







### **Company Background**

#### **AGRU - The Plastics Experts**

High-quality products made from engineering plastics.

As a reliable, professional supplier, AGRU offers everything from semi-finished products through to technologically optimised injection moulded fittings, all from a single source. Founded back in 1948 by Alois Gruber senior in Austria, nowadays the company is one of the world most important single-source suppliers for high-quality piping systems, semi-finished products, concrete protection liners and lining systems made from engineering plastics. With its expertise in producing engineering plastics components and developing tailored solutions, AGRU is present in virtually every sector of industry. Application areas include water and gas infrastructure, the energy sector, chemical and heavy industries, semiconductor and life-sciences (PURAD), tank and apparatus building, naval and aviation industries, civil engineering and mining, building construction. The possibilities opened up by AGRU products are manifold, just as the requirements of the worldwide customers are diverse.

#### **AGRU Mission**

AGRU supplies the plastics technology that makes customers from all over the world successful in their widely differing industries. AGRU offers everything from semi-finished products through to technologically optimised injection mouldings, all from a single source. Uncompromising quality, outstanding customer benefit and high operational dependability are the maxims. AGRU implements custom solutions and application-oriented new developments with the highest flexibility – with precision and economically.



#### **AGRU Locations**

Besides the main plant in Bad Hall, AGRU operates production plants in the USA, Germany, Poland and China.

The tight global sales network enables the supply of more than 150 countries with AGRU products.

#### AGRU In Bad Hall, Austria







### AGRU In Jiangsu China



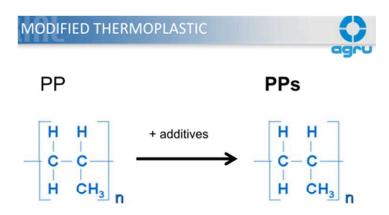




### Low Flammability Polypropylene (PPs) Systems

**Low-flammability polypropylene (PPs)** is a PP homopolymer, which is equipped with a flame retardant. Consequently, PPs can be classified as a material with higher flame resistance according to DIN 4102 and UL94. Low-flammability and electrically conductive (PPs-el ESD) polypropylene is made of PP copolymer and is equipped with both flame-resistant and electrically conductive / anti-static properties. AGRU products made of polypropylene natural and white (made of PPH) complete our extensive range of PP products.

It is well suited for intake and exhaust ventilation systems, fume cupboards, degassing pipes, and flue lining systems.



- Same molecular structure
- By adding of a flame retardant additive the special properties of PPs are reached
- > Flame retardant additive is free of halogenes

#### Features of PPs (Polypropylen-self extinguishing)

- > Flame retardent
- Increases of the safety and sustainability for many application, where
  - I. Explosive media are transported
  - II. Easy flammable gases are transported
  - III. High chemical resistance is needed
- Excellent alternative for high grade metal alloys



#### **Product, Quality and Standards**

AGRU has been on EN ISO 9001 certified since 1995. AGRU is characterized by an increasing number of certifications for high quality with ISO 9001, 14001 and 45001 being achieved.

#### **Standards**

Pipe: DIN 8077, EN ISO 4065, ISO 2505 and UL94

Fittings, Valve and Damper: DIN8077/8078, EN ISO 4065 and ISO1133

Fabricated special section fittings can be made upon request

Flammability Classification: DIN4102 and UL94

Mill's test standard: DIN EN10204

#### Supply programme:

Available up to MOP 10 bar

- Pipes OD 20 mm 1200 mm
- Fittings, injection moulded
   OD 20 mm 500 mm
- Fittings, segmented up to OD 1200 mm
- Accessories (flanges)
   OD 32 mm 160 mm
- Welding machines & Assembly tools



