NOVEMBER 2022

CALIBRE®

CABLE DUCT SYSTEMS

TECHNICAL GUIDE FOR DESIGN, SELECTION & INSTALLATION

Cable Management Solutions

MARLEY by aliaxis

aliaxis

we make life flow

Aliaxis are passionate about creating sustainable innovative solutions for water and energy. We provide people around the world with advanced plastic piping systems, leading the industry in a way that anticipates the rapidly evolving needs of our times.

Marley has been part of the Aliaxis group for 15 years and NZ homes for 60 years. Providing spouting, downpipes, building, plumbing and electrical solutions for kiwis since 1959.

With local manufacturing sites employing local people, the vast majority of the products we sell are proudly New Zealand made.

We are committed to keeping New Zealand green. Marley operates a uPVC recycling program as part of our ISO 14001 environmental management system and is Best Environmental Practice certified for its entire manufactured range of uPVC systems.

This allows designers to achieve GreenStar credits when specifying Marley uPVC systems in commercial buildings, and installers / end users to recycle their uPVC products.*

MADE USING BEST ENVIRONMENTAL PRACTICE

* Talk to us about our recycling program and requirements regarding return and condition of product

40+ Countries worldwide

100+ Distribution centres

70+ Manufacturing sites

15,500+ Employees worldwide

10 Commercial brands

MARLEY by aliaxis

60+ Years in New Zealand

2 Sites

2,500+ Products

200+ Employees nationally

OUR PRODUCT RANGE

Marley Cable Management is the encasement of electrical and communication cables for protection, conveyance and management in electrical related wiring systems and networks.

CALIBRE® Cable Duct Systems by Marley are trench and trenchless cable duct systems manufactured specifically for electrical distribution networks.

This guide provides general information for the design, selection and installation of such systems.

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HEALTH, SAFETY AND ENVIRONMENTAL

The use of the products referenced in this brochure can expose the installer to a number of hazards due to standard work practices. These may include working at height, working in confined spaces, working in excavated trenches and working with electricity.

It is the responsibility of the installer to ensure that all legal requirements are met; particularly where licensed and/or authorised staff are required for electrical wiring and that the codes of practice of Workplace New Zealand are followed.

Marley offer a take back scheme for any off-cuts or scrap of their pipe systems to reduce the amount of waste going to landfill. To utilise this service please contact our Marley contact centre on **0800 MARLEY (0800 627 539)**.

1.0 CALIBRE® CABLE DUCT RANGE

1.1 WHAT IS CALIBRE®?

CALIBRE®
CABLE DUCT SYSTEMS

REDEFINING PERFORMANCE IN ELECTRICAL UTILITIES

COMPLETE PE & PVC RANGE

Unified range for utilities market

ELECTRICAL PURPOSED STANDARD

AS/ NZS 61386 incorporates the replacement of the PE pressure standard

PERFORMANCE BASED CLASSIFICATION

Mechanical durability (VHD, HD, MD ratings)

SIMPLIFIED PRODUCT SELECTION

Applicated based options: Trench & Trenchless

FULLY FEATURED PRODUCT BENEFITS

Durability, Productivity & Assurance attributes to meet stakeholders needs

SUSTAINABILITY BENEFITS

100% recyclable. Made with 100% renewable electricity. Collection & recycling programs.

COMPLIANCE

Bureau Veritas - Independent verification of Performance & Quality

1.2 FEATURES & BENEFITS

The new CALIBRE® product range by Marley delivers a unified approach to cable ducting design, manufacture, and installation.

As a **fully featured PE and PVC cable duct range, CALIBRE® CABLE DUCT Systems** is manufactured to the electrical purposed AS/NZS 61386 standard with product classification according to a performance-based mechanical duty rating.

FULLY FEATURED

- **Durability** range: Performance-based Mechanical Protection rating
- **Productivity** features: Saves time and money for improved trenching
- **Assurance** credential: Product based sustainability practices, supporting certifications (BEP), declarations (EPD) and licences for compliance

EASE OF SELECTION

CALIBRE TRENCH

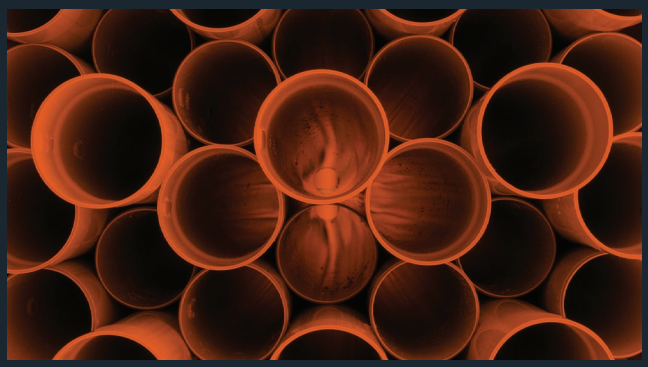
TRENCH
Unified solutions for open cut installations

CALIBRE TRENCHLESS

TRENCHLESS
Unified solutions for HDD installations

			TRENCH	TRENCHLESS
DURABILITY	A VHD HD	Category A Underground Wiring System	✓	✓
	VHD	Very Heavy Duty	✓	✓
	HD	Heavy Duty	✓	✓
	B MD	Category B Underground Wiring System	✓	✓
	MD	Medium Duty	✓	✓
		Service Temperature Range	✓	✓
PRODUCTIVITY		Service ID	✓	✓
		Metre Marked		✓
		Custom Length		✓
		Extensive PE Fittings		✓
		Extensive PVC Bends	✓	
ASSURANCE		PE / PVC 100% Recyclable	✓	✓
		Standards Compliance & Licence	✓	✓
		EPD Declaration	✓	✓

1.3 RANGE OVERVIEW

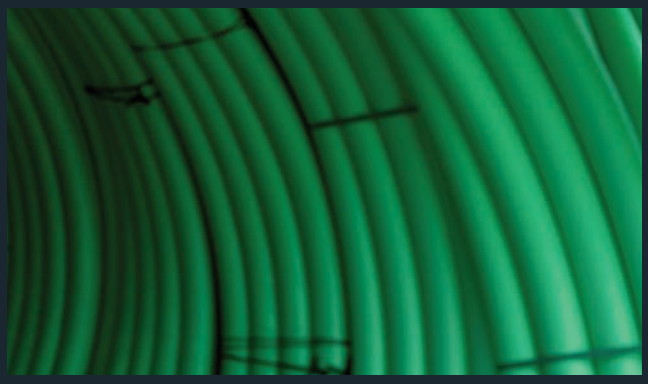


CALIBRE® TRENCH CABLE DUCT (STRAIGHT LENGTHS)

When undertaking trench (open cut) installations, CALIBRE® TRENCH protects power, communication and fibre optic cables. The high-quality PVC or PE cable duct is ideal for working around unidentifiable services and overcoming geotechnical rock and soils challenges. Manufactured to AS/NZS 61386, CALIBRE® is approved by major power and telecommunication authorities.

SUITABLE FOR

- Trench applications
- Industrial sites
- Rural locations
- Road side



CALIBRE® TRENCHLESS CABLE DUCT (COILS)

When undertaking trenchless (HDD) installations, CALIBRE® TRENCHLESS is approved by major power and telecommunication authorities for the protection of their network cables over the life of the asset.

Manufactured to AS/NZS 61386, the high-quality PE cable duct coils is ideal for large urban projects with long runs, minimizing disruption to communities above ground.

SUITABLE FOR

- Directional drilling
- Sub duct applications
- Urban and greenfield locations

CALIBRE® TRENCH JOINTING (SOLVENT TYPE)

Marley offer a full range of durable uPVC cable duct bends to suit your installation needs. Various radii and angles are available.

CALIBRE® TRENCHLESS JOINTING (PE TYPE)

Marley provide a full range of Philmac compression and Friatec electrofusion fittings designed for use with polyethylene pipe systems.

2.0 TRENCH RANGE

CALIBRE® Trench cable duct by Marley are high quality PVC & PE straight length cable ducting primarily used in open cut installations when undertaking work in power and telecommunication distribution networks underground.
In comparison to trenchless cable duct, trench cable duct of shorter lengths is ideal for working around multiple services when undertaking repair work, or where unidentifiable services and challenging geotechnical substrates are present.

2.1 SELECTION

CALIBRE® Trench cable duct is manufactured to AS/NZS 61386 (Conduit systems for cable management).
It is a performance-based rather than a prescriptive-based standard for classifying mechanical performance parameters – resistance to compression or ring stiffness, and resistance to impact.

Selection of Trench cable duct for open cut installation is primarily based on a mechanical durability classification of Very Heavy Duty, Heavy Duty and Medium duty. Other parameters such as productivity and quality must also be considered. To identify the necessary features and ensure a consistent approach to cable duct design, manufacture and cost-effective underground installation, please refer to Best Practice Selection Criteria (TABLE 1) and Summary of Marley Product Range, Wiring Rules & Mechanical Duty relationship (TABLE 3).

