result of material fatigue from a high number of repeated pressure cycles. Each time a PVC fitting is pressurized or the system pressure increases the high stressed areas stretch slightly.

This causes tensile stress, or stretch, in the crotch of tees and elbows. Piping and fittings are designed to withstand pressure fluctuations if they are limited, both in strength and quantity. But, high amplitude and quantity can cause the pipe or fittings to fail prematurely. The "stretch marks" found along the edge of the break along with "clamshell marks" or "beach marks" on the internal fracture surface are evidence of cyclic failure propagation.



Freeze

Water expands when it freezes. PVC, as do most materials, becomes brittle as the temperature is lowered. So, when PVC fails from entrapped frozen water; the break surfaces and cracks are brittle in appearance and give an appearance much like shattered glass.



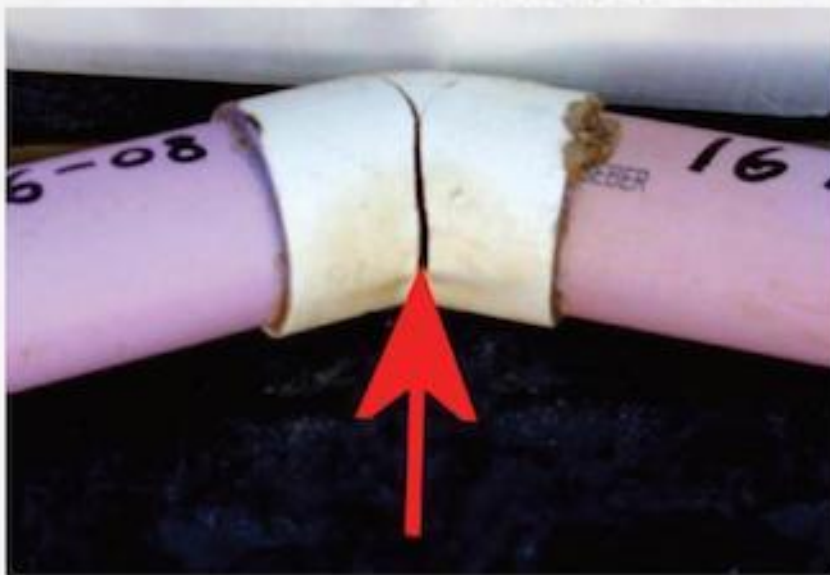
Mechanical

There are two common causes of mechanical breakage in PVC piping systems. The bending, or vibration, and the over tightened threaded connection. The bending or vibration failure starts on the outer surface of the part, and progresses inward. This distinguishes it from the other forms.

In the hands of a plastics failure expert, the fracture surface will have clues not only of the origin site of the failure but will also tell the expert the "how" or "what" caused the failure. Many times it is possible to find the orientation of external load by carefully fitting the pieces together and observing the fit and distortion of the failure area.

This should not be attempted by a novice, as surface features unique to the failure may be lost due to the relatively soft surfaces coming together and smearing the fracture surfaces. Because many of the mechanical failures are caused by vibration, the crack and fracture surface is similar to that of a cyclic fatigue, except its orientation. Cyclic fatigue with a hydraulic source will start on the interior of the pipe or part. The mechanical failure will start on an exterior surface. Male pipe threads, such as found in the male adapter, are the most common examples of a vibration fatigue failure.

Because pipe threads are tapered, the material is the thinnest under the male threaded section at the first thread past the female threads. The trimmed down wall thickness within the thread segment of the PVC male threaded part becomes the focus of all bending loads induced from any system vibration or misalignment.



Solvent Welding Failures

The solvent weld joint creates a chemical welding of the components resulting with a leak free connection. The use of correct equipment, procedure and chemicals are mandatory! Solvent weld failures fall into three general categories.

The dry joint, is the result of solvent cement that has partly dried, either in the can or during the installation. The lack of sufficient solvent to create the fusion bond will have the consequence of a weak and/or leaking joint.

Assembly was moved during cure time. If a solvent joint is disturbed during the cure period then the fusion bond is broken and a leak is imminent. The cure time depends on the temperature, piping size, humidity and solvent cements used. It is important to follow the API recommendations about the time necessary to allow the joint to set long enough for handling.

Dry Joint, no fusion of pipe and fitting. Too little solvent cement will produce what is known as a dry joint. The applicable standards from ASTM (American Society for Testing Materials) provide a slight taper in the socket diameter of all fittings. So, when the pipe and fitting are of ideal size the pipe will interfere with the tapered socket at about 1/3 to 2/3's of the socket depth.

This provides a chemical fusion bond in the bottom third of the socket from the solvent cement. But the gap between the upper socket and pipe wall must be filled with solvent cement to assure a strong, leak free joint. The lack of sufficient cement is obvious when a gap appears at the socket entrance around the pipe wall at the socket entrance.

Although there are many other styles of PVC pipe and fitting failures, the above examples show some of the more common that take place. It is always important to ask for assistance from the manufacturers of the piping, fitting, cement and accessories that fail. Their experience with their own products can provide the information needed to prevent more problems.



Is PVC the perfect material for all piping systems? Although the use of PVC piping is universal in many applications it is not to be recommended for all. The designer or installer must check all the circumstances the system is to experience before deciding.

PVC is not capable of withstanding high temperatures like metals, such as iron, copper and steel. Most plastics are recommended for cold water applications and must not be used in elevated temperature situations. PVC is not recommended where the working temperature of the system exceeds 140° F. (60° C). PVC pipe pressure ratings are based on working temperatures of 72° F (22° C). As the pipe temperature increases the pressure ratings of the system must be lowered. CPVC, a derivative of PVC, can safely handle system temperatures approaching boiling water or 210° F (100° C).the maximum pressure capability of CPVC is also based on temperatures of 73°F. As the CPVC pipe temperature increases the pressure ratings of the system must be lowered. Polyethylene or HDPE piping is more heat sensitive than PVC, generally 130° F (54° C) is its peak service temperature.

The strength of PVC, although it is about 10-15% that of steel, when compared to its light weight, corrosion resistance, ease of assembly and lower pressure loss due to friction, make it the ideal choice in many applications. While the effects of many acids and compounds are common knowledge with metal pipes, PVC can handle inorganic concentrated and oxidizing acids superior to steel and HDPE. Organic acid anhydrides are also bettered handled in PVC piping.

COMPARING PVC PIPE WITH STEEL AND HDPE

Characteristic	PVC	Steel	Steel
Solvent weld	Yes	No	No
Weight	81 lbs/ft ³	455.5 lbs/ft ³	59 lbs/ft ³
Chemical resistance	Excellent	Poor	Good
Flow coefficient	150	65 to 110	150
Modulus of elasticity	400,000 psi	29,000,000 psi	170,000 psi
Maximum service temperature	140 F	1,000 F	140 F
Tensile strength	7,000 psi	60,000 psi	4,600 psi
Maximum design stress	2,000 psi	20,000 psi	800 psi
Relative impact resistance (higher is better)	1	6	3
Coefficient of Thermal Expansion	3x10 ⁻⁶ in/in/ F	6.7x10 ⁻⁶ in/in/ F	9.0x10 ⁻⁶ in/in/ F

For exposed installations, above ground or within structures, the rigidity of PVC calls for less support brackets or structure than the more flexible HDPE. Along with its stiffness, PVC does not expand or contract as much as HDPE with temperature change.

Many open trench installations are installed when the ambient temperatures are about 70° F (21° C); but when buried the normal ground temperature may be 50° F (10° C). This will mean that a 100 foot run of PVC pipe will contract by .72 inches, although the HDPE will shrink 2.20 inches. This contraction can lead to elevated stress on directional fitting, valves and other appurtenances.

The true test of a piping material is long term serviceability. Do the materials provide for an operational system during estimated life expectancy? Many of the first PVC piping was produced in 1940 and since that time, billions of feet and fittings have been installed worldwide.

The successes of those installations, many in operations close to 50 years, have proven that PVC can be used with confidence when the system environment matches its properties. Irrigation, agriculture and turf are a few of the most common applications for PVC pipe and fittings. Also, there are many successful swimming pools, water features, residential irrigation and food processing operations in long term service using PVC.

Prevention And Cures

Cyclic Failures

Cyclic and surge failures are closely related in cause and outcome. When either is found in a system it is important to remove the cause as quickly as possible. Because water is almost not compressible, these pressure surges are sent throughout the pipes and fittings doing damage as they go.

As the surge wave travels down the pipe line there are two chief conditions controlling its strength. The piping material and duration of the velocity change. The more rigid the pipe material, the higher the resultant pressure spike; but softer material requires more time to change the flow velocity. In a 1,000 foot section of Schedule 40 piping, at 150 psi, with a flow velocity of 5 feet per second the critical velocity change time and pressure surge created is shown in the table below.

MATERIAL	CRITICAL TIME	SURGE PRESSURE	VALVE OPERATION
PVC	1.4 sec	94 psi	5.6 sec
HDPE	2.3 sec	60 psi	9.6 sec
Cast Iron	0.5 sec	294 psi	2.0 sec

Note that we use critical velocity change time and not valve closing time. The most commonly used valves do not cut the flow rate evenly as they operate. In these valves most the flow rate is controlled during the last 25% of closing or the first 25% of opening operation. So, a good rule of thumb would be to use one fourth of the valve operation time as the "Critical Close Time."

With repeat pressure surges, or water hammer, cyclic fatigue is to be expected. It is not just the peak pressure or the frequency, but the combination of both that is the villain. Let's use a paper clip to explain cyclic fatigue. If you make repeated right angle bends, the number of cycles needed to break the wire will be significantly less than if bent just a few degrees. Also, if the wire is bent many times in a short period, it will break much quicker than if bent once a day. These two conditions, frequency and amplitude of the pressure surges, are critical to the life expectancy of a piping system. Frequent high surges will drastically increase cyclic fatigue in the system.

Let's think about the same 2" PVC Schedule 40 system with a 150 psi working pressure, much like a typical golf installation. The pressure rating of the pipe is 280 psi. The pressure ratings of pipe have been developed by decreasing the long term design factor of PVC by 50 percent. Although the design factor is intended to reflect all the variables it is without consideration to conditions such as aggressive environments, cyclic stressing, localized stress concentrations, and temperature fluctuations.

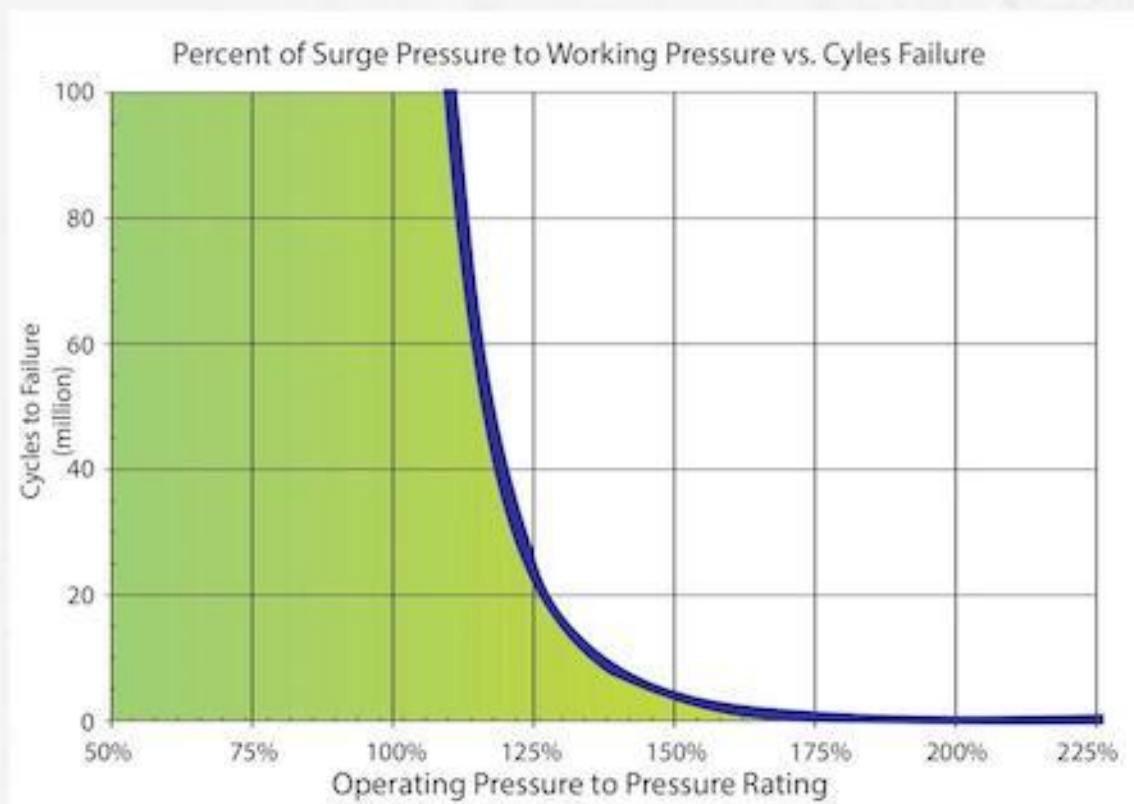
Recommended design practice is to limit the sum of any surge pressure plus the working pressure to 100 percent of system pressure rating.