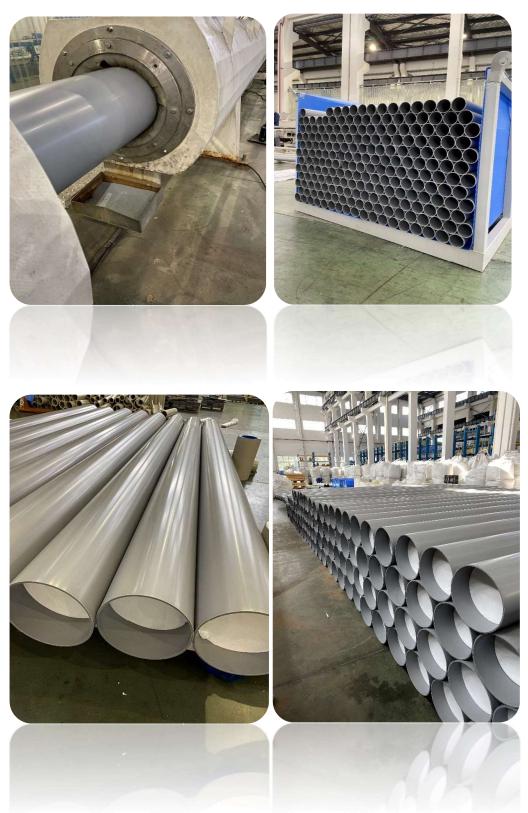
# Modified material grades - the perfect solution for special demands

In order to comply with the numerous specific requirements for chemical piping and apparatus engineering the flame retardant and electro conductive materials PP-s, PP-s-el and HDPE-el are offered.

During the operation of thermoplastic piping systems e.g. electrostatic charging can be caused by transport of media and gases. Piping systems made of antistatic plastic materials provide a durable and safe solution in such applications. AGRU piping systems and semi-finished products made of electro conductive plastic comply with the ATEX guidelines and can be applied in explosion protected (EX) areas. Flame retardant piping products are offered and used especially for applications in exhaust and ventilation areas.



# **AGRU PPs Pipes**



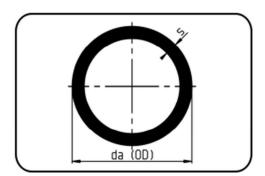


# **AGRU PPs Pipe**



extruded

PPs grey



**Code 705** 

Dimension	Code	Detail	da(OD) mm	s mm	Weight/ Gewicht
140	17.705.0140.00	140X3,0 Ventilation	140	3	1,32
160	17.705.0160.00	160X3,0 Ventilation	160	3	1,53
180	17.705.0180.00	180X3,0 Ventilation	180	3	1,71
200	17.705.0200.00	200X3,0 Ventilation	200	3	1,90
225	17.705.0225.00	225X3,5 Ventilation	225	3,5	2,47
250	17.705.0250.00	250X3,5 Ventilation	250	3,5	2,75
280	17.705.0280.00	280X4,0 Ventilation	280	4	3,48
315	17.705.0315.00	315X5,0 Ventilation	315	5	4,91
355	17.705.0355.00	355X5,0 Ventilation	355	6	5,54
400	17.705.0400.00	400X6,0 Ventilation	400	6	7,39
450	17.705.0450.00	450X6,0 Ventilation	450	6	8,33
500	17.705.0500.00	500X8,0 Ventilation	500	8	12,30
560	17.705.0560.00	560X8,0 Ventilation	560	8	13,80
630	17.705.0630.00	630X10,0 Ventilation	630	10	19,30
710	17.705.0710.00	710X12,0 Ventilation	710	12	26,00
800	17.705.0800.00	800X12,0 Ventilation	800	12	29,30
900	17.705.0900.00	900X15,0 Ventilation	900	15	41,20
1000	17.705.1000.00	1000X15,0 Ventilation	1.000	15	45,90
1200	17.705.1200.00	1200X18,0 Ventilation	1.200	18	65,80