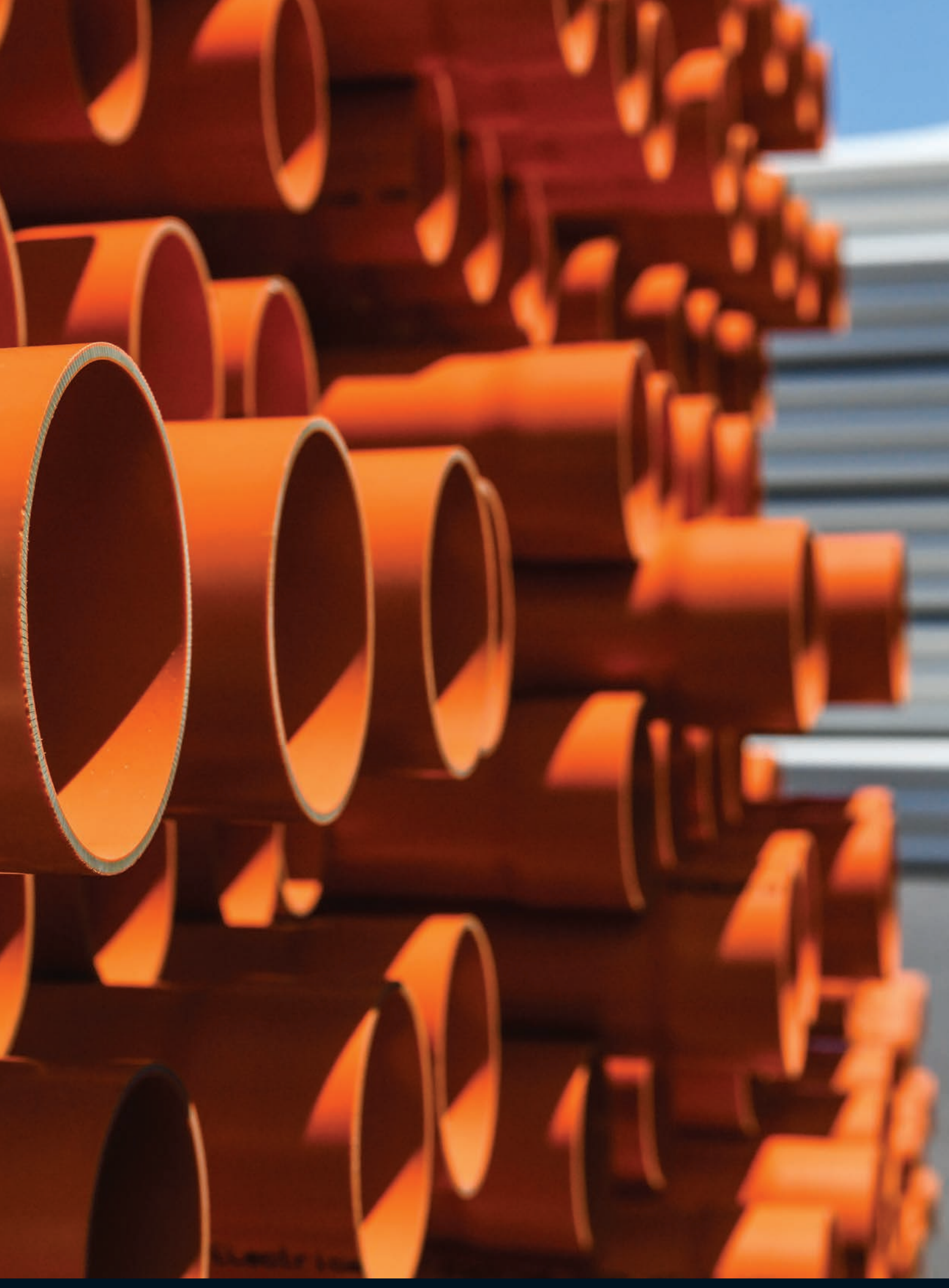
CALIBRE® Trench cable duct is available in a range of colors for identification purposes – orange color typically for power applications, and green color typically for telecommunication applications. Other colors (red, salmon or white) are also used to satisfy customer specific projects and specifications.

For cost effective and reliable underground cable duct systems, always consider 3 key selection factors – **reliability, productivity and quality**.

RELIABILITY & DURABILITY	
Designed for 100+ years performance (buried in service)	✓
Category A Underground Wiring Rules Very Heavy Duty / Heavy Duty	✓
Category B Underground Wiring Rules Medium Duty	✓ (Extra mechanical protection required)
In-service temperature (wide range)	-15/60°C
PRODUCTIVITY – INSTALLATION & BURIAL	
Application to suit project / site / economic parameters	› Urgent repairs › Short, shallow installs in soft soil › Unidentifiable services & obstacles › Deployment of minimal equipment › Ideal for Rural locations
Ease of handling / transport	› Rigid - straight lengths › Kink free
Ease of service identification › Power or Comms colour coded › Product print details	✓
Fittings range	Fabricated bends (duty, angle, radius)
Joining	PVC Solvent, PE Electrofusion, PE Compression fittings
QUALITY & COMPLIANCE	
Environmental	BEP (PVC applicable); EPD*
100% Recyclable	✓
Manufacturing standard – electrical specific AS/NZS 61386	✓
3rd Party verification	BV License
Tech and sales support	✓

TABLE 1 Best Practice Selection Criteria

*Marley's environmental product declaration (EPD) provide robust data that contribute to evaluating the environmental impacts of specific construction & infrastructure projects. Please refer to the Marley website for further information relating to LCA details, environmental indicators & calculated impacts associated with CALIBRE.



2.2 INSTALLATION

The following factors specific to cable duct installation are highlighted below and should be considered in conjunction with general practice installation guidelines (AS/NZS 2032) and Electricity Distribution Network specifications.

- Specification (wiring rules and mechanical duty)
- Print requirements
- Jointing types

2.2.1 SPECIFICATION (WIRING RULES & MECHANICAL DUTY)

In order to comply with the appropriate regulations and standards, the selection of the correct size and classification of cable duct for the application is important.

Marley manufactures an extensive range of rigid uPVC cable duct and bends to convey and protect electrical cables. These are primarily intended for trenched industrial applications where compression and impact resistance is required. They are not recommended where they are likely to be subjected to severe mechanical abuse.

DUTY CLASSIFICATION BY CABLE DUCT SIZE

In accordance to AS/NZS 61386.21, cable duct designation is typically defined as follows:

a. **Cable Duct Size ≥ DN100 mm:**
Duty Classification is based on Ring Stiffness (SN number) & Impact testing

- Medium Duty ≥ SN4
- Heavy Duty ≥ SN10
- Very Heavy Duty ≥ SN25

b. **Cable Duct Size < DN100 mm:**
Duty Classification is based on Resistance to Compression & Impact testing

AS/NZS 3000 WIRING RULES

In order to comply with AS/NZS 3000 Australian/ New Zealand Wiring Rules the following guidelines apply:

Category A: underground wiring systems may use heavy duty conduit without further mechanical protection.

Category B: underground wiring systems may use medium duty conduit with additional mechanical protection. This additional mechanical protection shall:

a. Be placed not more than 75mm above the wiring system.

b. Be not less than 150mm wide.

c. Overlap the system by at least 40mm on each side.

d. Consist of one or a combination of the following :

- Precast concrete slabs having a thickness not less than 40mm and a classification of not less than grade 20 in accordance with AS 3600 or NZS 3104
- Concrete slabs cast on-site having a thickness of not less than 100mm
- A continuous concrete pour having a thickness of not less than 75mm
- Fibrous cement slabs having a thickness of not less than 12mm
- Bricks manufactured specifically for the protection of electric cables
- Polymeric cable cover strip complying with AS 4702
- Other materials that offer the same degree of protection afforded by the materials in above items.

Refer to clause 3.11.4.3 of AS/NZS 3000 for additional mechanical protection requirements.

There is a requirement to identify underground wiring with orange marker tape complying with AS/NZS 2648.1 laid approximately 50% of the depth of cover above the wiring system.

MINIMUM DEPTH OF COVER FOR UNDERGROUND WIRING SYSTEMS

The depth of cover applies to the upper surface of the ground (or the bottom of any concrete laid on the surface) AND either the top of the wiring system or the top of the additional mechanical protection of Category B systems.

The minimum depth of cover required for Category A and B systems is as per TABLE 2.

DEPTH OF COVER FOR CAT A & B UNDERGROUND WIRING SYSTEM		
	Location of wiring system	
Surface covering on ground	Within building confines	External of building confines
>75mm Poured Concrete	0mm depth	300mm depth
<75mm Poured Concrete or No Surface Covering	500mm depth	500mm depth

TABLE 2 Depth of Cover for Underground Wiring Rules

Refer to Figure 1 illustrating underground wiring system requirements with no surface covering with respect to AS/NZS 3000 Wiring Rules.