Directional fittings have extra loads induced because of their configurations, and it is imperative that designers and installers be aware of these for system longevity. Proper design of a PVC system is to assure the operating pressure, which is working pressure plus surge pressure, is lower than the pipe rating. If there is a high frequency of pressure surges and/or the peak pressure exceeds the pressure rating of the pipe, higher rated pipe, fittings and appurtenances must be used.

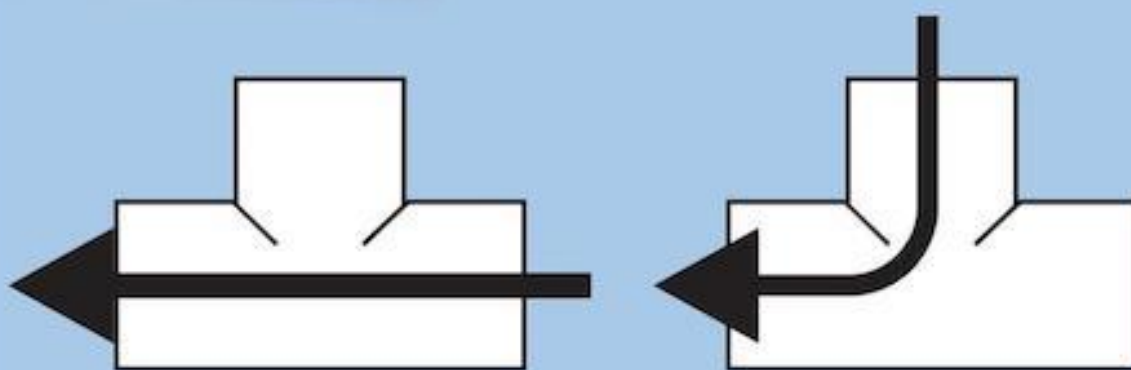
PVC has a unique feature which allows it to handle short term stress better than long term. Yet, with repeated surges taking the operating pressure above the pipe pressure rating, the cycles to failure must be taken into consideration. However, later studies showed that more than surge pressure and the cycles influence the fatigue life of PVC, as the ultra conservative formula estimated. This API study shows an intertwined relationship between the average system pressure, the peak surge pressure and the cycles to failure. The API study shows that the greater a variance between the average and the surge pressure, the shorter life expectancy of the system. A 50 year design life is expected, if the operating pressure, which is working pressure plus surge pressure, is less than the system pressure rating.

$$***P (operating) = p (surge) + p (working)***$$

Note that Schedule 40 and Schedule 80 fittings DO NOT have a pressure rating. These fittings have a wall thickness that is 25 percent heavier than the equal schedule and diameter pipe. For life cycle evaluation use the pressure rating of the same diameter and schedule pipe as the fittings. The API formula can be used to estimate the harmful effect that surges and cycles have on PVC pipe and fittings. Figure show that when the operating pressure exceeded the pressure rating of the piping, the number of cycles before failure decreases rapidly. Surge pressure is added to the working pressure to get the operating pressure, which in turn is used to achieve a piping system service factor.



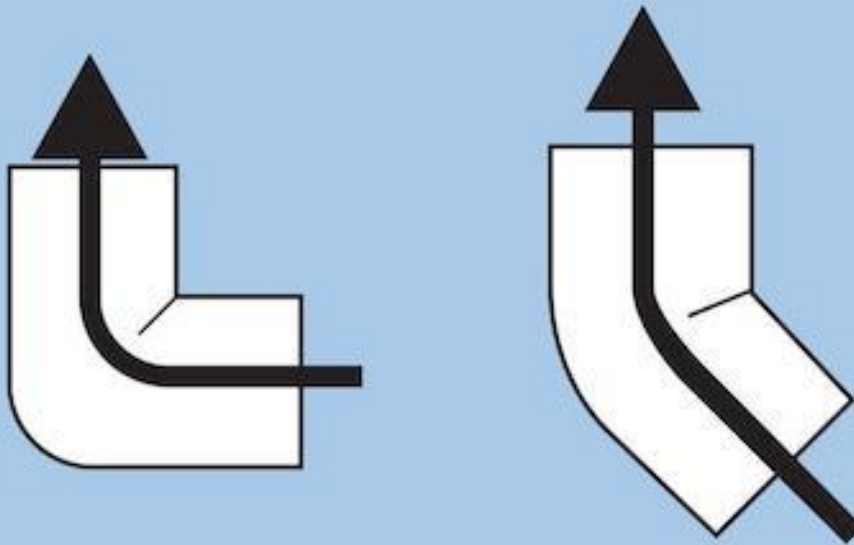
Controlling Cyclic Surges



There are multiple ways available to cut the surge pressure or spikes within a system. Surges and water hammer must be considered during the design of a system. The designer must also think about the potential of the end users operational modes, especially manual operation after repairs, or changes.

All components in a piping system that have been exposed to continual surge activity will be damaged. The first part to fail is the lowest rated part and only shows the tip of the iceberg. The rest of the pipe, fittings and apertures have been "bruised" or can be in position for failure upon replacement of the first to fail. It is important to remove the cause of surges to do away with future failures. System flow velocity is the easiest and many times the least expensive method to control surges and water hammer effects. Often by increasing the pipe by one size during the design phase and by keeping the flow velocity under 5 feet per second the possibility of surges will be greatly reduced. For example, API recommends surge allowance based on 2 feet per second flow velocity change.

Large pressure swings, from pump starts and jockey pumps, have been cut over the recent years, thanks to variable speed pumps. These soft start/soft stop pump units have become a welcome improvement to the elimination of pressure surges.



Air pockets within piping systems need to be continuously watched. During a repair or at "Phase" recharging of water in the system needs a vigilant operator. Although in practice the admission of air is not without problems, most of the problems are found during the release of air, sometimes leading to pressure even higher than if air valves were not installed. It is often assumed that because air relief valves are installed into a system, all the air will be removed. When a slug or bubble of air is traveling in a piping system, it generally travels at the water velocity. Air can escape through an opening or nozzle about 10 times faster than water.

When the slug is expelled through a sprinkler nozzle, for example, the water behind it will increase in velocity by a factor of ten. When the air is expelled the velocity of the water is instantly slowed, causing a reflective surge pressure wave back through the system. A 100 foot length of 2 inch SDR 21 pipe has a 1,571 pound column of water and its momentum will create a 16 psi pressure surge for each foot per second of velocity change.

In the past decade most of the solenoid irrigation valves have been redesigned to cut the "slam" effect of their predecessors. Yet it is important for designers and installers to understand that a slower closing valve will not produce the surge wave of a faster valve. The solenoid valve works on a difference of pressure across a diaphragm mechanism to control the flow of water. When the valve is opened, there is a high differential pressure and the passage is opened quickly. But on the close mode, the high differential pressure is at the end of the valve operation. A good "rule of thumb" is to assume that 75 percentage of the flow velocity is removed in the last 25 percentage of the valve close time.

Freeze



PVC piping, like all plastics, becomes stiffer and more brittle with low temperatures. Damage from frozen water within a system is the most common problem associated using PVC for cold temperatures. If the water or liquid does not freeze, expansion does not take place and PVC can be effectively used. But, the expansion of water upon freezing comes during a phase change and the water crystallizes into an open hexagonal form. This hexagonal lattice needs more space than the liquid state. This increases its volume about 9%. The damaging phenomenon is that the water will freeze from the outside toward the middle.

First a frozen shell which contains the remaining water is created. Then microscopic crack constantly crack, swell and refreeze exerting outward pressure on the container, or piping. When the stress forces developed by the ice go above the strength of PVC, the pipe or fitting will fail. The winterization process, in climates that experience freeze conditions, includes a step to "blow out" an irrigation system to remove all water. Although, strong safety warnings regarding the use of compressed air in PVC systems must be carefully heeded, this operation differs in its method and constraints.

The equipment used must provide air at a high volume, but low pressure. With enough air, you only need to have about 50 psi to blow out most systems. The piping system must have a large vent and earlier drained of as much water as possible.

NOTE

Pressurized (compressed) air or other compressed gases contain large amounts of stored energy which present serious safety hazards should a system fail for any reason.

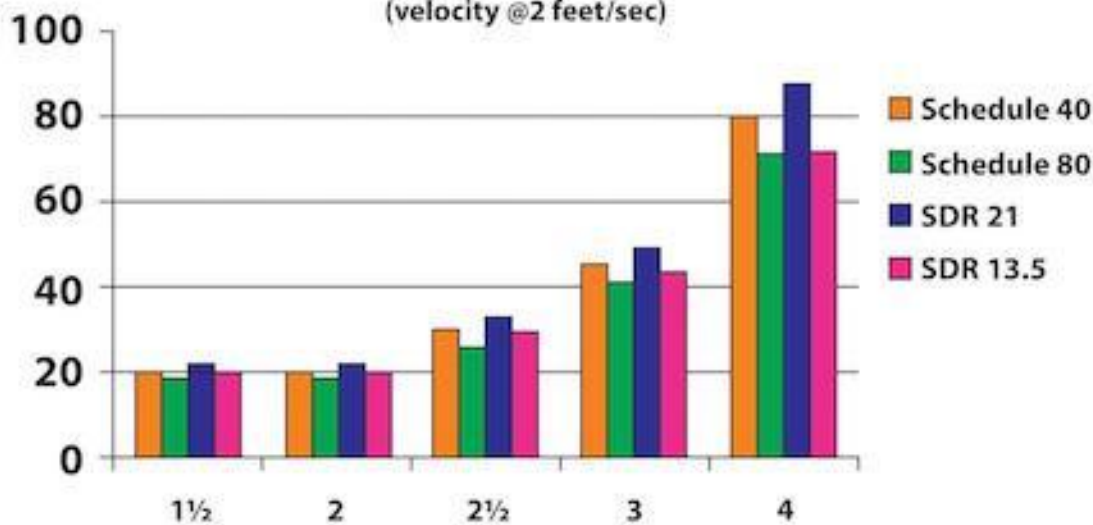
Entrapped Air

The "Springtime Started" procedure is equally essential. The refilling of a system that has been drained needs the full attention of the operator to prevent air slug and surge failures in the operation. Start by filling the system with the valve one quarter opened, until all the air within the system has been displaced. Only after all the air has been removed should the valve be opened completely. All air must be expelled from a piping system to prevent air slugs which cause pressure spikes. This is best done during the filling or refilling of a system.

Fill rate by pipe size to lower the chance of getting air in a system it is important to fill slowly from the lowest possible elevation. The flow velocity during the filling process should not exceed 2 feet per second. Be sure to allow sufficient air venting at the highest possible elevation. The combination of slow filling and ample venting will keep the amount of entrapped air to a minimum.

Fill Rate by Pipe Size

(velocity @2 feet/sec)



Bending And Mechanical Loads

PVC is known for its ability to flex and bend more than metal piping. Although this is a blessing in most situations, it can also be a cause for failures. Thermal expansion and contraction of piping, which is not buried, must be controlled to reduce any mechanical loads on the piping and fittings. The incorporation of expansion loops and offsets in the system layout are generally used. A flange is most commonly used to connect parts of differing materials within a system. Pump stations, Butterfly valves and tanks are some examples of flange type connections. Usually the flange that mates to PVC is metallic, which is a stronger and stiffer material. PVC flanges and other piping components often suffer from excessive loads during the installation process. The mating of two flanges requires that both sealing surfaces be parallel and aligned.

During the installation and tightening process, most of the loads resulting from misalignment and clamping are moved to the softer PVC. This is the reason that extra attention is needed during the installation of PVC flanges. More than once has there been a flange broken by trying to "pull" the adjoining parts into alignment with the bolts while tightening. When possible the mating flange pieces should be assembled before solvent welding the next downstream part. All bolts in the flange joint must be tightened uniformly using a tightening pattern recommended by the API. The mating faces must remain parallel within 1/16 inch during the entire tightening process.

A torque wrench must be used for the final tightening sequence. Because of slight product variations it is important to use the bolts, nuts, washers, and gasket recommended by the PVC flange manufacturer. Using the recommended tightening sequence and correct torque of the nuts will assure a secure, trouble free joint.





Correct Size Applicators

Solvent cement consists primarily of solvents (volatiles) that evaporate during curing. When the applicator is too small to apply the cement quickly, the volatiles flash off, leaving inadequate solvent to create a fusion between the pipes and fitting. This leads to a weak joint.

To prevent this, the applicator size needs to be one half of the pipe diameter.

For example, a 4 inch pipe needs a 2 inch diameter applicator. Remember! The applicators for both primer and cement need to be $\frac{1}{2}$ the diameter of the pipe being assembled.