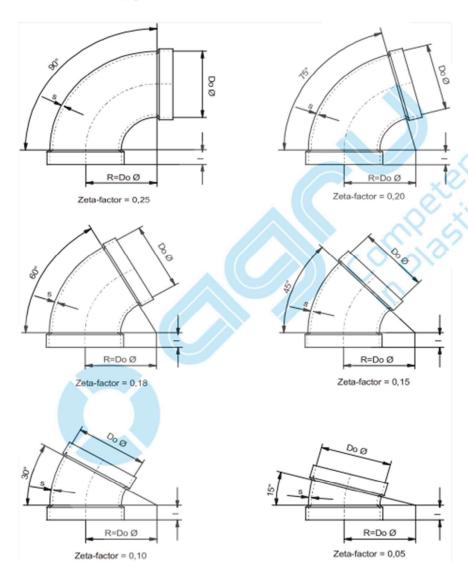






# Bend R = Do Ø with socket

#### Dimensions on the next page



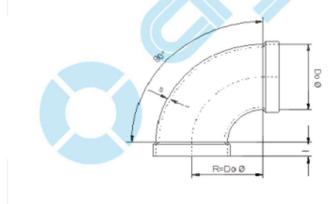
all dimension in mm



90 deg bend

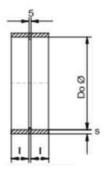
All other angels are with the corresponding measurements

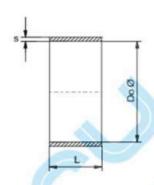
Do Ø	Tolerance	s	ı
50			
63			
75	0,7	3,0	40
90	0,9	3,0	40
110	1,0	3,0	40
125	1,2	3,0	40
140	1,3	3,0	40
160	1,5	3,0	40
180	1,7	3,0	40
200	1,8	3,0	40
225	1,9	3,5	40
250	2,0	3,5	40
280	2,2	3,5	50
315	2,4	4,0	50
355	2,7	4,0	50
400	3,0	4,5	50
450	3,5	5,0	60
560	4,5	6,0	80





#### Double socket



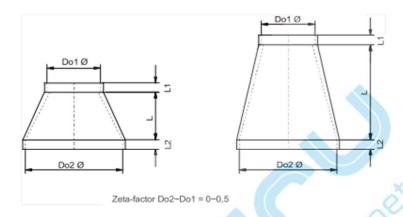


Do Ø	1	PP / PPs	PP / PPs
50	40	+0,7	3.0
63	40	+ 0,7	3.0
75	40	+ 0,7	3,0
90	40	+ 0,9	3,0
110	40	+ 1,0	3,0
125	40	+ 1,2	3,0
140	40	+ 1,3	3,0
160	40	+ 1,5	3,0
180	40	+1,7	3,0
200	40	+ 1,8	3,0
225	40	+ 1,9	3.5
250	40	+ 2,0	3.5
280	50	+ 2,2	3.5
315	50	+ 2,4	4,0
355	50	+2,7	4,0
400	50	+ 3.0	4.5

			1 .
	T	PP/P	Ps
Do Φ	I	Tolerance	S
50	40	+0.7	3.0
63	40	+0.7	3.0
75	40	+0.7	3.0
90	40	+0.9	3.0
110	40	+1.0	3.0
125	40	+1.2	3.0
140	40	+1.3	3.0
160	40	+1.5	3.0
180	-40	+1.7	3.0
200	40	+1.8	3.0
225	40	+1.9	3.5
250	40	+2.0	3.5
280	50	+2, 2	3, 5
315	50	+2.4	4.0
355	50	+2.7	4.0
400	50	+3.0	4.5