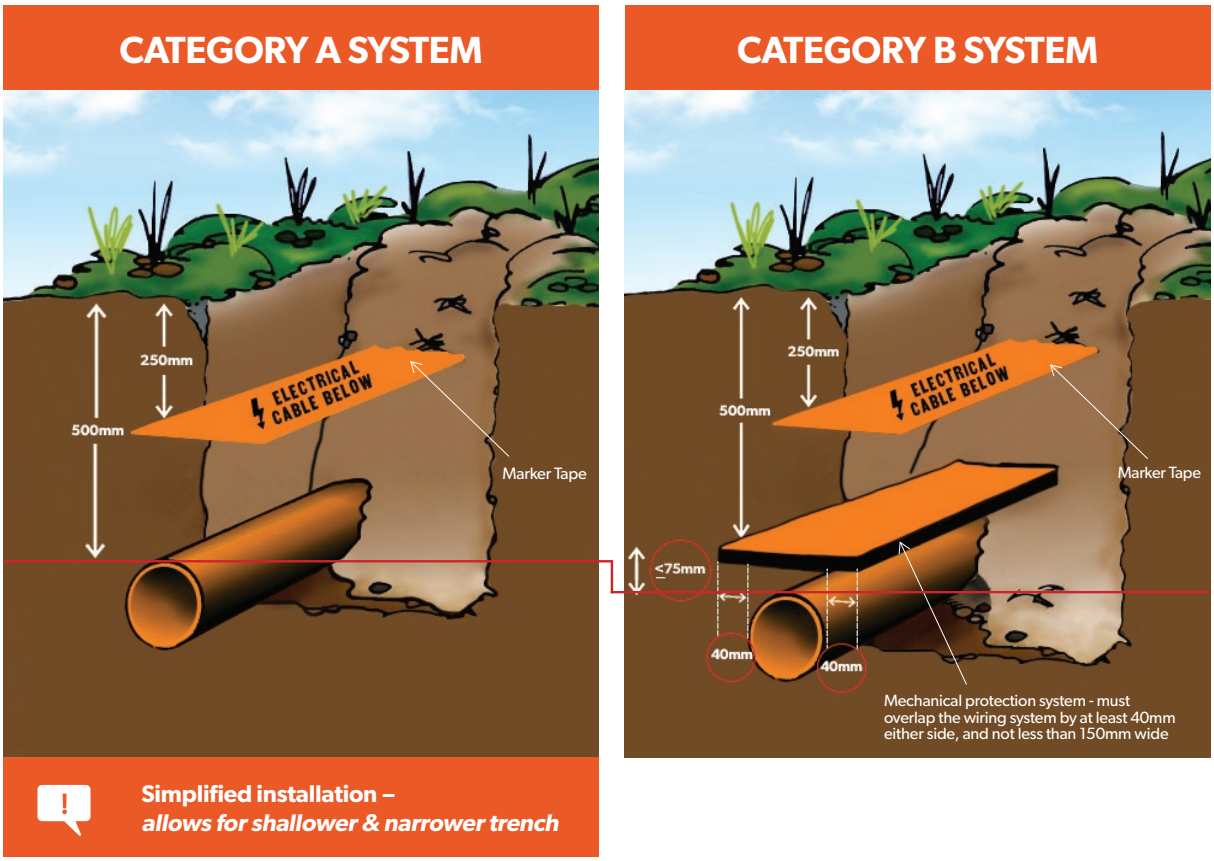


FIGURE 1 Underground Wiring Systems With No Surface Covering (dimensions & clearances)

PRODUCT RANGE & SPECIFICATION SUMMARY

The following selection guide can be used to identify Marley ARMA & CALIBRE® products and their relevance to AS/NZS 3000 Wiring Rules, Section 3.11 Underground Wiring Systems.

Table 3 should be read in conjunction with Best Practice Selection Criteria (TABLE 1) and CALIBRE® Trench Product Range (Section 2.3)

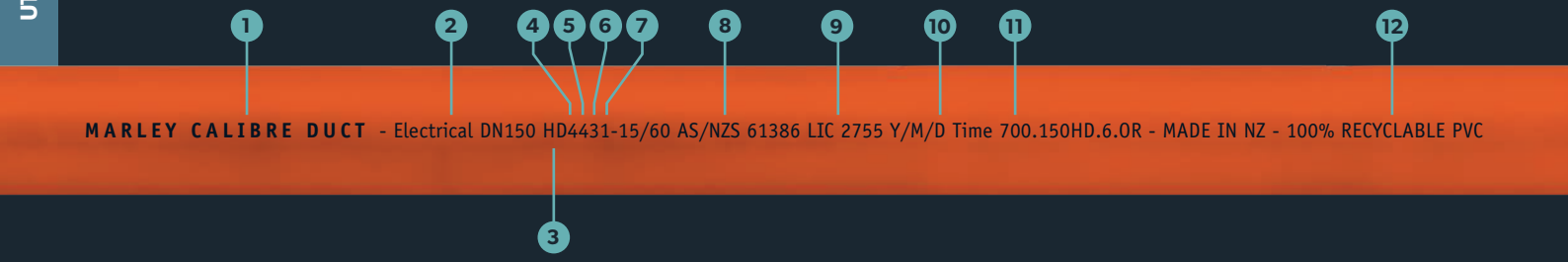
Underground Wiring Rules (AS/NZS 3000)	CATEGORY A			CATEGORY B	
Product Description	ARMA Conduit (OD) x 4m lengths	CALIBRE® Trench Duct (PVC) (ID) x 6m length	CALIBRE® Trench Duct (PE) (OD) x 12m length	CALIBRE® Trench Duct (PVC) (ID) x 6m length	
Mechanical Duty Classification (AS/NZS 61386)	**Heavy Duty / Very Heavy Duty** (no additional mechanical protection required)			**Medium Duty** (Additional mechanical protection required)	**Non Rated Duty*** (Additional mechanical protection required)
20	01.20HD.OR	x	x	x	x
25	01.25HD.OR	x	x	x	x
32	01.32HD.OR	x	x	x	700.32.6.O
40	01.40HD.OR	x	x	x	700.40.6.O
50	01.50HD.OR	x	x	x	700.50.6.O
65	x	x	x	x	700.65.6.O
80	x	700.80HD.6.OR	x	700.80MD.6.OR	x
100	x	700.100HD.6.OR 700.100VHD.6.OR	x	700.100MD.6.OR	x
140	x	x	600.140HD.12.OR	x	x
150	x	700.150HD.6.OR 700.150VHD.6.OR	x	700.150MD.6.OR	x
160	x	x	600.160VHD.12.OR	x	x

TABLE 3 Summary of Marley Product Range, Wiring Rules & Mechanical Duty relationship

*1. Manufactured to AS/NZS 1260 dimensions
2. For use where cable enclosures are optional
3. When referenced to local power authority requirements and/or specific project design specification

2.2.2 PRINT REQUIREMENTS

Not all brands of cable duct in the market perform to the same level. For proof of intended performance, check the mandatory print requirements that are marked on the cable duct.



1. Manufacturer and/or brand name identification
2. Designed specifically to protect electrical / fibre optic cables
3. Classification Rating
   (VHD = Very Heavy Duty)
   (HD = Heavy Duty)
   (MD = Medium Duty)
4. Compression Duty / Ring Stiffness Rating
   (Rating 5 = Very Heavy Duty)
   (Rating 4 = Heavy Duty)
   (Rating 3 = Medium Duty)
5. Impact Duty Rating
   (Rating 5 = Very Heavy Duty)
   (Rating 4 = Heavy Duty)
   (Rating 3 =Medium Duty)
6. Minimum Service Temperature rating (Rating 3 = -15˚c)
7. Maximum Service Temperature rating (Rating 1 = 60˚c)
8. Cable duct manufacturing standard
9. 3rd party Licence Verification for the specific manufacturing site
10. Exact date and time of manufacture
11. Marley item code for easy tracking
    PVC = 700 Series
    PE* = 600 Series
12. Recyclability

*PE inherently has flame propagating properties.

2.2.3 JOINTING TYPES

Cable ducting joints is determined by material composition.