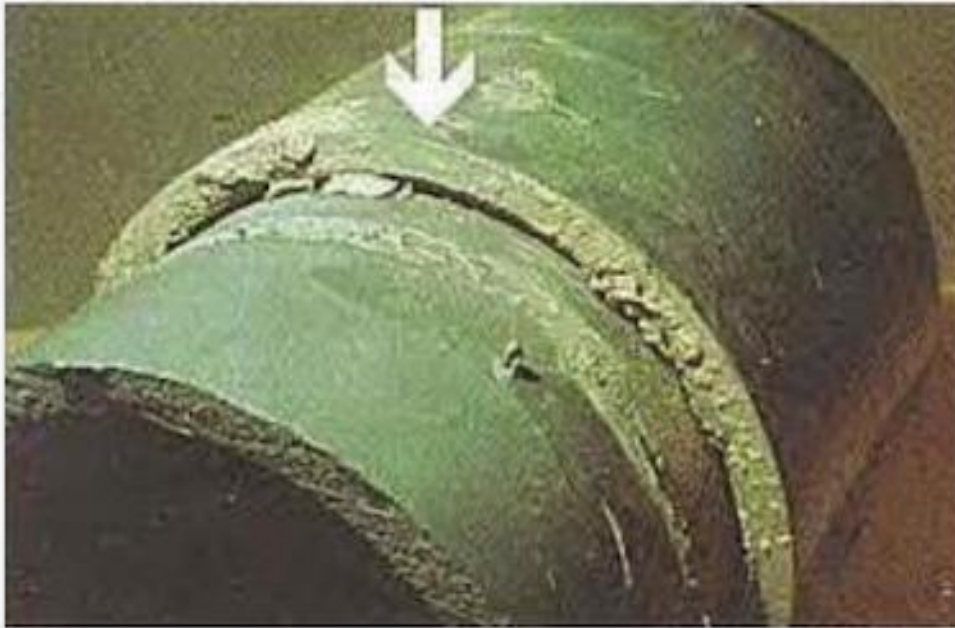
Application



The proper sequence of applying the primer and cement is important when you assemble larger sizes and necessary when you use Schedule 80 fittings.

Follow these steps in order:

- Shake or stir can of solvent cement before use.
- Always start with the fitting.
- Apply primer to the fitting socket. Next apply primer to the end of the pipe to a point $\frac{1}{2}$ inch beyond the depth of the fitting socket.
- Apply a second coat of primer to the fitting socket. Do not allow puddles of primer nor let primer run down pipe or fitting.
- With the proper size and type of applicator, and while the primed surfaces are still wet, right away and aggressively apply a full, even layer of cement to the pipe end equal to the depth of the fitting socket – do not brush it out to a thin paint type layer, as this will dry too quickly.
- Next apply a medium layer of cement in the fitting socket.
- Apply a second full layer of cement to the pipe and immediately push the parts together while rotating one eighth to one quarter turn. Do not continue to rotate after the pipe has reached the socket bottom.
- Hold the joint together for 15 to 30 seconds. (In cold weather installations, increase the hold time to prevent push off.)



Many joint failures can be attributed to the lack of a second coat of cement on the pipe. As you push the pipe into the fitting, any excess cement on the pipe will be pushed back out of the socket along the pipe, filling the tapered gap between the pipes and fitting at the socket opening.

This also cuts the possibility of cement becoming trapped, or puddled, inside the fitting. Any excess cement needs to be wiped off the exterior of the pipe at this point.

This is referred to as removing the bead of cement at the entrance of the fitting socket. Avoid puddles of primer or solvent cement inside the fitting.

Remember! Put cement on the pipe, then in the socket and a second coat on the pipe before assembling.

Many times field failures portrayed as defective parts have been found by laboratory analysis to be solvent weld failures. Often, improper solvent welding technique and assembly is the cause of the joint failure.

Exposure To Sunlight & Ultraviolet Radiation

Over the years PVC has been used in a multitude of applications above ground while being continuously exposed to the elements including Ultraviolet radiation (UV). For many years there has been concern about the ability of PVC pipe and fittings to resist the degradation influence of this exposure. The PVC compounds used in today's pipe and fittings are much improved over those that were used decades ago.

The present day formulations have improved stabilizers and UV inhibitors that resist UV breakdown that many earlier products experienced. Long exposure to UV does lead to some discoloration and chalking of the surface. This is a result of a breakdown of the molecular chain on the outermost surface. This thin surface skin in turn provides a UV shield to the PVC below, like Aluminum Oxide provides protection to the base Aluminum.

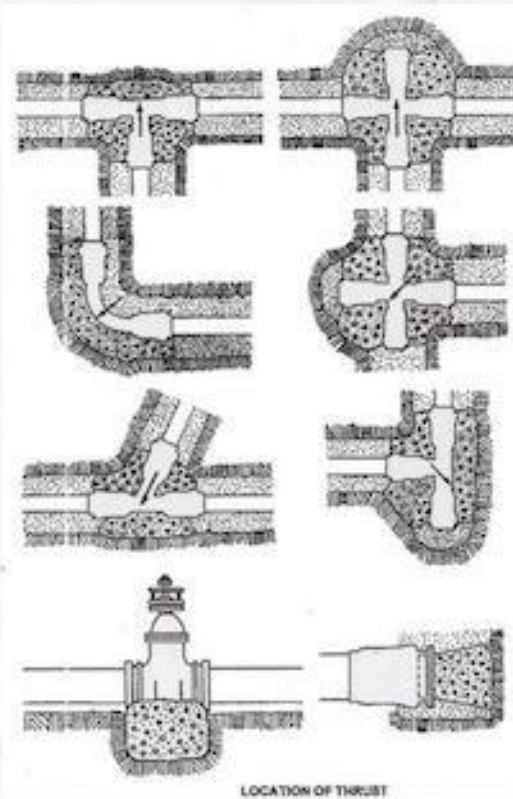
To prevent yellowing or discoloration of the pipe and fittings that are exposed to UV light you may wish to coat them with a heavily pigmented, water based exterior latex paint. Do not use a solvent or oil based paint! The color of the paint is of no particular importance, as the paint acts as an ultraviolet screen and prevents sunlight damage. White or other light color is recommended as it helps lower pipe temperature. The latex paint must be thickly applied as an opaque coating on any pipe and fittings that have been well cleaned. It is recommended to paint Gray or Schedule 80 pipe and fittings a light color to cut the absorption of solar radiation or heat into the system.

Thrust Blocking

The question is occasionally asked, "Do solvent welded systems need to be Thrust Blocked?" To answer this question we must first understand thrust blocking. Then we need to understand the differences in design between solvent welded, and Gasket (O ring) joining systems. The force of water within piping can be great enough to cause separation of certain types of joints. Thrust blocking is the procedure of placing a solid backing, such as concrete, behind a directional fitting to hold the assembly together.

In a solvent welded system, the joined parts are fused together into a self restraining entity. The same happens when a steel pipes and fittings are arc welded together. The American Society for Testing and Materials (ASTM) socket dimensions used in Schedule 40 and Schedule 80 fittings provide more than twice the socket depth necessary to constrain the thrust forces generated by the hydraulic pressure. To sum up, thrust blocking is not required on solvent welded joints.

In a Gasket or O ring joint system the parts are not welded or fused together. They remain separate entities. An O ring is needed to halt seepage of water from the connection. Because they remain separate unrestrained entities the only restraining forces that are available are O ring friction and burial load.



Yet, neither of these forces is capable of counter balancing the force created by the internal hydraulic pressure of the system. It is for this reason that thrust blocking is required on a Gasket or O ring joining system. Thrust transmitting joints that are heat fused or solvent welded, are capable of restraining maximum expected thrust forces generated by internal pressure, expansion and contraction. Gasket and other non thrust transmitting joints should be restrained by means of properly engineered external restraints or joint restraint devices.

To prevent joint disengagement of piping systems with gasket or O ring type joints, thrust restraint is necessary at certain points in the system, such as changes in direction, or terminal ends. Proper construction and placement of thrust blocking is necessary to keep joint integrity. The ability of the adjacent soil to resist the thrust forces developed is the first step in working out the size needed. The table shows the estimated bearing load each soil type will accommodate. It is important to determine the soil bearing properties by a qualified person.

The amount of thrust force generated depends on both the shape of the fitting and the hydraulic pressure in the system. For the thrust block to properly resist these forces, its bearing surface must be sufficiently large, so that bearing limit of the adjacent soil is not exceeded. This cannot be done with cinder blocks, timbers, bags of ready mix, or even a blob of concrete.



SOIL TYPE	LBS/ft ²
Muck, Peat, etc.	0
Soft Clay	500
Sand	1,000
Sand & Gravel	1,500
Sand & Gravel with Clay	2,000
Sand & Gravel Cemented Clay	4,000
Hard Pan	5,000

The thrust block must have uniform loading on the fitting surface and a soil contact surface of the proper square footage for soil, fitting and pressure.

Pipe Size (LPS)	90 Ell (LPS)	45 Ell (LPS)	Tee & End (LPS)
1 1/2	300	200	200
2	500	300	400
3	1,000	600	800
4	1,800	1,100	1,300
6	4,000	2,300	2,900
8	7,200	4,100	5,100

From above information, it is possible to compute the proper size thrust blocking to restrain the joint. To work out the total thrust bearing area on the adjacent soil, it is necessary to define the total thrust developed, divided by the bearing capacity of the undisturbed soil.

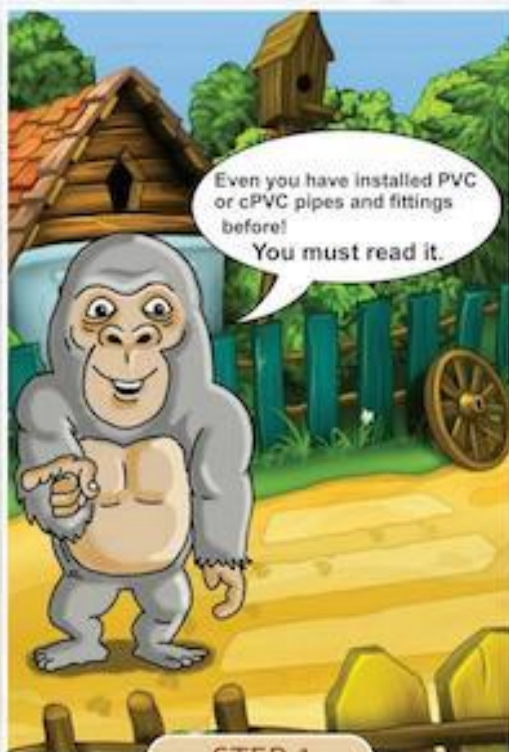
The following example shows that a thrust block with a thrust bearing surface against the adjacent soil must be 8 square feet. A bearing surface smaller will allow the joint to move and possibly leak or fail.

Example

Work out the thrust block size needed for a 6 inch 90° elbow, in sandy soil and a maximum test pressure of 200 psi.

$$\begin{aligned}
 \text{Thrust bearing surface area} &= \text{Total Thrust} / \text{Soil Bearing Load} \\
 &= (4,000 \text{ LBS} \times 2) / 1,000 \text{ LBS} / \text{ft}^2 \\
 &= 8 \text{ft}^2
 \end{aligned}$$

INSTALLATION GUIDANCE OF PVC



STEP 1



STEP 2

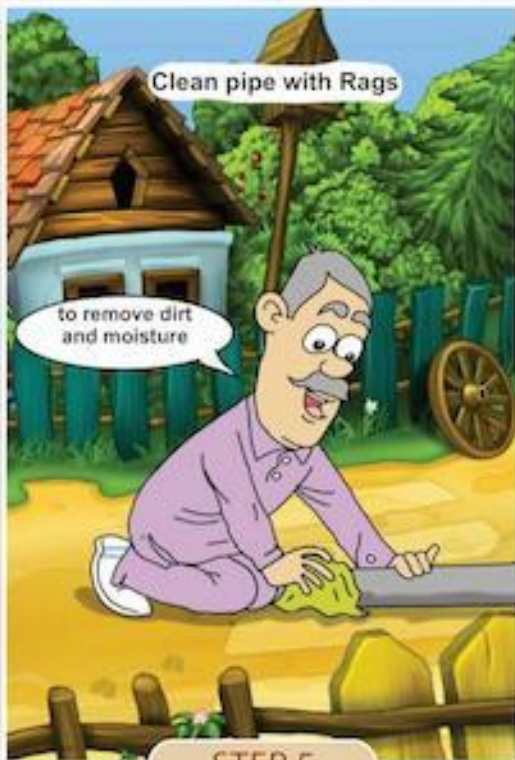


STEP 3

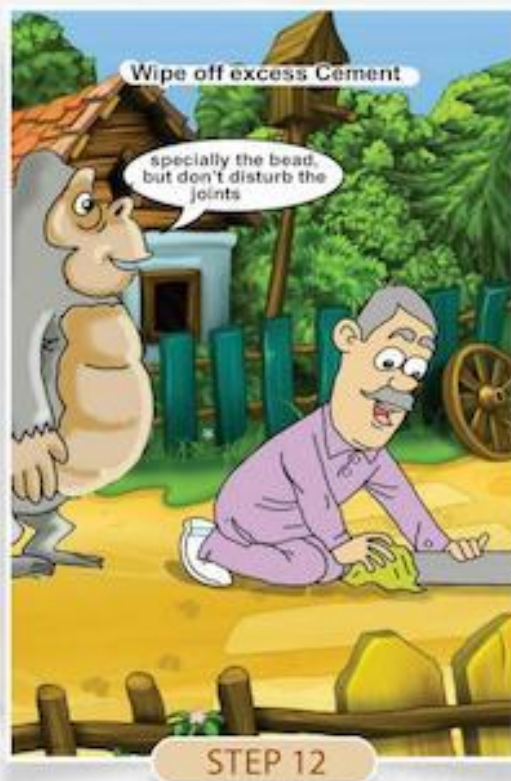
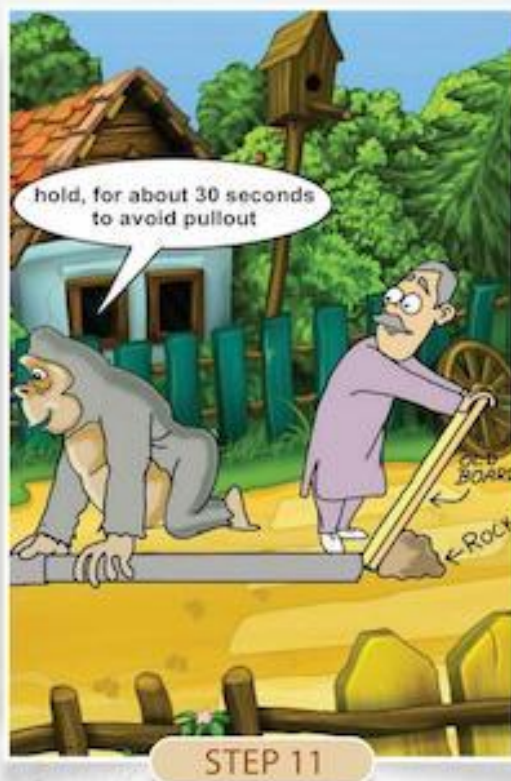