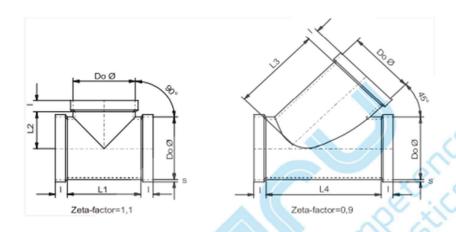
#### **Reducer with Socket**



Do1 Ø	Do2 Ø	L	L1	L2	OD 1	OD 2	L	L1	L2
75	90	40	40	40	200	225	80	40	40
75	110	80	40	40	200	250	140	40	40
90	110	60	40	40	200	280	105	40	50
110	125	40	40	40	200	315	160	40	50
110	140	80	40 /	40	200	355	115	- 40	50
110	160	140	40	40	225	250	80	40	40
110	180	50	40	40	225	280	40	40	50
110	200	65	40	40	225	315	65	40	50
125	140	40	40	40	225	355	95	40	50
125	160	100	40	40	225	400	125	40	50
125	180	40	40	40	250	280	35	40	50
125	200	55	40	40	250	315	100	40	50
125	225	65	40	40	250	355	140	40	50
125	250	90	40	40	250	400	105	40	50
140	160	60	40	40	250	450	145	40	50
140	180	30	40	40	280	315	100	50	50
140	200	45	40	40	280	355	65	50	50
140	225	60	40	40	280	400	90	50	50
140	250	80	40	40	280	450	120	50	50
160	180	60	40	40	280	500	160	50	50
160	200	120	40	40	315	355	20	50	50
160	225	100	40	40	315	400	120	50	50
160	250	120	40	40	315	450	95	50	50
160	280	85	40	50	315	500	135	50	50
160	315	115	40	50	355	400	135	50	50
180	200	75	40	40	355	450	75	50	50
180	225	85	40	40	355	500	110	50	50
180	250	100	40	40					
180	280	65	40	50	differe	nt dimensio	ns upon	request	
400	245	400	40	-50					



Branch outlet 90° and 45°

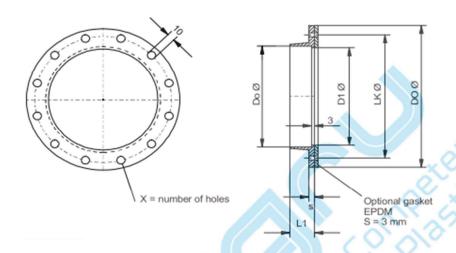


	Do Ø	PP / PPs	- 1	L1	L2	L3	L4	s
	50	+ 0,7	40	105	52.5	120	165	3.0
	63	+ 0,7	40	105	52.5	120	165	3.0
	75	+ 0,7	40	105	52,5	120	165	3,0
	90	+ 0,9	40	120	60,0	140	190	3,0
	110	+ 1,0	40	140	70,0	170	235	3,0
	125	+ 1,2	40	155	77,5	190	255	3,0
	140	+ 1,3	40	170	85,0	210	280	3,0
	160	+ 1,5	40	190	95,0	240	325	3,0
4	180	+ 1,7	40	210	105,0	265	355	3,0
	200	+ 1,8	40	230	115,0	290	380	3,0
	225	+ 1,9	40	270	127,5	330	440	3,5
	250	+ 2,0	40	290	140,0	360	475	3,5
	280	+ 2,2	50	320	165,0	400	515	4.0
	315	+ 2,4	50	370	172,5	440	565	5.0
4	355	+ 2,7	50	400	192,5	490	620	5.0
	400	+ 3,0	50	440	215,0	540	685	6.0
	450	+ 3,5	60	570	285,0	610	770	5,0
	500	+ 4,0	60	620	310,0	680	880	5,0
	560	+ 4,5	60	680	340,0			6.0
	600	+ 4,5	60	760	380,0	850	1200	6,0

From Do Ø 630 upon request



Flange

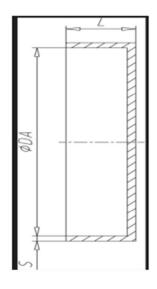


1	DoØ	LKØ	DOØ	X	D1Ø	L1	S
	75	110	140	8	69	29	6,5
	90	128	158	8	84	29	6,5
	110	150	170	8	106	30	8.0
	125	165	185	8	122	30	8.0
	140	175	200	8	136	30	8.0
4	160	200	230	8	156	30	8.0
	180	220	245	8	176	30	8.0
	200	240	270	8	196	30	8.0
	225	265	290	8	222	30	8.0
	250	290	320	12	246	30	8.0
	280	325	355	12	275	30	10.0
4	315	350	395	12	310	30	10.0
	355	400	435	12	349	30	10.0
	400	445	475	16	393	30	10.0