For PVC

- trench cable duct = 6m overall length inclusive of socket at one end and spigot/plain at the other
- trench cable duct bends = 90/45/22 and 11 degrees at various radii, socketed at both ends. (refer Appendix 6.6 for typical dimensional details)
- solvent cement is the standard method for joining cable duct to provide leak free joints. Less common are Rubber Ring jointing systems.
  i. Solvent joints are classified as an interference fit.
  ii. The actual area of contact between the cable duct spigot and bend socket is only a few millimeters
  iii. Bending of cable duct and joints for curved trench applications is permissible if:
  RADIUS of CURVATURE ≥ 150 x Cable Diameter

  For further details refer to Section 5 for detailed solvent jointing procedures

For PE

- trench cable duct = 12m standard dimension length with plain ends. Other lengths available on request
- Friatec electrofusion or Philmac compression fittings (suited for smaller DN sizes) are the accepted methods of joining PE cable duct lengths
  i. They are the same type of fitting used for PE pressure pipe systems with a default specification referencing SDR ratings
  ii. For Electrical Distribution networks, fittings designated with a SDR13.6 –SDR17 range can satisfy the majority of cable duct jointing specifications.
  iii. PE jointing is not compatible with solvent cement

2.3 CALIBRE® TRENCH PRODUCT RANGE

SIZE (ID)	LENGTH (m)	DUTY	MATERIAL	ORANGE	GREEN	WHITE	RED	CRATE QUANTITY
20	6	Non Rated	PVC		TC20GRDUCT	TC20WHDUCT	700.20.6.RD	900
32	6	Non Rated	PVC	700.32.6.O				230
40	6	Non Rated	PVC	700.40.6.O				180
50	6	Non Rated	PVC	700.50.6.O	TC50GRDUCT	TC50WHDUCT.RRJ	700.50.6.RD	149 150 105
65	6	Non Rated	PVC	700.65.6.O				96
80	6	MD HD	PVC	700.80MD.6.OR 700.80HD.6.OR				66
100	6	MD HD VHD Non Rated	PVC	700.100MD.6.OR 700.100HD.6.OR 700.100VHD.6.OR TC110.OR.RRJ (KIWI Rail)	TC110GRDUCT	TC110WHDUCT.RRJ	700.100.6.RD	60
150	6	MD HD VHD	PVC	700.150MD.6.OR 700.150HD.6.OR 700.150VHD.6.OR				28
140 (OD)	12	HD	PE	600.140HD.12.OR				8
160 (OD)	12	VHD	PE	600.160VHD.12.OR				8

NOTES:

1. Product Code Suffix
   a. OR = orange for Power application & comply with AS/NZS 61386
   b. O = non duty rated Power application. Use Marley ARMA rigid conduit for AS/NZS 61386 HD duty rated requirements
   c. GRDUCT = green for Communication application & comply to equivalent Chorus specification (also WHDUCT = white, RD = red)

2. In accordance to AS/NZS 61386.21, cable duct designation is typically defined as follows:

   a. Cable Duct Size ≥ DN100 mm: Duty Classification is based on Ring Stiffness (SN number) & Impact testing
   - Medium Duty ≥ SN4
   - Heavy Duty ≥ SN10
   - Very Heavy Duty ≥ SN25

   b. Cable Duct Size < DN100 mm: Duty Classification is based on resistance to Compression & Impact testing

3. All PVC cable duct lengths are inclusive of socket length

4. All PVC joins are solvent type joints, unless stated otherwise as rubber ring joints (RRJ)

5. All PE joins are electrofusion type joints

For further details contact 0800MARLEY (0800 627 539) for POA & availability.
MOQ & lead times may apply to customer specific requests or non stocked items (e.g. Size, Duty, Colour)

3.0 TRENCHLESS RANGE

Marley CALIBRE® Trenchless cable duct are high quality polyethylene (PE) coils primarily used for horizontal directional drilling installations for power and telecommunication distribution networks.

Ideal for larger projects requiring continuous lengths, Trenchless cable ducting is manufactured across a range of diameters (DN 20-160) with coil lengths up to 1000m depending on dimensional and performance specifications.

3.1 SELECTION

CALIBRE® Trenchless cable duct is manufactured to AS/NZS 61386 (Conduit systems for cable management). Prior to the launch of CALIBRE® trenchless, PE cable duct differed to PVC cable duct and was manufactured to AS/NZS 4130 (polyethylene PE pipes for pressure applications) in the absence of an electrical purposed, non-pressure application standard.

AS/NZS 61386 is a performance-based rather than a prescriptive standard for ascertaining mechanical performance parameters – resistance to compression or ring stiffness, and resistance to impact.

Selection of Trenchless cable ducting for horizontal directional drilling is primarily based on a mechanical durability classification of Very Heavy Duty, Heavy Duty and Medium duty. Other parameters such as productivity and quality must also be considered. To identify the necessary features and ensure a consistent approach to cable duct design, manufacture and cost-effective underground installation, please refer to Best Practice Selection Criteria (TABLE 4) and Summary of Cable Duct Size, Wiring Rules, Mechanical Duty, EF Jointing and Towing Load relationships (TABLE 5).

CALBIRE® Trenchless cable duct is available in a range of colors for identification purposes – orange color typically for power applications, and green color typically for telecommunication applications. Other colors are also used to satisfy customer specific projects and specifications.

For cost effective and reliable underground cable duct systems, always consider 3 key selection factors – **reliability, productivity and quality**.

RELIABILITY & DURABILITY	
Designed for 100+ years performance (buried in service)	✓
Category A Underground Wiring Rules Very Heavy Duty / Heavy Duty	✓
Category B Underground Wiring Rules Medium Duty	✓ (Sub Duct application)
In-service temperature (wide range)	-15/60°C
PRODUCTIVITY – INSTALLATION & BURIAL	
Application to suit project / site / economic parameters	› Environmental / social sustainability › Long, deep installs or under roads, bridges, crossings › Greenfield installations › Deployment of sophisticated technology, equipment & operations › Ideal for Urban locations
Ease of handling / transport	› Coils – 50 to 1000m › Customised lengths › Metre marking › Strapping to maintain nesting and minimise coil tails
Ease of service identification › Power or Comms colour coded › Product print details	✓
Fittings range	Friatec, Philmac (smaller DN)
Joining	PE Electrofusion, PE Compression fittings
QUALITY & COMPLIANCE	
Environmental	EPD*
100% Recyclable	✓
Manufacturing standard – electrical specific AS/NZS 61386	✓
3rd Party verification	BV License
Tech and sales support	✓

TABLE 4 Best Practice Selection Criteria

*Marley's environmental product declaration (EPD) provide robust data that contribute to evaluating the environmental impacts of specific construction & infrastructure projects. Please refer to the Marley website for further information relating to LCA details, environmental indicators & calculated impacts associated with CALIBRE®.

3.2 INSTALLATION

The following factors specific to cable duct installation are highlighted below and should be considered in conjunction with general practice installation guidelines (AS/NZS 2033) and Electricity Distribution Network specifications.

- Specification & Standards summary
- Print requirements
- Jointing

3.2.1 SPECIFICATION & STANDARDS SUMMARY

The following table illustrates the interrelationship between the wiring rules, manufacturing standards, jointing specifications and towing loads. Table 5 should be read in conjunction with Best Practice Selection Criteria (TABLE 4) and CALIBRE® Trenchless Product Range (Section 3.3).

	AS/NZS 3000	AS/NZ 61386			JOINTING SPECIFICATION (ELECTROFUSION/COMPRESSION FITTINGS)		TOWING LOADS
DN	UNDERGROUND WIRING RULES	DUTY	SN	DIMENSIONS (OD, T, OVALITY)	SDR	MATERIAL DENSITY	Force (KN) (@20˚C)
20	CATEGORY B	MD	N/A	AS/NZS 4130 (TABLE 2) (FITTING/JOINTING COMPATIBILITY)	9	MEDIUM DENSITY (MDPE)	0.78*
25					11		1.18*
32					13.6		2.65*
40					17		2.16
50	CATEGORY A	HD			13.6	HIGH DENSITY (HDPE)	3.14
63					17		4.91
90							10.79
110			>10				15.70
125							20.60
140							24.53
160		VHD	>25				33.35

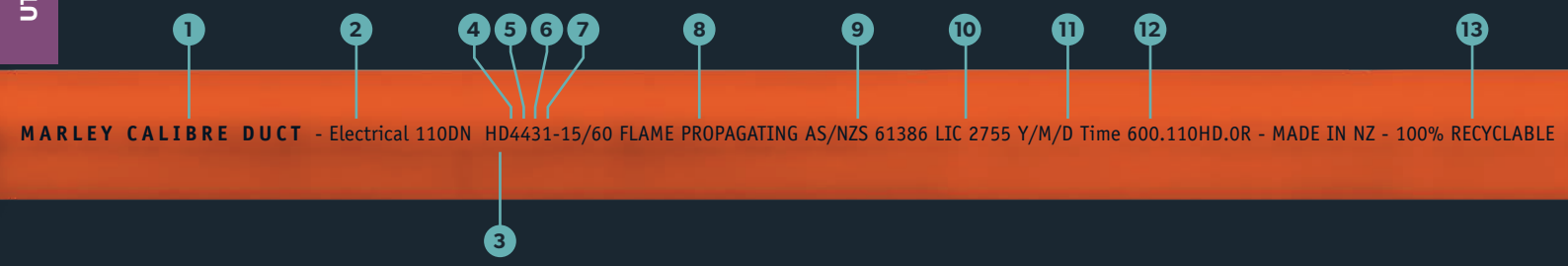
TABLE 5 Summary of Cable Duct Size, Wiring Rules, Mechanical Duty, EF Jointing and Towing Load relationships

NOTES:

1. For AS/NZS 3000 Category A underground wiring systems, Heavy or Very Heavy Duty cable ducting is best suited for trenchless applications given the inability to install additional mechanical protection.
2. For AS/NZS 3000 Category B underground wiring systems, medium duty cable ducting is best suited for sub ducting applications
3. Please refer to specific Electrical Distribution Network policies and procedures which may differ to the above specification
4. *It is recommended that the smaller diameters be pulled by hand.