STEP 4

INSTALLATION GUIDANCE OF PVC



INSTALLATION GUIDANCE OF PVC



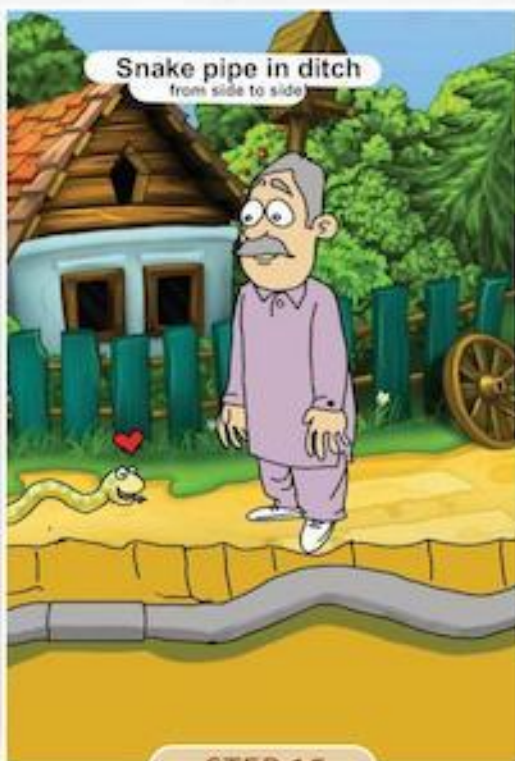
INSTALLATION GUIDANCE OF PVC



STEP 13



STEP 14

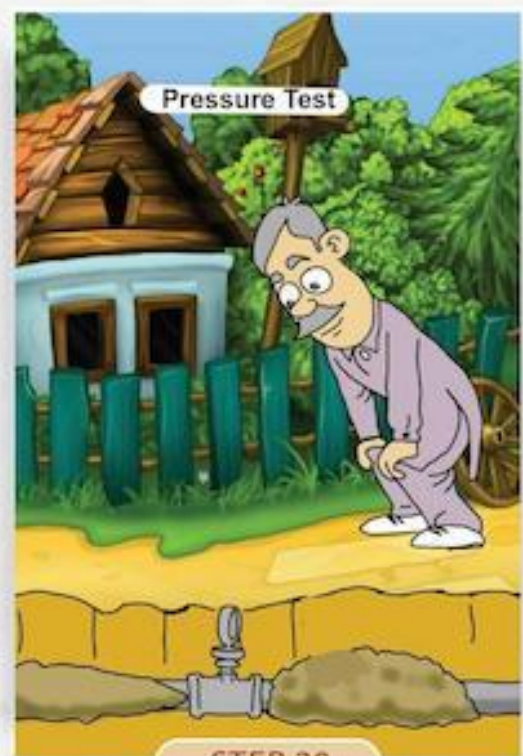
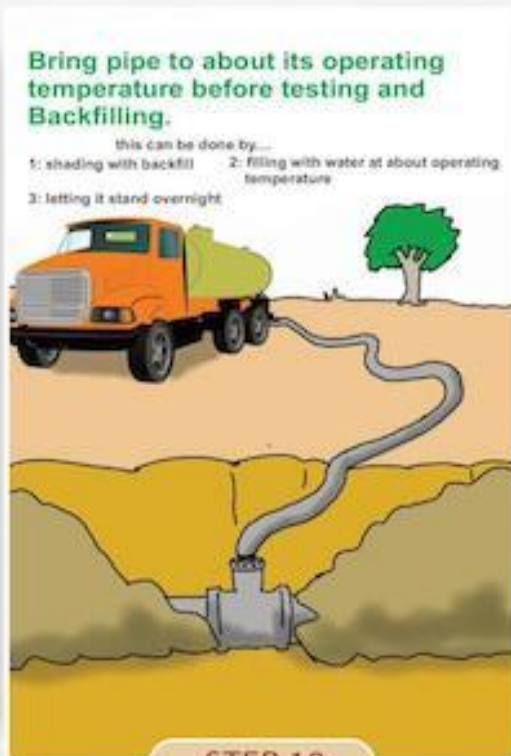
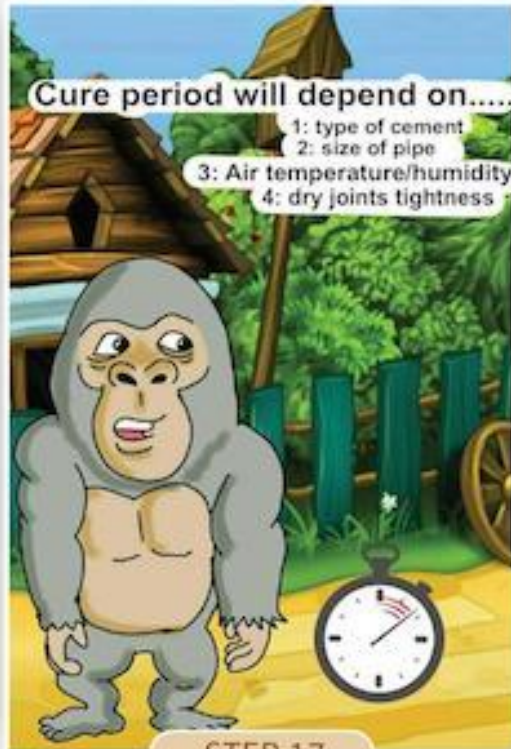


STEP 15

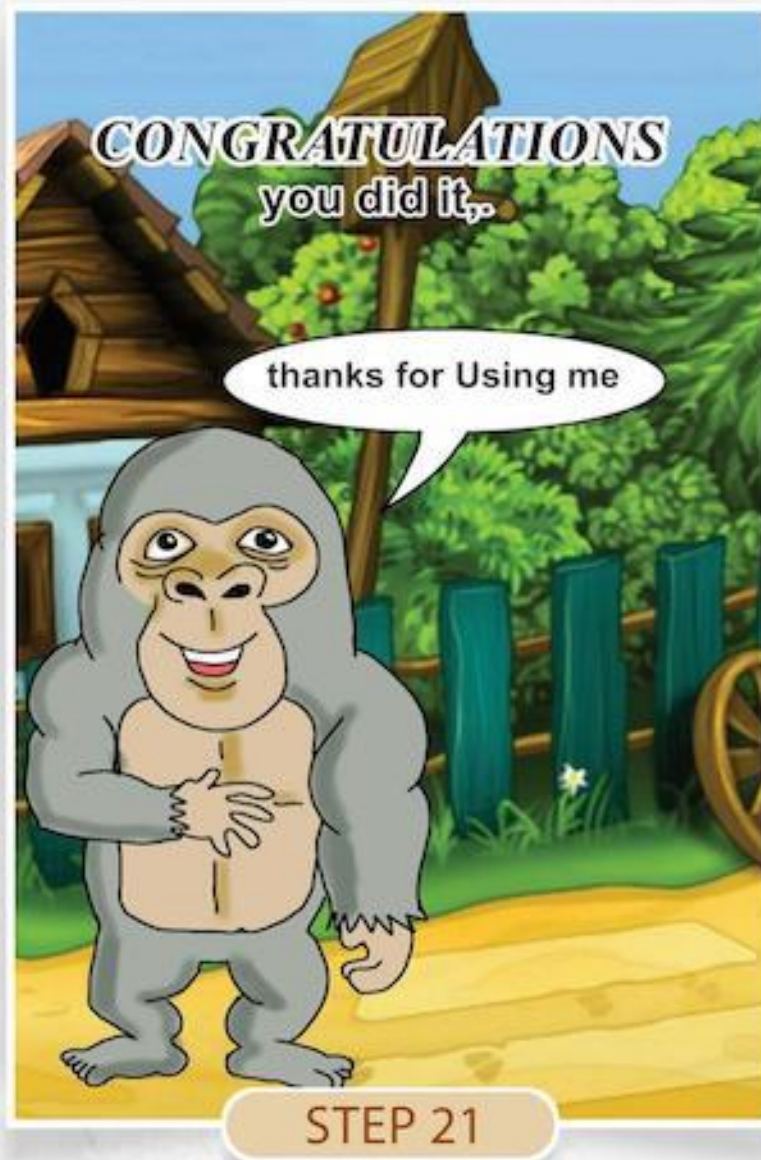


STEP 16

INSTALLATION GUIDANCE OF PVC



INSTALLATION GUIDANCE OF PVC



PPR-C



Our PPR-C PIPES & FITTINGS is a versatile, and comprehensive system for water and other fluid delivery, is used in applications of pressurized warm or cold water in all modern residential, commercial, and industrial applications. The creative solutions provided by our product base renders it a leader in the construction industry. PPR-C piping system is an ultimate solution for transportation of water and other fluids, used in applications of pressurized hot and cold water delivery as well as under floor heating in all modern residential apartments, commercial buildings and various industries due to their high resistance to high temperature and pressure. A random copolymer grade of polypropylene called PPR-C was especially developed for engineering applications with certain stringent requirements. PPR-C is characterized by excellent physical and chemical properties even at elevated temperatures. Compression strength, elasticity, corrosion, chemical and heat resistance are just some of these properties. Our PPR-C piping system has proven its high resilience even at the most extreme conditions. The extent of the preventive measures depends on the kind of installation. PPR-C-pipes and fittings comply with the requirements of the fire classification (normal inflammable). Compared to natural products like wood, cork, wool, piping system does not produce any gas toxicity. Therefore, in case of fire, there is no risk of dioxin emissions.

Pressure, temperature & time are the main factors that should be considered when measuring conditions and durability. The service life of our Pipe System depends on the internal hoop stress over time subject to the temperature. The following table provides detailed information regarding the permissible pressure of various pipe pressure ratings at various temperatures. These values are derived from a hoop stress chart and formula. Under normal pressures and conditions, the average service life of our pipes is projected to be more than 50 years.

Due to low thermal conductivity, Pipe System reaches their operating temperature much faster than metal piping systems do. Thus, less energy is wasted in heating the pipes and less insulation is needed. Pipe System is suitable for transporting hot and cold fluids under pressure for long periods of time. This capability makes it ideal for construction of water supply, heating and air-conditioning systems, in residential and industrial buildings.

It also suitable for transporting fluids for human consumption, industrial fluids and compressed air supply. Our potable water is one of the best controlled commodity goods. The domestic supply system should influence the water on its way up to the taps as little as possible. Choosing the right domestic water pipe system and its material is of decisive importance. Our Piping system is suitable for all different qualities of potable water.

Linear Expansion

The difference of temperature during installation and under service conditions, i.e. a medium flows through the system at a different temperature to that prevailing during the installation period, results in linear changes expansion or contraction. In polypropylene applications material flexibility is used for linear compensations. Pipe bends are also used for these purposes. A suitable compensation technique is the one where the pipeline is deflected perpendicularly to the original route and a free compensating length (marked as L_s) is left at the normal line. The value of L_s compensating length will depend on calculated route extension (shortening), pipe material and diameter.

Raw Material Performance

The raw material of the PPR-C choose the chemical raw material industrial chemicals of South Korea, Taiwan and Europe. This raw material is generally recognized by the professionals of this industry as one of the stratosphere PPR-C raw material in the world, it's predominant performance and stability establish the status of high quality of API rigidity over steady PPR-C pipe fitting in the market.

Connection

The Connection between the metal rigidity over steady PPR-C pipes and the matched PPR-C pipe adopts the method of hot melt. Do shuck of the cover of PPR-C by the use of tools for specific production before the connection and wipe off clean. The extrinsic feature of the PPR-C pipe fitting is designed on the base of refer to the famous brands of external and combined with the culture feature of Pakistan by the profession industrial designer of our company, which have the feature of concision and elegance, beautiful and face in good taste.