# **AGRU PPs End Cap**

**End Cap** 





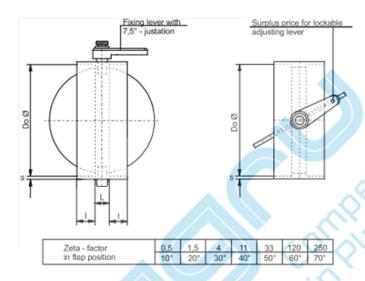
PPs ventilation end cap with socket

Do	L	S
75	25	3.0
90	25	3.0
110	25	3.0
125	25	3.0
140	25	3.0
160	25	3.0
180	25	3.0
200	25	3.0
225	25	3.0
250	25	3.0
315	25	3.0
355	25	3.0
400	25	3.0



### **AGRU PPs Damper & Valves**

# Damper Control Valve with socket



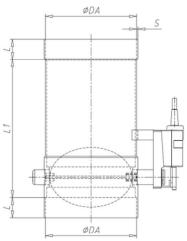
Do1 Ø		L	1	s
75	+ 0,7	40	40	3.0
90	+ 0,9	40	40	3.0
110	+ 1,0	40	40	3.0
125	+ 1,2	40	40	3.0
140	+ 1,3	40	40	3.0
160	+ 1,5	40	40	3.0
180	+ 1,7	40	40	3.5
200	+ 1,8	40	40	3.5
225	+ 1,9	40	40	3.5
250	+ 2,0	40	40	3.5
280	+ 2,2	40	50	3.5
315	+ 2,4	40	50	4.0
355	+ 2,4	40	50	4.0
400	+ 2,4	40	50	4.5



# **Other Damper Models Available Upon Request**

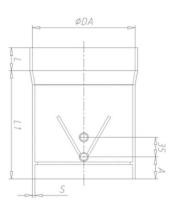
#### PPs damper with socket (for electric actuator):





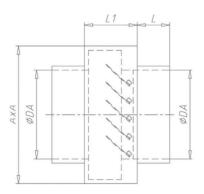
#### PPs check valve for vertical application





PPs check valve for horizontal application



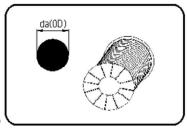




# **Welding Fillers**

Marking, requirements and test in accordance to DVS 2211.

Welding-Rod circular profile extruded Hot-gas-welding PPs grey





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CO	u	c	•	۰	v

Dimension	Code	Detail	da(OD) mm	Weight/ Gewicht
3	17.410.0000.30	3mm	3	1,00
4	17.410.0000.40	4mm	4	1,00

#### Technical data for PPs grey welding rod material

	Property	Unit	PPs grey
	Specific density at 23°C	g/cm <sup>3</sup>	0,93
	Melt flow index MFR 190/5 MFR 190/2,16 MFR 230/5 MFI range	g/10min	0,80 2,00
	Tensile stress at yield	MPa	30
	Elongation at yield	%	10
	Elongation at break	%	>50
sal	Impact strength unnotched at +23°C Impact strength unnotched at -30°C	kJ/m²	no break 28
Mechanical Properties	Impact strength notched at +23°C Impact strength notched at 0°C Impact strength notched at -30°C	kJ/m²	9 2,8 2,2
	Ball indentation hardness acc. Rockwell	MPa	72
	Flexural strength (3,5% flexural stress)	MPa	37
	Modulus of elasticity	MPa	1300
	Vicat-Softening point VST/B/50	°C	85
20334	Heat deflection temperature HDT/B	°C	85
Thermal Properties	Linear coefficient of thermal expansion	K <sup>-1</sup> x 10 <sup>-4</sup>	1,6
P P	Thermal conductivity at 20 °C	W/(mxK)	0,2
	Flammability	-	V-2 E (d2) B1
= s	Specific volume resistance	OHM cm	>10 <sup>15</sup>
trice artie	Specific surface resistance	ОНМ	>1015
Electrical Properties	relative dielectric constant at 1 MHz	-	
	Dielectric strength	kV/mm	30-45
	Physiologically non-toxic	-	Yes
	FDA		No
	UV stabilized	-	No
	Colour	_	Grey (similar RAL 7037) Dark grey