3.2.2 PRINT REQUIREMENTS

Not all brands of cable duct in the market perform to the same level. For proof of intended performance, check the mandatory print requirements that are marked on the cable duct.



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   (Rating 3 = Medium Duty)
5. Impact Duty Rating
   (Rating 5 = Very Heavy Duty)
   (Rating 4 = Heavy Duty)
   (Rating 3 =Medium Duty)
6. Minimum Service Temperature rating (Rating 3 = -15˚c)
7. Maximum Service Temperature rating (Rating 1 = 60˚c)
8. Resistance to burning (PE duct only = flame propagating)
9. Cable duct manufacturing standard
10. 3rd party Licence Verification for the specific manufacturing site
11. Exact date and time of manufacture
12. Marley item code for easy tracking
    PE = 600 Series
13. Recyclability

3.2.3 JOINTING

- Friatec electrofusion or Philmac compression fittings (suited for smaller DN sizes) are the accepted methods of joining coil lengths. They are the same type of fittings used for PE pressure pipe systems with a default specification referencing SDR ratings
- For Electrical Distribution networks, fittings designated with a SDR13.6 –SDR17 range can satisfy the majority of cable duct jointing specifications (refer TABLE 5)
- PE jointing is not compatible with solvent cement

3.2.4 TOWING LOADS

Towing loads apply to trenchless horizontal directional drilling where the cable duct is pulled through the ground under a tensile force. Such loading will be determined by various factors such as cable duct length, drill path direction, and friction between the size of the cable duct and the composition of the surrounding ground.

Where possible, the minimum towing load to achieve the installation should be used and in no case should the loads in TABLE 5 be exceeded. Exceeding these loads may result in a reduction of the diameter and wall thickness of the cable duct.

When slip lining it is recommended that for long strings, a pipe relaxation period of at least 24 hours is allowed before grouting or making permanent tie-in joints.

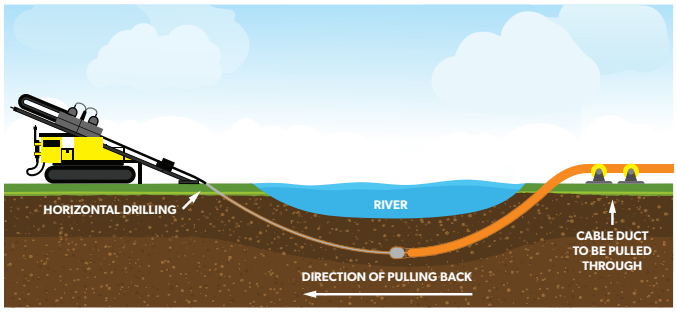
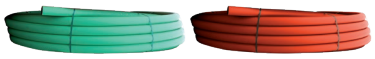


FIGURE 2 Horizontal Directional Drilling

3.3 CALIBRE® TRENCHLESS PRODUCT RANGE



SIZE (OD)	DUTY	MATERIAL	COIL LENGTH 50m	COIL LENGTH 100m	COIL LENGTH 150m	COIL LENGTH 200m	COIL LENGTH 500m	COIL LENGTH 1000m
25	MD	MDPE				600.25MD.200.GN		
32	MD	MDPE				600.32MD.200.OR 600.32MD.200.GN 600.32MD.200.RD	600.32MD.500.OR 600.32MD.500.GN	600.32MD.1000.OR 600.32MD.1000.GN
40	MD	MDPE				600.40MD.200.OR		
50	HD	HDPE		600.50HD.100.OR 600.50HD.100.GN 600.50HD.100.RD				
63	HD	HDPE	600.63HD.50.GN	600.63HD.100.OR 600.63HD.100.GN 600.63HD.100.RD	600.63HD.150.OR 600.63HD.150.GN			
90	HD	HDPE		600.90HD.100.OR				
110	HD	HDPE	600.110HD.50.OR 600.110HD.50.GN	600.110HD.100.OR 600.110HD.100.GN 600.110HD.100.RD				
125	HD	HDPE		600.125HD.100.OR				
140	HD	HDPE	600.140HD.50.OR	600.140HD.100.OR				
160	VHD	HDPE	600.160VHD.50.OR	600.160VHD.100.OR				

NOTES:

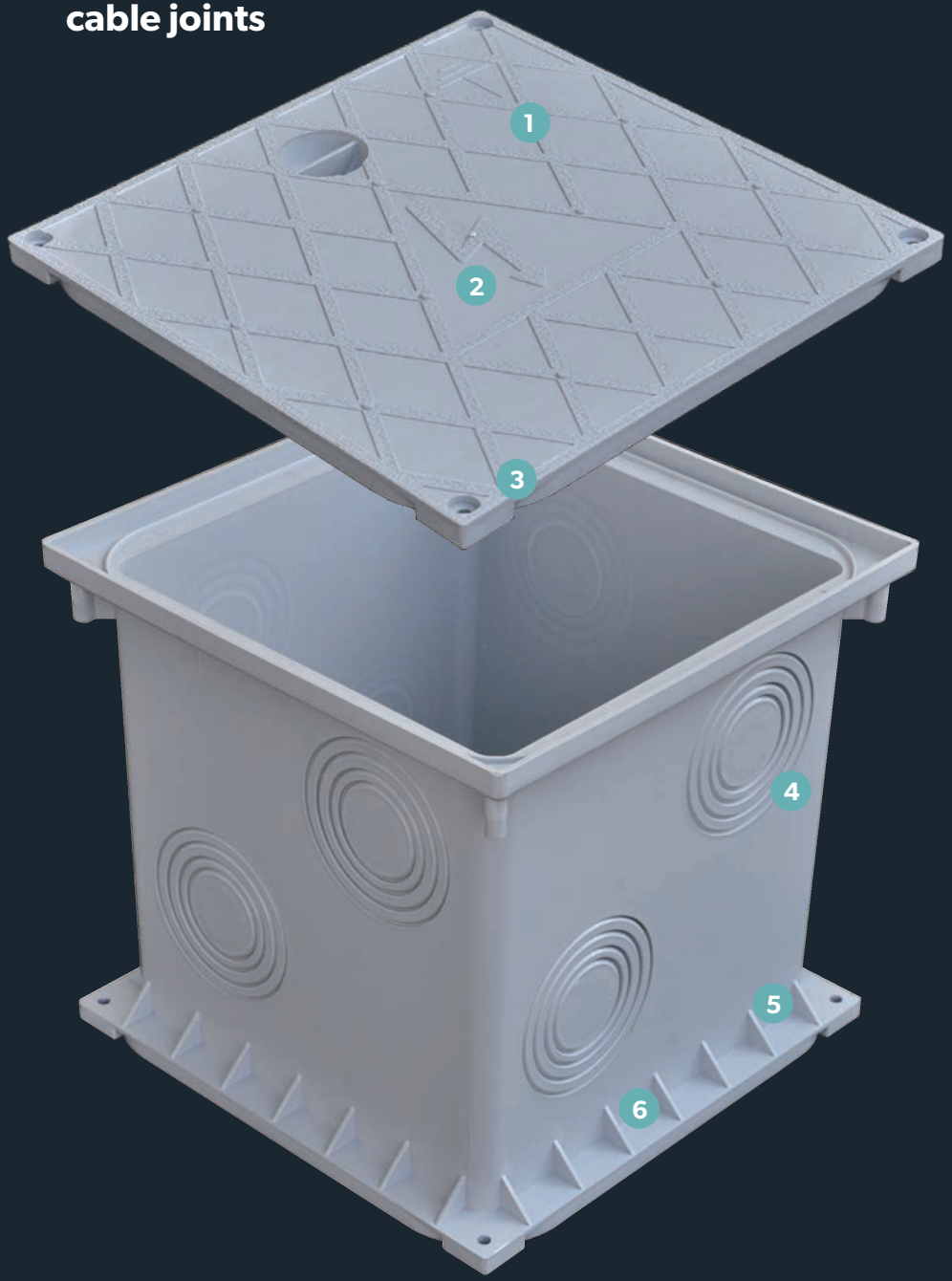
1. Product Code Suffix
   a. OR = orange for Power application & comply with AS/NZS 61386
   b. GN = green for Communication applications (also RD=red and SM=salmon)
2. Comply to AS/NZS 61386 unless otherwise stated.
3. In accordance to AS/NZS 61386.21, cable duct designation is typically defined as follows:
   a. Cable Duct Size ≥ DN100 mm: Duty Classification is based on Ring Stiffness (SN number) & Impact testing
   - Medium Duty ≥ SN4
   - Heavy Duty ≥ SN10
   - Very Heavy Duty ≥ SN25

   b. Cable Duct Size < DN100 mm: Duty Classification is based on resistance to Compression & Impact testing
4. Dimensional parameters satisfy AS/NZS 4130 Table 2 (mean OD, mean ID and wall thickness) and achieve an equivalent SDR 17 or smaller.
5. For communication related installations (non Chorus)
   a. CALIBRE® product (with product suffix code GN) is equivalent to Chorus specification
   b. Must not be used for Chorus work (refer Chorus Approved product listing)
   c. Size DN<40 satisfy AS/NZS 61386 Medium Duty (MD) mechanical duty rating