General Principles

We especially design this regulations in order to let the design and construction of the rigidity over PPR-C piping system project can be done live up to the advanced technique, economical and reasonable, safe and sanitary, and guarantee the engineering quality. This regulation applies to the design and construction of life service pipe, hot water supply pipes in industry and civilian constructions. This regulation does not apply to the fire supply system; does not connect with fire supply pipe in the buildings. The design and construction of the rigidity over steady PPR-C piping project should not only accord with this regulation, but also accord with the national related standards and regulations those are currently in effect, such as PSQCA and DIN.

Technical Terms

Working Pressure

The pressure needed the long safety running of the water supply system. The nominal pressure of the piping be selected during the design should bigger than the working pressure.

Permitted Pressure

At some medium temperature, in order to guarantee a certain service life, the biggest pressure that the piping system can support. The permitted pressures of the rigidity over steady PPR-C Pipes have some concern with the temperature of the water and the service life.

Nominal Pressure

When the tubes and pipes are used at the temperature of the water is 20 to 50 degree centigrade, and the service life is fifty years for PPR-C Pipe and eighty years for PPR-C/GF/PPR-C pipes, the permitted pressure that are counted by MPa.

Natural Compensation

Make use of natural bending during the laying of the tubes and pipes to absorb the distortion of the pipes caused by the difference in temperature, which is called natural compensation.

Free Arm

During the Natural Compensation, make use of the cantilever displacement of the break angle part; absorb the shrinking distortion at the location from the fixation point to the conversion. This correspondent cornering part is called free arm.

Hot Melt Connection

When the tubes and pipes made by the same thermo plastics are connected with the pipe the special purposes hot melt tools to heat the surface of the connection part, and directly do the hot melt and socket, which can be connected as one after cooling.

Design General Policy Conditions

The selection of the structure water supply rigidity over steady PPR-C pipes should be defined according to the water temperature of the continuous duty, the working pressure and the service life. The structure water supply rigidity over steady PPR-C pipes should be hidden lying mode includes directly burying indirectly burying. When the pipes are laid with the form of clear laying and indirectly burying hidden lying, the technique measure of the temperature distortion of the pipes should be take into account, in the condition of directly burying and hidden laying it should corresponded with the construction and the texture, and take some corresponded conservatory measures. The connection form of the pipes should be selected according to the laying mode and other factors. The pipes of clear laying and indirectly burying are suitable to be connected with hot melt, the connection with metal pipes are the water utilization should adopt screw thread are flanged connection, the directly burrieng pipes should be connected with hot melt.



Arrangement And Laying Of Piping

When the temperature is lower than 0, the shock resistance of the rigidity over steady PPR-C pipes is not so good, and riser arranged in house, hall of residence and other public places are easy to be destroyed, so the water supply riser arranged in public places are better to be laid in the conduit shaft. The service pipes those are clear laid not should be arranged at the corner formed by two walls, the side of wall or the side of stand column near to the plumbing fixtures, the water supply volume of which is The service pipes those are clear laid not be allowed to across bedroom, storage room and air flue, and wind tunnel. The service pipes should keep away from heat source include: water heater, cooking utensils, boiler and hot water pipes and so on, the clear distance between the riser and the water heater or the edge of kitchen range should not be less than 400mm, when the condition is not be equipped with the thermal insulation conservatory measures should be done, but the least clear distance should not be less than 200mm. If the pipes are directly buried in the wall or the surface layer of the floor on grade, as the well or the cement ground in the floor on grade will restrict the thermal expansion of the pipes, so we cannot take the vertical shrinking compensation into account. In a general way, the thickness of the floor on grade is only 50mm, so we define that the outside diameter should, pn 25, if the thickness of the surface layer is less than 50mm, then the outside diameter of the directly buried pipes should be reduced un correspond. The directly buried hidden pipes must be connected with the model of hot melt connection. The pipes those are arranged in the surface layer of the floor on grade, should have position fixing dimension, and are better to be laid along the wall, in order to avoid destroying the pipes during the second decoration. If the pipes have the possible to be destroyed, the local of the pipes should be protected with sleeves. If the pipeline crossing the outer wall of the basement and other places which have the requirement of waterproof, there should be set rigidity or flexibility steeliness waterproof, there should be set reliable measure to anti seepage and fixation. When the water pot, water tank is connected with ball cock and other feed-eater equipment's, there should be reliable fixation measures, the ball cock and other feed-eater equipments and the weight should not be put on the pipes. The connection between horizon main pipe and horizon branch pipe, the connection between horizon main pipe and riser, the connection between the riser and the branch pipe of every layer, all should consider the measure to make sure the pipe should not be impacted by each other during the shrinking.

PPR-C Chemical Endurance

RE-AGENT	CONCENTRATION	TEMPERATUR DEGREE		
		20	60	100
di-ethyl ether	100%	G	S	-
di-ethylene glycol	100%	G	G	-
di-glycolic acid	sat.sol	G	-	-
di-isooctyl phthalate	100%	G	S	-
di-methylamine	100%	G	-	-
di-methylformamide	100%	G	G	-
di-octyl phthalate	100%	S	S	-
dioxan	100%	S	S	-
ethanalamine	100%	G	-	-
ethylalcohol(ethanole)	up to 95 %	G	G	G
ethylene chloride	100%	S	S	-
ethyleneglycole	100%	G	G	G
formaldehyde	40%	G	-	-
formic acid	10%	G	G	S
formic acid	85%	G	NS	NS
formic acid (anhydrous)	100%	G	S	S
fructose	sol.	G	G	G
fruit juice		G	G	G
glucose	20%	G	G	G
glycerine	100%	G	G	G
glycolice acid	30%	G	-	-
hexane	up to 48%	G	S	-
hydrobromic acid	2-7%	G	S	NS
hydrochloric acid	10-20%	G	G	G
hydrochloric acid	30%	G	G	-
hydrochloric acid	33-36%	G	S	S
hydrochloric acid	100%	G	-	-
hydrochloric acid, gas, dry	dil. sol.	G	G	-
hydrofluoric acid	40%	G	-	-
hydrifluoric acid	100%	G	-	-
hydrogen	up to 10%	G	-	-
hydrogen peroxide	up to 30%	G	-	-
hydrogen peroxide	100%	G	s	-
hydrogen sulphide, gas, dry		G	G	-
iodine(alcoholic solution)		G	-	-
isopropylalcohol	100%	G	G	G

PPR-C Chemical Endurance

RE-AGENT	CONCENTRATION	TEMPERATUR DEGREE		
		20	60	100
acetic anhydride	100%	G	-	-
acetic di-tri-chloroacetic	sol.	G	-	-
acetic glacial acid	up to 40%	G	G	-
acetic glacial acid	50%	G	G	S
acetic glacial acid	over 96%	G	S	NS
acetone	100%	G	G	-
acetophenone	100%	G	S	-
acrylonitrile	100%	G	-	-
air	-	G	G	G
almond-oil	-	G	-	-
alum	sol.	G	-	-
ammonia(gas)	100%	G	-	-
ammonia(saturated)	100%	G	-	-
ammonia liquor	up to 30%	G	-	-
ammonium acetate	Sat. Sol.	G	G	-
ammonium bicarbonate	Sat. Sol.	G	G	-
ammonium chloride	Sat. Sol.	G	-	-
ammonium fluoride	sol.	G	G	-
ammonium hydroxide	sol.	G	-	-
ammonium metaphosphate	Sat. Sol.	G	G	G
ammonium nitrate	Sat. Sol.	G	G	G
ammonium phosphate	Sat. Sol.	G	-	-
ammonium sulphate	Sat. Sol.	G	G	G
amyl acetate	100%	S	-	-
amyl alcohol	100%	G	G	G
aniline	100%	G	G	-
anisole	100%	S	-	-
apple juice	-	G	-	-
barium carbonate	Sat. Sol.	G	G	G
barium chloride	Sat. Sol.	G	G	G
barium hydroxide	Sat. Sol.	G	G	G
barium sulphate	Sat. Sol.	G	G	G
benzoic acid	Sat. Sol.	G	-	-
benzoyl chloride	100%	S	-	-
benzyl alcohol	100%	G	S	-
borax	sol.	G	G	-

PPR-C Chemical Endurance

RE-AGENT	CONCENTRATION	TEMPERATUR DEGREE		
		20	60	100
acetic anhydride	100%	G	-	-
acetic di-tri-chloroacetic	sol.	G	-	-
acetic glacial acid	up to 40%	G	G	-
acetic glacial acid	50%	G	G	S
acetic glacial acid	over 96%	G	S	NS
acetone	100%	G	G	-
acetophenone	100%	G	S	-
acrylonitrile	100%	G	-	-
air	-	G	G	G
almond-oil	-	G	-	-
alum	sol.	G	-	-
ammonia(gas)	100%	G	-	-
ammonia(saturated)	100%	G	-	-
ammonia liquor	up to 30%	G	-	-
ammonium acetate	Sat. Sol.	G	G	-
ammonium bicarbonate	Sat. Sol.	G	G	-
ammonium chloride	Sat. Sol.	G	-	-
ammonium fluoride	sol.	G	G	-
ammonium hydroxide	sol.	G	-	-
ammonium metaphosphate	Sat. Sol.	G	G	G
ammonium nitrate	Sat. Sol.	G	G	G
ammonium phosphate	Sat. Sol.	G	-	-
ammonium sulphate	Sat. Sol.	G	G	G
amyl acetate	100%	S	-	-
amyl alcohol	100%	G	G	G
aniline	100%	G	G	-
anisole	100%	S	-	-
apple juice	-	G	-	-
barium carbonate	Sat. Sol.	G	G	G
barium chloride	Sat. Sol.	G	G	G
barium hydroxide	Sat. Sol.	G	G	G
barium sulphate	Sat. Sol.	G	G	G
benzoic acid	Sat. Sol.	G	-	-
benzoyl chloride	100%	S	-	-
benzyl alcohol	100%	G	S	-
borax	sol.	G	G	-

PPR-C Chemical Endurance

RE-AGENT	CONCENTRATION	TEMPERATUR DEGREE		
		20	60	100
boric acid	sat. sol.	G	-	-
butane	100%	G	-	-
butanol	100%	G	S	S
butylglycol	100%	G	-	-
butylphenol	cold sat. sol.	G	-	-
butyl phtalate	100%	G	S	S
calcium carbonate	sat. sol.	G	G	G
calcium chloride	sat. sol.	G	G	G
calcium hydroxide	sat. sol.	G	G	-
calcium hypochlorite	sol.	G	-	-
calcium nitrate	sat. sol.	G	G	-
carbon dioxide, gaseous, dry	100%	G	G	-
carbon dioxide, gaseous, wet		G	G	-
carbon di-sulphide	100%	G	G	-
carbon tetrachloride	100%	G	G	-
castor-oil	100%	G	G	-
chlorine water	sat. sol.	G	S	-
chloroethanol	100%	G	-	-
chrome alum	sol.	G	G	
chromic acid	up to 40%	G	S	NS
citric acid	10%	G	G	G
coconut-oil		G	-	-
corn-oil		G	S	-
cottn-oil		G	G	-
cresol	over90%	G		-
cupric chloride	sat. sol.	G	G	-
cupric nitrate	30%	G	G	G
cupric sulphate	sat. sol.	G	G	-
cyclohexane	100%	G		-
cyclohexanol	100%	G	S	-
dextrin	sol.	G	G	-
dextrose	sol.	G	G	-
di-butyl phtalate	100%	G	S	NS
di-chloroacetic acid	100%	S		-
di-chloroethylene	100%	S	-	-
di-ethanolamine	100%	G	-	-

PPR-C Chemical Endurance

RE-AGENT	CONCENTRATION	TEMPERATUR DEGREE		
		20	60	100
Phosphoric Acid	uo to 85%	G	G	G
Phosphoric Oxychloride	100%	S	-	-
Picric Acid	sat. sol.	G	-	-
Potassium Bicarbonate	sat. sol.	G	G	-
Potassium Borate	sat. sol.	G	G	-
Potassium Bromate	upto 10%	G	G	-
Potassium Bromiate	sat. sol.	G	G	-
Potassium Carbonate	sat. sol.	G	-	-
Potassium Chlorate	sat. sol.	G	G	-
Potassium Chloride	sat. sol.	G	-	-
Potassium Chromate	sat. sol.	G	G	-
Potassium Cyanide	sol.	G	-	-
Potassium Flouride	sat. sol.	G	G	-
Potassium hydroxide	up to 50%	G	G	G
Potassium iodide	sat. sol.	G	-	-
Potassium Nitrate	sat. sol.	G	G	-
Potassium Perchlorate	10%	G	G	-
Potassium Permanganate	2N	G	-	-
Potassium Persulphate	sat. sol.	G	-	-
Potassium Sulphate	sat. sol.	G	-	-
Propane	100%	G	-	-
Propionic Acid	over 50%	G	-	-
Pyridine	100%	S	-	-
Silicone Oil		G	G	G
Silver	sat. sol.	G	G	S
Sodium acatate	sat. sol.	G	G	G
Sodium Bensoate	35%	G	-	-
Sodium Bicarbonate	sat. sol.	G	G	G
Sodium BISULFITE	sol.	G	-	-
Sodium Bisulphate	sat. sol.	G	G	-
Sodium Carbonate	up to 50%	G	G	S
Sodium Chlorate	sat. sol.	G	-	-
Sodium Chlorade	10%	G	G	G
Sodium Chlorite	2%	G	S	NS
Sodium Chlorite	20%	G	S	NS
Sodium dichromate	sat. sol.	G	G	G