#### **Transport, Handling and Storage Guidelines**

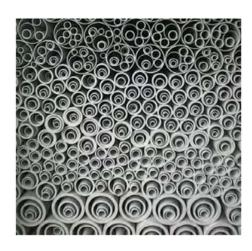
#### Transport and handling

At the transport and handling of pipes and fittings, the following guidelines have to be observed in order to avoid damages:

Pipes out of PP-H, special materials (PP-R-s-el, PP-H-s, PE-el) and prefabricated components (for example segmented bends) may only be loaded resp. transported with special care at pipe wall temperatures below 0°C.

Impact- and bending stresses at temperatures < 0°C have to be avoided.

Damages of the surface (scratches, marks, ...), as they occur at dragging of pipes, have to be avoided.



#### Storage

At the storage of pipes and fittings, the below stated regulations have to be observed in order to avoid a quality decrease:

The storage area has to be even and free from waste, such as stones, screws, nails, etc.

At piling of pipes, storage heights of 1 m may not be exceeded. In order to avoid a rolling away of the pipes, wooden wedges have to be situated at the outside pipes. At pipes > OD 630mm, maximum two rows may be stored on top of one another. Pipes > OD 1000mm have to be stored loosely.

Pipes have to be stored flat and without bending stress, if possible in a wooden frame.

Natural and grey coloured products have to be protected against UV radiation at a storage outdoors. According to the standard EN 12207-2 pigmented (orange, blue) pipes can be stored outside for a period of 12 months.

Pipes and fittings out of PP-R-s-el and PE-el have to be protected at storage against humidity and UV radiation (no outdoor exposure, use of dry warehouses).



As the special types PP-R-s-el and PE-el suffer the danger of absorption of humidity at a storage period above 12 months, it is recommended to check the usability of the material by means of a welding test.





### **Application - Oversea**



# Application

AGRU - Kunststofftechnik GmbH AGRU - Technology in Plastics



PPs Duct industrial application

## APPLICATIONS/REFERENCES-PPs







PPs for Ventilation piping and scrubbers

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# JOB REFERENCE

# <u>LIST OF MAIN JOBS INSTALLED -</u> "AGRU" POLYPROPYLENE (PP-s) PIPES AND FITTINGS

PROJECT NAME	CONTRACTOR	CONSULTANT / OWNER	<u>Year</u>	
SCHOOL & UNIVERSITY LABORATORIES				
HKU ACADEMIC BUILDING AT NO.3 SASSOON ROAD	GETWICK ENGINEERS LTD.	HONG KONG UNIVERSI	2021	
HONG KONG WEST ISLAND SCHOOL			2021	
CITY UNIVERSITY OF HONG KONG - FONG YUN WAH BUILDING	YAT DYNAMIC ENGINEERING COMPANY	CITY UNIVERSITY	2020	
HONG KONG SOUTH ISLAND SCHOOL	MGI (FAR EAST) LTD.	SOUTH ISLAND SCHOOL	I 2020	
UNIVERSITY OF HONG KONG - NEW STEM CELL LABORARY	WISE GENERAL ENGINEERING SERVICES LTD.	HKU	2019	
THE EDUCATION UNIVERSITY OF HONG KONG	ELEGANT ENGINEERING (HONG KONG) LTD.	EDUCATION UNIVERSIT	I 2018	
VTC CHAI WAN HIGHER EDUCATION	KRUEGER ENGINEERING (ASIA) LTD.	ASD	2016	
UNIVERSITY OF HONG KONG - HUI OI CHOW BUILDING	GETWICK ENGINEERS LTD.	ASD	2016	
UNIVERSITY OF HONG KONG - THE FACULTY OF MEDICINE BUILDING	GETWICK ENGINEERS LTD.	ASD	2015	
SCHOOL OF CHINESE MEDICINE AT BAPTIST UNIVERSITY	BIOCLINE HEALTHCARE SERVICES LTD	PBA	2013 - 2014	
CHA CHI-MING SCIENCE TOWER AT BAPTIST UNIVERSITY	JADE STAR ENGINEERING LIMITED	BAPTIST UNIVERSITY	2013 - 2014	
STANDARD SECONDARY SCHOOL IN TIN SHUI WAI AREA 102		ASD	2003 - 2004	
STANDARD SECONDARY SCHOOL IN NGA YING CHAU AREA 1. TSING YI		ASD	2003 - 2004	
GOVERNMENT SECONDARY SCHOOL, PO KONG ESTATE		ASD	2005 - 2006	
GOVERNMENT SECONDARY SCHOOL IN TSEUNG KWAN O AREA 73A, PHASE 3		ASD	2002 - 2003	