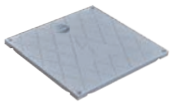
For further details contact 0800MARLEY (0800 627 539) for POA & availability.
MOQ & lead times may apply to customer specific requests or non stocked items (e.g. Size, Duty, Colour)

4.0 ACCESS PITS

Easy access to your cable joints



1. ANTI-SLIP TRAFFICABLE LID

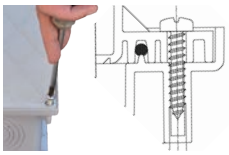


With watertight rubber gasket

2. ELECTRICAL IDENTIFICATION

Signifies that live cables are enclosed

3. WATERTIGHT HERMETIC SCREWING SYSTEM WITH RUBBER GASKET

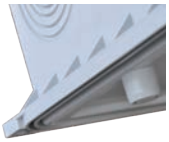


For water and dust protection (IP67)

4. VARIOUS SIZED KNOCK-OUT OUTLETS

(sides and bottom)

5. OUTLET

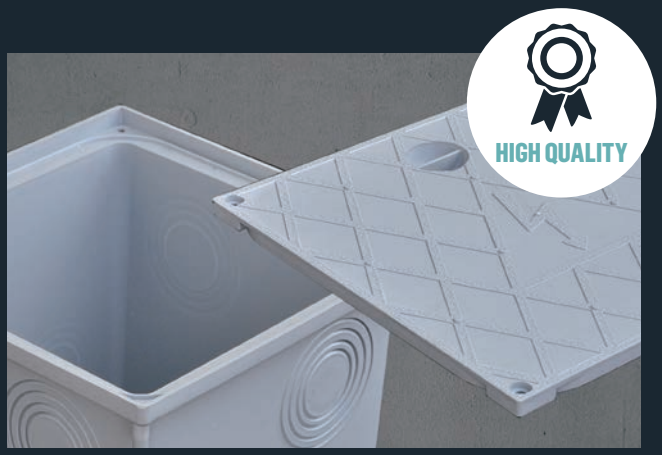


For condensation gathering and discharge

6. PITS HAVE PRE-CUT BASES AND CAN BE STACKED AS RISERS

(hermetic screwing system applies to pit connection)

CALIBRE® TRENCH & TRENCHLESS JOINTING FOR SMALLER PVC CONDUIT & PE CABLE DUCT SIZE



ELECTRICAL ACCESS PITS

Fully Featured and versatile for ease of installation, quick and easy access when undertaking cable jointing work, designed for long term durability.

- riser capability with stackable bases
- timesaving precut bases & multi sized knock-out outlets
- 1.5 tonne high load carrying capacity
- non-conductive, chemical resistant
- watertight hermetric screwing system for securing, sealing & connecting pits

	ACCESS PIT
SIZE	
Overall (WxDxH)	250 x 250 x 240mm
Knock out (uPVC)	40, 50mm
Knock out (PE)	40, 53, 63, 75mm
MATERIAL	
Colour	Grey
Formulation	Polypropylene
TEMPERATURE	
Service Range	-5°C to 50°C
FITTINGS	
Bonding adhesive	Suitable for joining dissimilar materials (PE, uPVC, PP) refer TAM TECH adhesive
DURABILITY	
Load Resistance (EN124)	15KN (max); 1.5 tonne
IP Rating (CEI EN60529)	67
UV Resistance	Yes
Chemical Resistance	High Avoid contact with ketones, esters, aromatic & chlorinated solvent

5.0 GENERAL JOINTING PROCEDURES (TRENCH)

5.1 SOLVENT CEMENT

Marley Solvent Cement is designed for solvent welding PVC joints. It is a welding process not an adhesive or gluing process. It is a blend of three aggressive solvents and sufficient resin to provide a brushing consistency.

When applied to the joint surface the Priming fluid and Marley Solvent Cements cause the PVC to soften and swell. When two such surfaces are placed in close contact (as in a spigot and socket joint) the softened surfaces mix and on hardening produce a chemically welded joint. It is important that the spigot provides an interference fit in the socket. Do not attempt to make a joint that does not achieve an interference fit when dry. The actual area of contact between the spigot and the socket may only be a few millimetres.

To make successful solvent weld joints, the following procedure is recommended for an easy, reliable and efficient assembly of solvent joints:

5.1.1 SAFETY PRECAUTIONS WITH SOLVENT WELD JOINTING

- Ventilation
  1. Make sure there is adequate ventilation.
  2. Forced ventilation may be necessary inside buildings, in confined trenches and manholes.
  3. Keep the containers tightly sealed when not in use.
- Flammability
  1. Solvent cement and priming fluids are highly flammable.
  2. Store them in a cool place away from heat, flames and sparks. Do not smoke while using them.
  3. Keep the containers tightly sealed when not in use.
- Contact and Handling

  Safety and First Aid instructions on the container should be followed.
  1. Skin: Solvent cement spilt onto skin should be washed off immediately with soap and water. Always wash hands thoroughly after use. The solvents attack the natural oils in human skin eventually causing serious dermatitis
  2. Eyes: Should solvent cement affect the eyes, flush with cool clean water for at least 15 minutes.
  3. Ingestion: If solvent cement or primer is swallowed, induce vomiting.

5.1.2 SPECIAL CONSIDERATIONS

When correct procedures and workmanship are carried out by appropriately trained personnel, durability including water tightness of the solvent joint can be assured.

- Old or expired solvent should not be used
  1. Over time solvent can evaporate in the container and thicken to become jelly like. It will then be unable to chemically soften the joint surface adequately
  2. Do not add thinners or solvents to Marley Gold, Marley Clear Solvent Cement or Marley Joint Primer.
- Contamination will be detrimental to having a full-strength joint
  1. Do not use dirty or contaminated brushes or rags
  2. Contamination such as oil, grease, water, dust or similar on the PVC surface prevents effective contact between the surfaces.
- Solvent jointing should only be carried out in dry conditions above 5°C
- Minimise the number of joints
- Introduce no deflections or strain on fittings or joints
- The spigot end must be square to make a good joint.

5.1.3 HOW TO SOLVENT JOINT

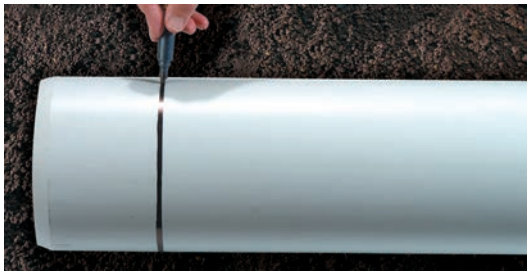
General

- Before proceeding, make sure that the spigots and sockets are not cracked or damaged during transit.
- Only use a fine-tooth hack saw when cutting to length is necessary. Ensure the spigot is cut square, taking care not to chip or crack the cable duct. Remove all burrs from the inside.

SOLVENT CEMENT COVERAGE

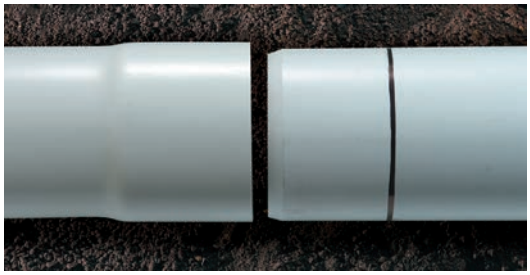
The approximate number of joints that may be jointed with one litre is as follows:

Size DN	Solvent Cement
15	600
20	350
25	260
32	190
40	140
50	85
65	70
80	60
100	50
123	40
150	30
200	25
225	15
300	10
375	10



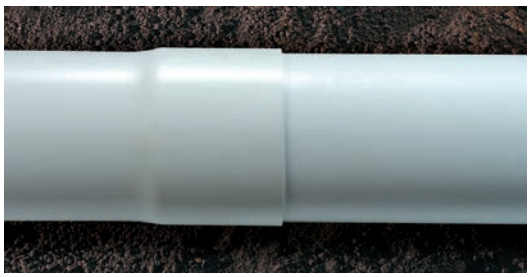
1. Mark and chamfer

- Mark the insertion depth on the spigot end. The insertion depth is equivalent to the depth of the corresponding joint socket. Use a soft pencil or felt pen which does not damage the cable duct.
- Make a 15° chamfer to the external end of the spigot to remove any other burrs. Typically required on larger sized cable duct



2. Clean

- Clean, dry and degrease the spigot and socket. Wiping with a clean cloth clipped in methylated spirits or Marley primer.