PPR-C Chemical Endurance

RE-AGENT	CONCENTRATION	TEMPERATUR DEGREE		
		20	60	100
Sodium Hydroxide	1%	G	G	G
Sodium Hydroxide	up to 60%	G	G	G
Sodium Hypochlorite	5%	G	G	-
Sodium Hypochlorite	10%	G	-	-
Sodium Hypochlorite	20%	G	S	-
Sodium Metaphosphate	sol.	G	-	-
Sodium nitrate	sat. sol.	G	G	-
Sodium ortho - phosphate	sat. sol.	G	G	G
Sodium perborate	sat. sol.	G	-	-
Sodium silicate	sol.	G	G	-
Sodium sulfide	sat. sol.	G	-	-
Sodium sulfite	40%	G	G	G
Sodium sulphate	sat. sol.	G	G	-
Sodium thiosulphate	sat. sol.	G	-	-
Soybean- Oil		G	S	-
Stannic Chloride	sat. sol.	G	G	-
Succinic acid	sat. sol.	G	G	-
Sulphur dioxide. dry	100%	G	-	-
Sulphur dioxide. wet	100%	G	-	-
Sulphuric Acid	up to 10%	G	G	G
Sulphuric Acid	10-30%	G	G	-
Sulphuric Acid	50%	G	G	G
Sulphuric Acid	96%	G	S	NS
Sulphurous Acid	sol.	G	-	-
Tartaric Acid	10%	G	G	-
Thiophene	100%	G	S	-
Trichloroacetic Acid	up to 50	G	G	-
Triethanolamine	sol.	G	-	-
Urea	sat. sol.	G	-	-
Vineger		G	G	-
Water. Brackish		G	G	G
Water Distilled	100%	G	G	G
Water Drinkable		G	G	G
Water. Mineral		G	G	G
Water (Sea Water)		G	G	G

Why API PPR-C Pipe

- It is suitable to use up to 70 °C. (Insulation must be applied by taking the freezing point of the fluid in the pipe.)
- It has high resistance against chemical substances.
- It is corrosion resistant. Also, it is calcification and rust-free.
- They do not change the color, taste and smell of the water.
- Have smooth and bright internal surfaces.
- No diameter contraction in the welding points. Has high welding performance.
- Provides a saving of 70% in assembly and do not have assembly losses.
- Maintains heat and sound insulation.
- Environment-friendly.

PPR-C Applications

- Water supply
- Irrigation/farming/Tube wells
- Sprinkler & Drip Irrigation Systems
- Construction Industry
- Hot / Cold and chilled water piping
- Compressed Air
- Food and Beverage Processing
- Suitable for potable water.

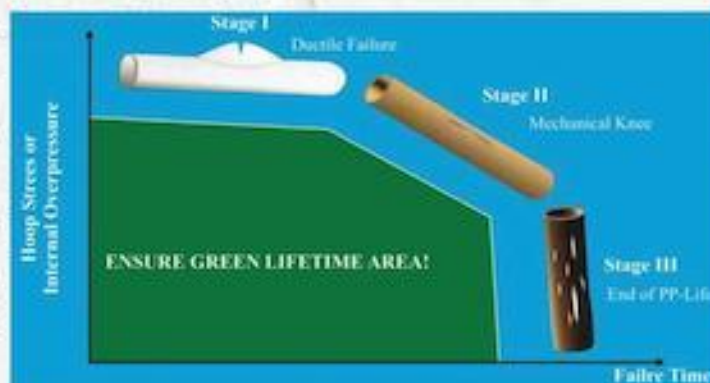
PPR-C Pipe Characteristics

- PPR-C Stands for Polypropylene Random Co-polymer
- Light in Weight
- More Flexible than other metal based pipe
- Smooth Surface, so Conserve Energy in pumping
- Resistant to environmental threats / Crack
- Good chemical resistance
- Can defy pipeline Corrosion
- Can protect form Frost & Rodent
- PPR-C stands for Polypropylene Random Copolymer
- Environmentally friendly
- Chemically Stable
- Creeping strength (Hydrostatic test),
- High temperature resistance.
- Corrosion Resistant.
- Higher flow capacities.
- Reduces energy losses

Life Curve Of Ppr-c Pipes And Fittings

PPR-C Pipes have unique lifetime according to their molecular structure, additives, andsoon.

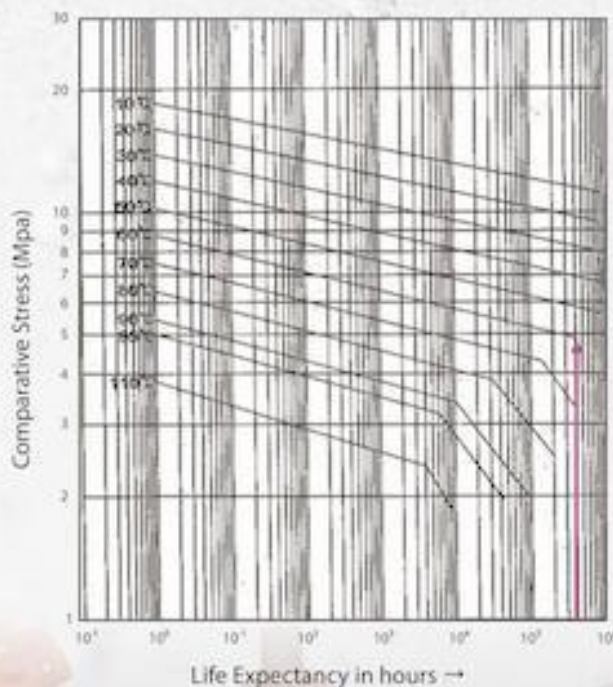
So the international standard needs long-term hydrostatic pressure test, i.e more than 8,760 hours (1year)



Working Conditions And Life Expectance Curve

The life curve establishes the average life expectancy of pipelines as a function of mechanical stress acting on the pipe walls.

Mechanical stress is in connection with pressure according to the following relation.



$$\sigma = P \times \frac{(d-e)}{2 \times e}$$

σ = Hoop stress (MPa)
 P = Internal pressure (MPa)
 D = Outside diameter (mm)
 E = Pipe wall thickness (mm)

Ex) Applying a safety factor of 1.5 at 60 °C, we obtain the max allowable working pressure continuous duty

$$4.9 = P \times \frac{(20 - 3.4)}{2 \times e} \quad P = 2.0 \text{ Mpa}$$

$$= 20 \text{ kg/cm}^2$$

Applying safety factor 1.5 = 20/1.5
 = 13.3 kg/cm²



Distribution of Color Master Batch

The optimization of the pigment is one of the critical factor when it effects impact strength as well as heat aging resistance. PPR-C material has very long molecular chain making them tough enough in processing.

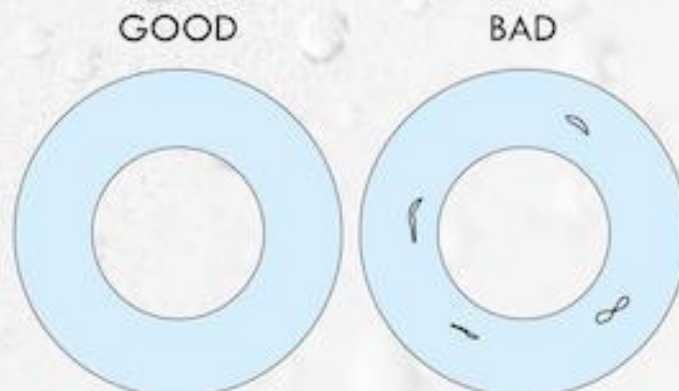
When using a color master batch and natural PPR-C resin, the distribution level achieved in the extrude is usually not acceptable. This can be seen clearly from the micro cut of a pipe cross section.

This has a similar effect to small impurities and it can cause early failures due to slow crack growth at the imperfections.

Further complications with the two component approach can arise due to incompatibility of the carrier material of the master batch and the PPR-C resin, wrong choice of the pigments by the master batch producer and handling/impurity problems at the pipe producer.

FACTORS OF DISPERSITY

Extruder Capability
Pigments
Carrier Resin



Material

The raw material of the PPR-C choose the chemical raw material industrial chemical of south korea, taiwan and europe. This raw material is generally recognise by the professional of this industry as one of the startosphere PPR-C raw materal in the world, its predominant performance and stability establish the status of high quality of API rigidity over steady PPR-C pipe fitting in the market.

Physical Properties

P R O P E R T I E S		TEST METHOD	UNIT	DATA
DENSITY		ASTM D792	g/cm 3	0.91
Melt Index	230 0 c, 2.16kg	ASTM D1238	g/10min	0.25
	190 0 c, 5.0kg			0.45
Tensile Strenght	yield point	ASTM D638	kg/cm 2	270
	break point			230
ELONGATION		ASTM D638	%	>400
FLEXURAL MODULUS		ASTM D790	kg/cm 2	8,500
Izod Impact Strenght	23 o C	ASTM D256	kg. cm/cm	30
	o C			8
	20 o C			3
VICAT SOFTENING POINT		ASTM D1525	o C	130
MELTING TEMPERATURE		HS Method	o C	141
SURFACE RESISNACE		HS Method	?	>1013
Mean coefficient of linear thermal expansion (0°C-110oc)		Dilatometer	K-1	1.5 * 10-4

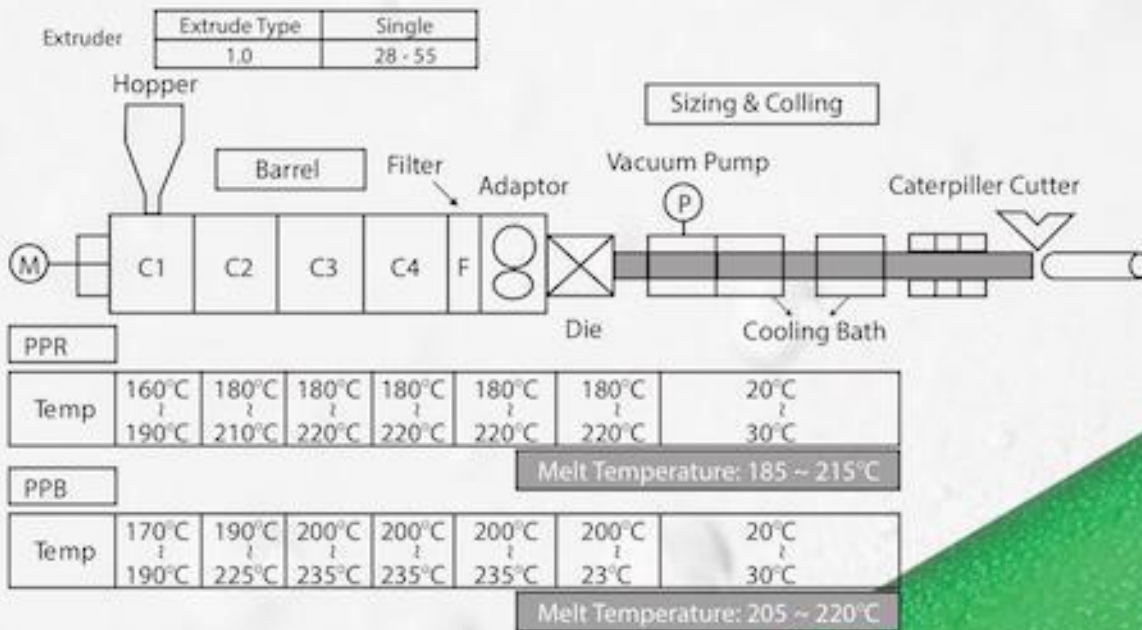
* The data of table are relative and represent empirical values obtained in various tests.

Resistance to internal hydrostatic Pressure.

CONDITION	REQUIRED	API	TEST METHOD
20	16 MPa	1 hr	>10 hrs
95	3.5 MPa	1000 hrs	>5000 hrs
110	1.9 MPa	8,760	10,000 hrs

PPR-C Processing Conditions

PPR-C EXTRUSION



The actual extrusion conditions will depend on the type of equipment and the SDR of Pipe. The above conditions may be used as a guideline for our material.