HONG KONG WEST ISLAND SCHOOL

## JOB REFERENCE

# <u>LIST OF MAIN JOBS INSTALLED -</u> "AGRU" POLYPROPYLENE (PP-s) PIPES AND FITTINGS

PROJECT NAME	CONTRACTOR	$\underline{\mathit{CONSULTANT}/\mathit{OWNER}}$	<u>Year</u>
<u>HOSPITAL</u>			
UNITED CHRISTIAN HOSPITAL	BIOCLINE HEALTHCARE SERVICES LTD		2021
HONG KONG CHILDREN'S HOSPITAL	CHINA STATE MECHANICAL & ELECTRICAL ENG. LTD.	ASD	2017
GLENEAGLES HOSPITAL AT ABERDEEN	A & R ENGINEERING CO., LTD.	PBA	2015 - 2016
EXPANSION OF ST. PAUL HOSPITAL PHASE B	CHINA STATE MECHANICAL & ELECTRICAL ENG. LTD.	PBA	2014 - 2016
CARITAS MEDICAL CENTRE PHASE 2	CORNWALL CONTRACTING COMPANY LIMITED	PBA	2011 - 2012
PRINCE OF WALES HOSPITAL, SHA TIN	HSIN CHONG ASTER BUILDING SERVICES LIN	v PBA	2006 - 2007



#### HONG KONG CHILDREN'S HOSPITAL



GLENEAGLES HOSPITAL

## **JOB REFERENCE**

# <u>LIST OF MAIN JOBS INSTALLED -</u> "AGRU" POLYPROPYLENE (PP-s) PIPES AND FITTINGS

PROJECT NAME	<u>CONTRACTOR</u>	$\underline{\mathit{CONSULTANT}/\mathit{OWNER}}$	Year
INDUSTRIAL APPLICATION			
CONVENTION OF OFFICE TO FULL WET LABORATORY AT 6W, HK SCIENCE	ALLIANCE CONTRACTING CO., LTD	SCIENCE PARK	2022
FU SHAN MORTUARY, SHATIN,	ON HARVEST E&M LTD	ASD	2021
HKU ACADEMIC BUILDING AT NO.3 SASSOON ROAD	GETWICK ENGINEERS LTD.	HKU	2021
SCIENCE PARK 17W	HSIN CHONG ASTER BUILDING SERVICES	SCIENCE PARK	2020
HONG KONG SCIENCE PARK EXPANSION STAGE 1	BIOCLINE HEALTHCARE SERVICES LTD.	SCIENCE PARK	2018
SCIENCE PARK 20E	BIOCLINE HEALTHCARE SERVICES LTD.	SCIENCE PARK	2018
HONG KONG RED CROSS	UNION (LUEN HOP) REFRIGERATION CO.,	RED CROSS	2018
SCIENCE PARK PHASE 2 B15W	BIOCLINE HEALTHCARE SERVICES LTD.	ASD	2017
NO. 95-97 FUK HEI STREET AT YUEN LONG INDUSTRIAL ESTATE	ELEGANT ENGINEERING (HONG KONG) LTD.	DANGEROUS GOODS STORE	2016
HONG KONG SCIENCE TECHNOLOGY PARK - SME LAB WC103	GETWICK ENGINEERS LTD.	ASD	2016
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