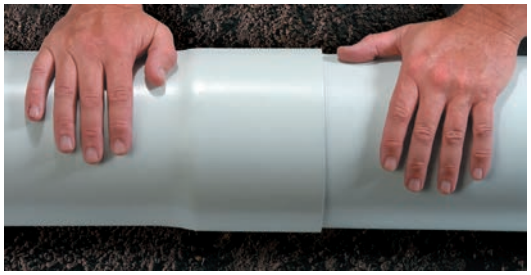


3. Check the fit

- Dry assemble all intended joins.
- Check that all joints have a full interference fit. Interference fit means that the spigot should not be able to fully penetrate the socket up to the insertion mark without force.

4. Apply primer and solvent

- Apply an even coat of priming fluid to the socket and then the spigot. **NOTE:** Solvent Cement should be applied before Priming fluid completely dries off.
- Coat the socket and the spigot (to the insertion mark) evenly and sparingly with either Marley Gold or Marley Clear Solvent Cement.



5. Join

- Immediately insert the spigot to the full marked depth in the socket to evenly spread the solvent cement.
- HOLD for a minimum of 30 seconds, depending on temperature.

6. Clean off

- Wipe off any excess Solvent Cement.

7. Handling and testing

- Do not handle the joint for approximately 5 minutes.
- Allow 10 hours of drying time before any rough handling (or testing if required)

5.1.4 CURVED TRENCH

When installing on a curve, cable ducting should be joined straight and then laid to a curve until resistance starts to occur.

Bending should be controlled using non mechanical forces.

The acceptable limits for longitudinal (axial) bending is the equivalent to achieving a Radius of Curvature (R) $\geq$ 150 x cable duct diameter.

If a tighter curvature is required, fittings such as elbows and sweep bends should be used.

Bending is best achieved when several lengths of cable duct are initially joined to become a "pipe-string".

Significant bending moments should not be exerted on the joint. This introduces localized stresses in the spigot and socket that maybe detrimental to long term performance. Bend should primarily be located mid point along a cable duct length, with joints supported by compact soil.

5.2 RUBBER RING JOINTING

How to make a Rubber Ring Joint

1. Check spigot end

› Ensure spigot has full 15° chamfer around circumference and insertion depth mark.
This should be 10-15mm less than the socket depth.

2. Clean socket and rubber ring

› Clean socket and ring groove of dirt and loose gravel.
› Clean Rubber Ring.

3. Fit rubber ring

› Place rubber ring in groove correct way around and check for proper seating.
› Fin must point into pipe for Z-ring.

4. Alignment

› Align horizontally and vertically.
Do not try to insert at an angle to socket.

5. Lubricate spigot

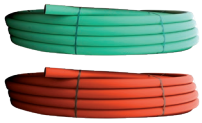
› Clean off dust and dirt and apply jointing lubricant to chamfer.
› Keep end free from dirt.

6. Insertion

› Insert spigot into socket to the marked distance.
Do not use undue force. If force is required, check ring seating, using a torch to look up cable duct.

6.0 APPENDIX

6.1 PRODUCT SPECIFICATION

	CALIBRE® TRENCH	CALIBRE® TRENCHLESS
		
SIZE		
Diameter (mm)	32, 40, 50, 65, 80, 100, 150 (PE = 140/160)	20, 25, 32, 40, 50, 63, 90, 110, 125, 140, 160
Length (m)	6 (PE = 12)	50, 100, 150, 200, 500, 1000
MATERIAL		
Colour	Orange, Green, White, Salmon	Orange, Green, Red, Salmon
Formulation	uPVC Resin + modifiers	MDPE (DN≤40) HDPE (DN ≥50)
Finish	Matte Finish	Matte Finish
TEMPERATURE		
Service temperature range	-15˚C to 60˚C	-15˚C to 60˚C
Linear co efficient of thermal expansion	7 X 10^{-5} m/(mK)	17 X 10^{-5} m/(mK)
FITTINGS		
Marley colour match	Orange, Green, White	
Extensive range	Yes	
Joint	Solvent (SJ) Rubber Ring Joint (RRJ)	Electrofusion Compression
Duty rating[1]	Very Heavy Duty (5531) Heavy Duty (4431) Medium Duty (3331)	SDR 11-17
DURABILITY		
Duty rating[1]	Very Heavy Duty (5531) Heavy Duty (4431) Medium Duty (3331) Non-Duty Rated	Very Heavy Duty (5531) Heavy Duty (4431) Medium Duty (3331)
Ring stiffness (SN) (when DN≥100)	MD ≥ SN4 HD ≥ SN10 VHD ≥ SN25	MD ≥ SN4 HD ≥ SN10 VHD ≥ SN25
Resistance to burning	Non flame propagating	Flame propagating
UV resistance[3]	White Cable Duct only	N/A
Chemical resistance	High[2]	High[2]
COMPLIANCE		
Manufacturing standard	AS/NZS 61386 AS/NZS 1260	AS/NZS 61386
Environmental	BEP certified (PVC applicable) ISO 14001 EPD	BEP certified - N/A ISO 14001 EPD
3rd party verification	Manurewa: BV Lic. 2755 Horotiu: BV Lic. 2970 Tinwald: BV Lic. 2806	Manurewa: BV Lic. 2755 Horotiu: BV Lic. 2970 Tinwald: BV Lic. 2806

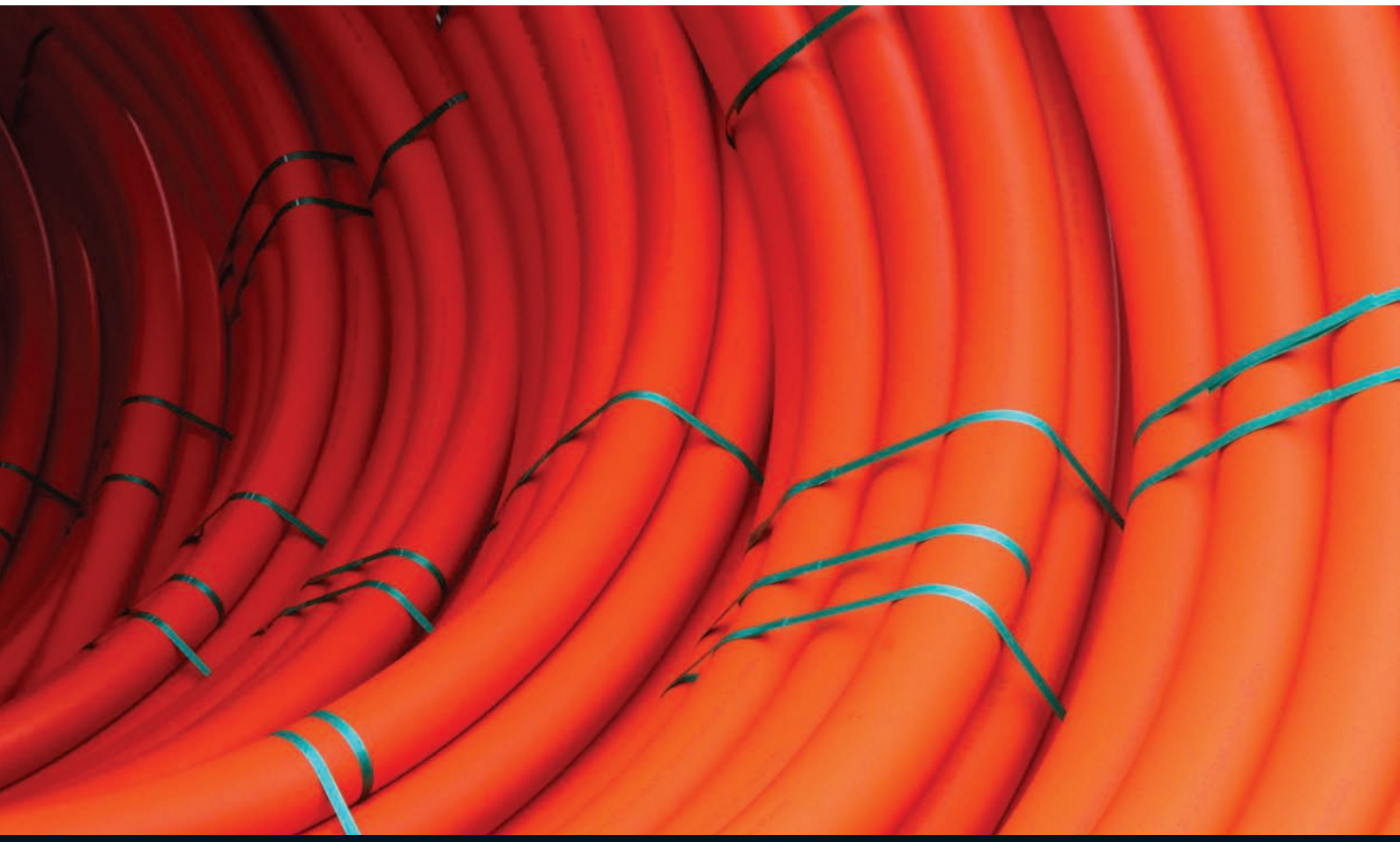
1 Duty rating varies by size and customer requirements, please contact Marley for more information
2 Avoid contact with ketones, esters, aromatic and chlorinated solvent
3 Cable ducting designed to be buried in service, unless stated otherwise

6.2 MATERIAL PROPERTIES

Marley supply a wide range of products in uPVC, polypropylene and polyethylene. Please refer to the table below for performance data "typical" of these materials.