PPR-C Benefits



- Hygienically Safe (Food Grade)
- Easy to install and handle
- Least chance to conduct heat
- Scrape free
- Long Life (more than 50Years)
- Can be easily joined by mechanical (Compression Fittings) & butt fusion methods
- Reduces jointing and labor cost
- Low cost of Fittings
- Quick & Easy Installation
- Lesser number of fittings are used
- Easy connectivity over a complex network.
- Safe environment with recyclable ability.
- Nontoxic and Physiologically harmless material.
- Provide Long-life Service

Product Design

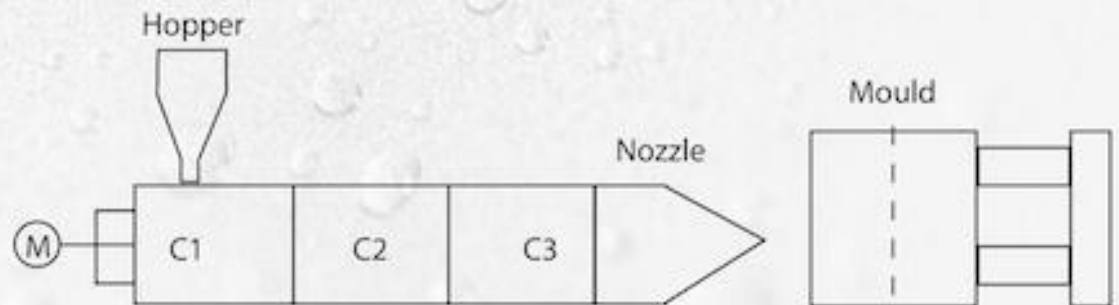


Our products especially design the state-of-the-art design at prime location, which assists us in serving customers in a quick and better manner. It includes a sophisticated manufacturing unit, which is installed with advanced machinery that assists in the efficient production of PPR-C and uPVC Pipes. The machines are operated by a team of experts having good expertise in the domain. They ensure their upkeep so as to ensure efficient semi-automatic production process.

Plastic pipes are capable of fulfilling the specific requirement for each application. They do so over a long life time and with reliability and safety. The key success factor is achieved by maintaining consistently high quality levels. Two aspects are fundamentally important for the performance of plastic pipes: flexibility and long lifetime.

Processing Conditions

INJECTION MOULDING FITTING, etc.



Temp	180°C 190°C	200°C 220°C	210°C 230°C	210°C 240°C	30°C 50°C
------	----------------	----------------	----------------	----------------	--------------

Time Condition

Cycle Time	> 50 sec
Cooling Time	> 10 sec
Holdpressure Time	80% (or 20 sec)





API



PPR-C Installation (Summary)

- Basically, the installation of the PPR-C pipe supply system does not differ from the installation of a metallic piping.
- To prevent the forming of condensate, the hot water lines shall be installed above the cold water lines.
- The piping should be assembled starting from the lowest part of the plant and moving towards the tapping point.
- In the riser, arrange for compensating devices on the top and drainage devices at the bottom.
- The fixed and sliding point clamps must wrap completely the pipes.

Please proceed the following steps for installation of PPR-C & Fittings.

Step 1

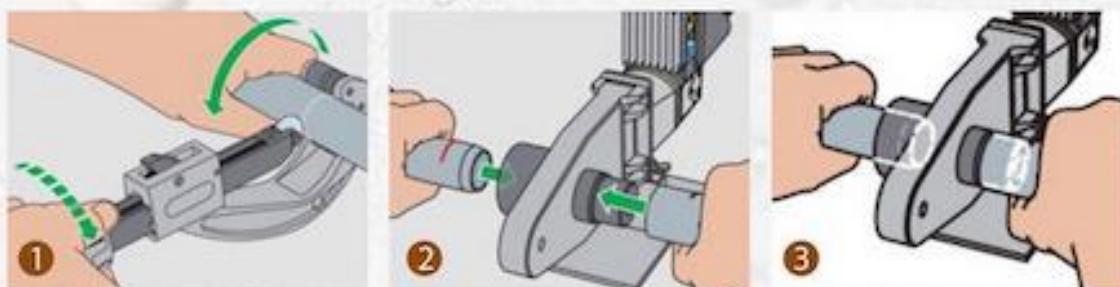
Cut the pipe with specified cutter. Keep in mind to clean the pipe and fittings before fusion.

Step 2

Push the pipe and the fittings into/on a welding tool and melt them for specific time. The exact time of warming depends on the diameter.

Step 3

Take the parts off the tool and insert the pipe carefully straight into the fitting.



PPR-C Installation (Welding)

Welding is carried out heating simultaneously via the male and female parts to be joined together. Once the welding temperature is reached, coupling is carried out to obtain a tight joint.

THERMAL FUSION WELDING TIME

PIPE DIA	DEPTH OF WELD	HEATING TIME	JOINTING TIME	COOLING TIME
o mm	mm	Sec. (Min.)	Sec. (Min.)	Minutes (Min.)
16	13	5	4	2
20	14	5	4	2
25	15	7	4	2
32	16	8	6	4
40	18	12	6	4
50	20	18	6	4
63	24	24	8	6
75	26	30	8	6
90	29	40	8	6
110	32.5	50	10	8



Pre-cautions



- Make sure that you are choosing the right jointing socket while welding the pipe with fitting
- The fusion machine should calibrate for the require temperature
- This pipe is produced only for the water supply; please never use it on any gas including natural gas
- Check the crack on pipe before you install, sometime miscarriage can cause the crack on pipe
- Perform the pressure test once you installation is complete on a project with at least 200 PSI for at least 24 hours. It can insure and report the possible joint leakage

Installation Guidance Of PPR-C



Cut the pipe on right way with Pipe Cutter.



Consolation that your joint sockets (jointing) is on your desired size, because some time joint socket (jointing) size changes due to some reason.



Hot store your welding machine on 230C°-250C°.



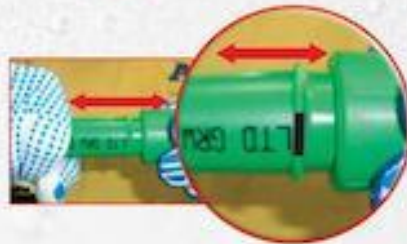
Remove all dust from inside and outside of pipe and make sure that there is no any dirt on pipe.



Now push the pipe and fitting with suitable force on welding machine joint socket (jointing).



Immediately remove pipe and fitting after desire force and insert the pipe into the fitting (jointing) it is to be clear that in this process pipe and fitting angle is on right way.



Tightly hold the pipe when inserting on to the fitting so that the angle of the pipe are not change.



Do not round the pipe into the fitting so the joint is not on wrong angle.



Leave the joint to be cool and try to not waved or touch the joint.

Remember

Joint is very important issue so that if you spend a little time on it that will be profitable for your whole life. Additional request is that after installation of PPR-C at home the pressure is 200 pounds for seven days and Console that the joint on the right way and there is no leakage. Company consoles the joint for (250-1500) pounds pressure then we delivered our products to the customer.







Pipe uPVC (Standard)

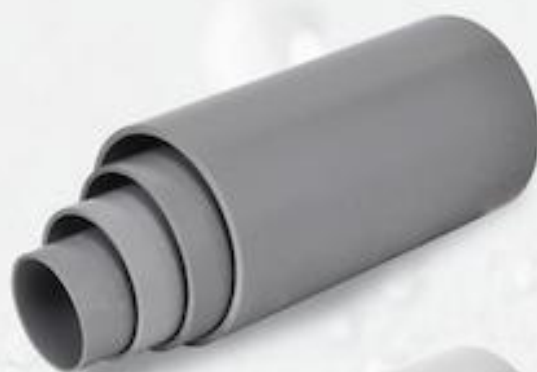
(This pipe is being supplied as per market demand and trend without taking any responsibility on company.)

Size	Conduit	Medium	C
1"	✓	✓	✓
1 1/4"	✓	✓	✓
2"	✓	✓	✓
3"	✓	✓	✓
4"	✓	✓	✓
5"	✓	✓	✓
6"	✓	✓	✓
8"	✓	✓	✓



Pipe uPVC (Pressure)

Size	B	C	D	E
2"	✗	✓	✓	✓
3"	✓	✓	✓	✓
4"	✓	✓	✓	✓
5"	✓	✓	✓	✓
6"	✓	✓	✓	✓
7"	Available on Demand			
8"	✓	✓	✓	✓



Elbow (90°)



Code	Size
8-L2"	2"
8-L3"	3"
8-L4"	4"

Elbow (45°)



Code	Size
8-L2"-45	2"
8-L3"-45	3"
8-L4"-45	4"

Reducer Elbow



Code	Size
8-L3"x2"	3"x2"
8-L4"x2"	4"x2"
8-L4"x3"	4"x3"

Plug Elbow

Code	Size
8-PL3"	3"
8-PL4"	4"



Tee Equal

Code	Size
8-T2"	2"
8-T3"	3"
8-T4"	4"



Reducer Tee

Code	Size
8-T3"x2"	3"x2"
8-T4"x2"	4"x2"
8-T4"x3"	4"x3"



Yee Equal



Code	Size
8-Y2"	2"
8-Y3"	3"
8-Y4"	4"

Reducer Yee



Code	Size
8-Y3"x2"	3"x2"
8-Y4"x3"	4"x3"

Double Yee



Code	Size
8-YY3"	3"
8-YY4"	4"

Socket Equal

Code	Size
8-S2"	2"
8-S3"	3"
8-S4"	4"



Reducer Socket

Code	Size
8-S3"x2"	3"x2"
8-S4"x2"	4"x2"
8-S4"x3"	4"x3"



End Cap

Code	Size
8-EC2"	2"
8-EC3"	3"
8-EC4"	4"



Clean Out



Code	Size
8-CO3"	3"
8-CO4"	4"



Multi Floor Trap

Code	Size
8-MFT4"	4"



Floor Waste

Code	Size
8-FW4"	4"

Plug Tee

Code	Size
8-PT3"	3"
8-PT4"	4"



Cross Tee

Code	Size
8-CT3"	3"
8-CT4"	4"



P-Trap

Code	Size
8-PTR2"	2"
8-PTR3"	3"
8-PTR4"	4"



API



Pipe PPR-C

Code	Size
XPP20	20mm
XPP25	25mm
XPP32	32mm
XPP40	40mm
XPP50	50mm
XPP63	63mm



Pipe 3 Layred

Code	Size
XGF20	20mm
XGF25	25mm
XGF32	32mm
XGF40	40mm
XGF50	50mm
XGF63	63mm



Elbow (45°)

Code	Size
XL20-45	20mm
XL25-45	25mm
XL32-45	32mm
XL40-45	40mm
XL50-45	50mm
XL63-45	63mm



Elbow (90°)



Code	Size
XL20	20mm
XL25	25mm
XL32	32mm
XL40	40mm
XL50	50mm
XL63	63mm

Elbow Reducer



Code	Size
XL2520	25x20
XL3225	32x25
XL4032	40x32
XL4025	40x25
XL5032	50x32
XL5040	50x40
XL6350	63x50
XL6340	63x40
XL6332	63x32
XL6325	63x25

Elbow Male



Code	Size
XL2012M	20x1/2"
XL2512M	25x1/2"
XL2534M	25x3/4"
XL3212M	32x1/2"
XL3234M	32x3/4"
XL3201M	32x1"

Elbow Female

Code	Size
XL2012F	20x1/2"
XL2512F	25x1/2"
XL2534F	25x3/4"
XL3212F	32x1/2"
XL3234F	32x3/4"
XL3201F	32x01"
XL401 1/4F	40x1 1/4"
XL501 1/2F	50x1 1/2"
XL6302F	63x02"



Socket

Code	Size
XS20	20mm
XS25	25mm
XS32	32mm
XS40	40mm
XS50	50mm
XS63	63mm



Tee Equal

Code	Size
XT20	20mm
XT25	25mm
XT32	32mm
XT40	40mm
XT50	50mm
XT63	63mm



Socket Reducer



Code	Size
XS2520	25x20
XS3225	32x25
XS4032	40x32
XS4025	40x25
XS5040	50x40
XS5032	50x32
XS6350	63x50
XS6340	63x40
XS6332	63x32
XS6325	63x25

Socket Female



Code	Size
XS2012F	20x1/2"
XS2512F	25x1/2"
XS2534F	25x3/4"
XS3212F	32x1/2"
XS3234F	32x3/4"
XS3201F	32x01"
XS401 1/4F	40x1 1/4"
XS501 1/2F	50x1 1/2"
XS6302F	63x02"

Socket Male



Code	Size
XS2012M	20x1/2"
XS2512M	25x1/2"
XS2534M	25x3/4"
XS3212M	32x1/2"
XS3234M	32x3/4"
XS3201M	32x01"

Tee Reducer

Code	Size
XT2520	25x20
XT3225	32x25
XT4032	40x32
XT4025	40x25
XT5040	50x40
XT5032	50x32
XT6350	63x50
XT6340	63x40
XT6332	63x32
XT6325	63x25



Tee Female

Code	Size
XT2012F	20x1/2"
XT2512F	25x1/2"
XT2534F	25x3/4"
XT3212F	32x1/2"
XT3234F	32x3/4"
XT3201F	32x01"
XT4011/4F	40x1 1/4"
XT5011/2F	50x1 1/2"
XT6320F	63x02"



Tee Male

Code	Size
XT2012M	20x1/2"
XT2512M	25x1/2"
XT2534M	25x3/4"
XT3212M	32x1/2"
XT3234M	32x3/4"
XT3201M	32x01"



Cross Tee



Code	Size
XCT25	25mm
XCT32	32mm

Mixer Elbow



Code	Size
XM2512	25x1/2"
XM3212	32x1/2"

Union PPRC



Code	Size
XU20	20mm
XU25	25mm
XU32	32mm
XU40	40mm
XU50	50mm
XU63	63mm

Over Cross

Code	Size
XOC20	20mm
XOC25	25mm
XOC32	32mm
XOC40	40mm
XOC50	50mm
XOC63	63mm



V Over Cross

Code	Size
XVOC25	25mm
XVOC32	32mm



End Cap

Code	Size
XEC20	20mm
XEC25	25mm
XEC32	32mm
XEC40	40mm
XEC50	50mm
XEC63	63mm



End Plug



Code	Size
XEP12	1/2"
XEP34	3/4"
XEP01	1"
XEP1 1/4	1 1/4"
XEP1 1/2	1 1/2"
XEP02	2"

Gate Valve Plastic



Code	Size
XGVP25	25mm
XGVP32	32mm

Gate Valve Metal



Code	Size
XGVM20	20mm
XGVM25	25mm
XGVM32	32mm

Gate Valve Under Ground

Code	Size
XGVU25	25mm
XGVU32	32mm



Gate Valve Commercial

Code	Size
XGV40	40mm
XGV50	50mm
XGV63	63mm



Ball Valve

Code	Size
XBV20	20mm
XBV25	25mm
XBV32	32mm





API

Pipe PPR-C

Code	Size
1-PP20	20mm
1-PP25	25mm
1-PP32	32mm
1-PP40	40mm
1-PP50	50mm
1-PP63	63mm



Pipes Fiber

Code	Size
1-GF20	20mm
1-GF25	25mm
1-GF32	32mm
1-GF40	40mm
1-GF50	50mm
1-GF63	63mm



Elbow (45°)

Code	Size
1-L20-45	20mm
1-L25-45	25mm
1-L32-45	32mm
1-L40-45	40mm
1-L50-45	50mm
1-L63-45	63mm





Elbow (90°)

Code	Size
1-L20	20mm
1-L25	25mm
1-L32	32mm
1-L40	40mm
1-L50	50mm
1-L63	63mm



Elbow Reducer

Code	Size
1-L2520	25x20
1-L3225	32x25
1-L4032	40x32
1-L4025	40x25
1-L5032	50x32
1-L5040	50x40
1-L6350	63x50
1-L6340	63x40
1-L6332	63x32
1-L6325	63x25



Elbow Male

Code	Size
1-L2012M	20x1/2"
1-L2512M	25x1/2"
1-L2534M	25x3/4"
1-L3212M	32x1/2"
1-L3234M	32x3/4"
1-L3201M	32x01"

Elbow Female

Code	Size
1-L2012F	20x1/2"
1-L2512F	25x1/2"
1-L2534F	25x3/4"
1-L3212F	32x1/2"
1-L3234F	32x3/4"
1-L3201F	32x01"
1-L4011/4F	40x1 1/4"
1-L5011/2F	50x1 1/2"
1-L6302F	63x02"



Socket

Code	Size
1-S20	20mm
1-S25	25mm
1-S32	32mm
1-S40	40mm
1-S50	50mm
1-S63	63mm



Tee Equal

Code	Size
1-T20	20mm
1-T25	25mm
1-T32	32mm
1-T40	40mm
1-T50	50mm
1-T63	63mm



Socket Reducer



Code	Size
1-S2520	25x20
1-S3225	32x25
1-S4032	40x32
1-S4025	40x25
1-S5040	50x40
1-S5032	50x32
1-S6350	63x50
1-S6340	63x40
1-S6332	63x32
1-S6325	63x25

Socket Female



Code	Size
1-S2012F	20x1/2"
1-S2512F	25x1/2"
1-S2534F	25x3/4"
1-S3212F	32x1/2"
1-S3234F	32x3/4"
1-S3201F	32x01"
1-S401 1/4F	40x1 1/4"
1-S501 1/2F	50x1 1/2"
1-S6302F	63x02"

Socket Male



Code	Size
1-S2012M	20x1/2"
1-S2512M	25x1/2"
1-S2534M	25x3/4"
1-S3212M	32x1/2"
1-S3234M	32x3/4"
1-S3201M	32x01"

Tee Reducer

Code	Size
1-T2520	25x20
1-T3225	32x25
1-T4032	40x32
1-T4025	40x25
1-T5040	50x40
1-T5032	50x32
1-T6350	63x50
1-T6340	63x40
1-T6332	63x32
1-T6325	63x25



Tee Female

Code	Size
1-T2012F	20x1/2"
1-T2512F	25x1/2"
1-T2534F	25x3/4"
1-T3212F	32x1/2"
1-T3234F	32x3/4"
1-T3201F	32x01"
1-T401 1/4F	40x1 1/4"
1-T501 1/2F	50x1 1/2"
1-T6320F	63x02"



Tee Male

Code	Size
1-T2012M	20x1/2"
1-T2512M	25x1/2"
1-T2534M	25x3/4"
1-T3212M	32x1/2"
1-T3234M	32x3/4"
1-T3201M	32x01"



Cross Tee



Code	Size
1-CT25	25mm
1-CT32	32mm

Mixer Elbow



Code	Size
1-M2512	25x1/2"
1-M3212	32x1/2"

Union PPRC



Code	Size
1-U20	20mm
1-U25	25mm
1-U32	32mm
1-U40	40mm
1-U50	50mm
1-U63	63mm

Over Cross

Code	Size
1-OC20	20mm
1-OC25	25mm
1-OC32	32mm
1-OC40	40mm
1-OC50	50mm
1-OC63	63mm



V Over Cross

Code	Size
1-VOC25	25mm
1-VOC32	32mm



End Cap

Code	Size
1-EC20	20mm
1-EC25	25mm
1-EC32	32mm
1-EC40	40mm
1-EC50	50mm
1-EC63	63mm



End Plug



Code	Size
1-EP12	1/2"
1-EP34	3/4"
1-EPO1	1"
1-EP1 1/4	1 1/4"
1-EP1 1/2	1 1/2"
1-EPO2	2"



Gate Valve Plastic

Code	Size
1-GVP25	25mm
1-GVP32	32mm



Gate Valve Metal

Code	Size
1-GVM20	20mm
1-GVM25	25mm
1-GVM32	32mm

Gate Valve Under Ground

Code	Size
1-GVU25	25mm
1-GVU32	32mm



Gate Valve Commercial

Code	Size
1-GV40	40mm
1-GV50	50mm
1-GV63	63mm



Ball Valve

Code	Size
1-BV20	20mm
1-BV25	25mm
1-BV32	32mm





API

Gorilla Products

For effective jointing API introduce the solvent cement and pipe cleaner that enhance the life of jointing and pipe. Company give the better for its products and what customer pay.

The product of GORILLA helps plumber and end customer for effective plumbing work, so that for you uPVC and PPR-C GORILLA is must for good jointing and life of pipe.

Product	Code
All Rounder	(AR)



Product	Code
Super All Rounder	(SAR)

Product	Code
Heavy Bodied (Clear)	(HBC)



Gorilla Products



Product	Code
Heavy Bodied (Orange)	(HBO)



Product	Code
Cleaner + Heavy Bodied Orange	(HBO)



Product	Code
Cleaner	(CLR)

Disclaimer



In formulating this guideline API has relied upon the advice of VARIOUS EXPERT and, where appropriate, independent testing.

Not with standing, users of the guidelines are advised to seek their own independent advice and, where appropriate, to conduct their own testing and assessment of matters contained in the guidelines, and to not rely solely on the guidelines in relation to any matter that may risk loss or damage.

Users of the guidelines are advised that their reliance on any matter contained in the guidelines is at their own risk.

However, being quality products manufacture API grants guarantee to their product. Our each guarantee lasts for the number of years stated against each product and provides our customers with reliable protection and support for their purchases.



A large area of the page is filled with horizontal dashed lines, serving as a template for writing. The background of this area is a light, textured surface with a pattern of small, white, water-like droplets.



A large area of the page is filled with horizontal dashed lines, serving as a template for writing or notes.



- بین الاقوامی معیار ISO-9001, 14001, 18001 سے تصدیق شدہ
- حکومت پاکستان PCSIR سے تصدیق شدہ
- یورپین کوائٹی CE سے تصدیق شدہ
- PSQCA سے لائسنس یافتہ
- صدر پاکستان، وزیر اعظم پاکستان، گورنر پنجاب اور گورنر سندھ کی طرف سے ایوارڈ یافتہ
- سینئر سائنسدان ڈاکٹر عبدالقدیر خان سے ایوارڈ یافتہ
- وفاقی وزیر برائے صنعت و تجارت سے ایوارڈ یافتہ
- حکومت پنجاب سے رجسٹرڈ شدہ
- جدید ترین آلات سے مزین لیبارٹری
- 100% فوڈ گریڈ میٹریل، زنگ اور جراثیم سے محفوظ
- ہائی پریشر اور زیادہ درجہ حرارت برداشت کرنے کی صلاحیت
- جدید ترین ٹیکنالوجی کی حامل مشینوں پر تیار کردہ
- غیر ملکی انجینئرز کی نگرانی میں تیار شدہ
- کوائٹی کنٹرول کیلئے جدید ترین ٹیسٹنگ سسٹم لیبارٹری



- International Quality ISO 9001, 14001, 18001 Certified.
- European Quality Certificate CE Approved.
- PCSIR (Government of Pakistan) Approved Tests.
- PSQCA Licensed.
- Awarded By President Of Pakistan, Prime Minister Of Pakistan
- Governor Of Punjab And Sindh.
- Awarded By Pakistan, Most Senior Scientist Dr. Abdul Qadeer Khan.
- Achievement Award From Federal Ministry Of Commerce.
- Registered With Government Of Punjab.
- Up To Date Calibrated In House Advanced Laboratory.
- 100% Food Grade Material.
- Rust and Germ Proof.
- Durable for High Pressure Manufacturing With High Technology.
- Produced With Latest Machinery.
- Under Supervision Of Foreign Engineers.
- Highest Standers Of Quality Proofing And Testing.



- ISO 9001- 14001- 18001 الجودۃ التوالیۃ.
- شهادة الأوروبی CE الجودۃ المعتمدة.
- PCSIR (حکومت پاکستان) اختبار المعتمدة.
- PSQCA المرخصة.
- منحت بواسطة رئیس پاکستان ورئيس وزراء پاکستان حاکم پنجاب والسند.
- منحت پاکستان، ومعظم كبار العلماء الدكتور عبد القدر خان.
- جائزة الإنجاز من وزارة التجارة الاتحادية.
- مسجل مع حكومة ولاية پنجاب.
- يصل إلى تاريخ المعايرة في المختبر المتقدم البيت.
- 100% الغذاء الصنف المواد.
- الصدا وجودة التليل.
- دائم لارتفاع ضغط تصنيع مع التكنولوجيا العالية.
- أنتجت مع أحدث الآلات.
- تحت إشراف مهندسين الخارجية.
- أعلى المارة من جودة التليل والاختبار.



- Uluslararası Kalite ISO 9001, 14001, 18001 Sertifikalı
- Avrupa Kalite Belgesi CE Onaylıdır
- PCSIR (Pakistan Hükümeti) Onaylı Test
- PSQCA Lisanslıdır
- Pakistan Başbakanı, Pakistan Başbakanı, Punjab Valisi ve Sindh tarafından verildi.
- Pakistan, En Kıdemli Bilim İnsanı Dr. Abdul Kadeer Khan tarafından verildi.
- Federal Ticaret Bakanlığından Bayan Ödülü
- Punjab Hükümeti ile Kayıtlı
- Bugüne Kadar Kalibre Edilmiş Evde İleri Laboratuvar
- % 100 Gıda Sınıfı Malzeme
- Pas ve Germ Kanıtı
- Yüksek Teknoloji ile Yüksek Basıncı İmalat İçin Dayanıklı
- Son Makina ile Üretilen
- Yabancı Mühendislerin Denetiminde Abında
- Kalite Prova ve Testinin En Üst Düzeydeki Kullanılan



- Международное качество ISO 9001, 14001, 18001
- Сертифицировано.
- Европейский сертификат качества CE утверждён.
- Утверждённый тест PCSIR (правительство Пакистана).
- PSQCA Лицензировано.
- Награжден президентом Пакистана, премьер-министром Пакистана
- Губернатор Пенджаб и Синд.
- Награжден Пакистаном, главным научным сотрудником д-ра Абдула Кадера Хана.
- Награда за достижения от Федерального министерства торговли.
- Зарегистрирован с правительством Пенджаба.
- Современная лабораторная лаборатория.
- 100% пищевой материал.
- Доказательство ржавчины и зародыша.
- Прочный для высокого давления производства с высокими технологиями.
- Произведено с новейшими машинами.
- Под надзором иностранных инженеров.
- Высочайшее качество контроля качества и тестирования.



ASLI PUNJAB INDUSTRIES (Pvt.) LIMITED



Noor-E-Mustafa Colony,
Near Rajkot Disposal,
Gondlanwala Road,
Gujranwala Pakistan.



UAN: +92 55 111-API-222
+92 55 111-274-222



FAX: +92 55 3413108



32.186852
74.163213



nasim@apipk.com
www.apipk.com