PROPERTIES	UNITS	uPVC	POLYPROPYLENE	POLYETHYLENE
1.1 GENERAL PROPERTIES				
Specific Gravity		1.46	.96	.95
Water Absorption	%	0.5	<0.1	<0.1
1.2 ELECTRICAL PROPERTIES				
Dielectric Strength	kV/mm	14	30	22
Dielectric Constant	1MHz	2.7	2.2	2.3
Dissipation Factor	1MHz	.025	.0004	.0003
Surface Resistivity	ΩM	10^{15}	$>10^{16}$	$>10^{15}$
Volume Resistivity	ΩM	1.2×10^{14}	$>10^{14}$	$>10^{13}$
1.3 THERMAL PROPERTIES				
Co-Efficient Of Thermal Expansion	$\times 10^{-5}$ m/(mK)	7	17	17
Minimum Service Temperature	˚C	-15	-5	-15
Max Service Temperature	˚C	60	60	60
Specific Heat	$JK^{-1}kg^{-1}$	1250	1800	1900
Thermal Conductivity	w/m˚C	.16	.22	.45
1.4 FLAMMABILITY CHARACTERISTICS				
Flammability		Self extinguishing Non flame propagating	Non flame propagating	Flame propagating

NOTE: Above values are indicative only.



6.3 BEST PRACTICE CABLE DUCT® SELECTION CRITERIA

For cost effective and reliable underground cable duct systems, always consider 3 key selection factors – **reliability, productivity and quality**.

	INSTALLATION METHODOLOGY	
	CALIBRE® TRENCH	CALIBRE® TRENCHLESS
RELIABILITY & DURABILITY		
Designed for 100+ years performance (buried in service)	✓	✓
Category A Underground Wiring Rules Very Heavy Duty / Heavy Duty	✓	✓
Category B Underground Wiring Rules Medium Duty	✓ (Extra mechanical protection required)	✓ (Sub Duct application)
In-service temperature (wide range)	-15/60°C	-15/60°C
PRODUCTIVITY – INSTALLATION & BURIAL		
Application to suit project / site / economic parameters	› Urgent repairs › Short, shallow installs in soft soil › Unidentifiable services & obstacles › Deployment of minimal equipment › Ideal for Rural locations	› Environmental / social sustainability › Long, deep installs or under roads, bridges, crossings › Greenfield installations › Deployment of sophisticated technology, equipment & operations › Ideal for Urban locations
Ease of handling / transport	› Rigid - straight lengths › Kink free	› Coils – 50 to 1000m › Customised lengths › Metre marking › Strapping to maintain nesting and minimise coil tails
Ease of service identification › Power or Comms colour coded › Product print details	✓	✓
Fittings range	Fabricated bends (duty, angle, radius)	Friatec, Philmac (smaller DN)
Joining	PVC Solvent, PE Electrofusion, PE Compression fittings	PE Electrofusion, PE Compression fittings
QUALITY & COMPLIANCE		
Environmental	BEP (PVC applicable); EPD*	EPD*
100% Recyclable	✓	✓
Manufacturing standard – electrical specific AS/NZS 61386	✓	✓
3rd Party verification	BV License	BV License
Tech and sales support	✓	✓

*Marley's environmental product declaration (EPD) provide robust data that contribute to evaluating the environmental impacts of specific construction & infrastructure projects. Please refer to the Marley website for further information relating to LCA details, environmental indicators & calculated impacts associated with CALIBRE®.

6.4 HANDLING & STORAGE

Any product over 25 kilos needs to be lifted mechanically.

Storage

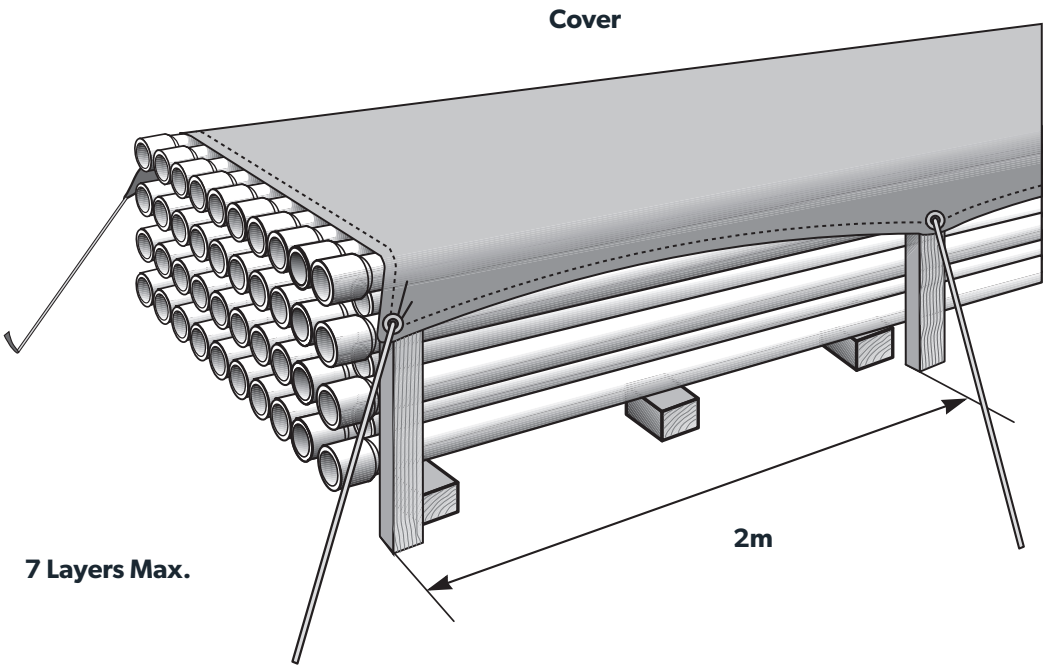
Cable duct should not be stored in direct sunlight for longer than twelve months without a hessian or similar cover. Black plastic should be avoided as it can create excessive heat build-up.

Stringing

Laying the cable duct along the line of the trench is known as stringing.

The following points should be observed:

- Sockets should face the direction in which work will be going
- Cable duct should be unloaded on the opposite side of the trench to the soil
- Cable duct should be placed at 6 metre intervals
- Sockets should be placed so that the cable enters the socket end of the cable duct
- The identification marketing strip should be laid uppermost to aid in identifying the cable duct should it be uncovered at any time in the future.



6.5 CALIBRE® PRODUCT RANGE – TRENCH & TRENCHLESS

CALIBRE TRENCH

SIZE (ID)	LENGTH (m)	DUTY	MATERIAL	ORANGE	GREEN	WHITE	RED	CRATE QUANTITY
20	6	Non Rated	PVC		TC20GRDUCT	TC20WHDUCT	700.20.6.RD	900
32	6	Non Rated	PVC	700.32.6.O				230
40	6	Non Rated	PVC	700.40.6.O				180
50	6	Non Rated	PVC	700.50.6.O	TC50GRDUCT	TC50WHDUCT.RRJ	700.50.6.RD	149 150 105
65	6	Non Rated	PVC	700.65.6.O				96
80	6	MD HD	PVC	700.80MD.6.OR 700.80HD.6.OR				66
100	6	MD HD VHD Non Rated	PVC	700.100MD.6.OR 700.100HD.6.OR 700.100VHD.6.OR TC110.OR.RRJ (KIWI Rail)	TC110GRDUCT	TC110WHDUCT.RRJ	700.100.6.RD	60
150	6	MD HD VHD	PVC	700.150MD.6.OR 700.150HD.6.OR 700.150VHD.6.OR				28
140 (OD)	12	HD	PE	600.140HD.12.OR				8
160 (OD)	12	VHD	PE	600.160VHD.12.OR				8

NOTES:

1. Product Code Suffix
   a. OR = orange for Power application & comply with AS/NZS 61386
   b. O = non duty rated Power application. Use Marley ARMA rigid conduit for AS/NZS 61386 HD duty rated requirements
   c. GRDUCT = green for Communication application & comply to equivalent Chorus specification (also WHDUCT = white, RD = red)

2. In accordance to AS/NZS 61386.21, cable duct designation is typically defined as follows:
   a. Cable Duct Size ≥ DN100 mm: Duty Classification is based on Ring Stiffness (SN number) & Impact testing
   - Medium Duty ≥ SN4
   - Heavy Duty ≥ SN10
   - Very Heavy Duty ≥ SN25

   b. Cable Duct Size < DN100 mm: Duty Classification is based on resistance to Compression & Impact testing

3. All PVC cable duct lengths are inclusive of socket length

4. All PVC joins are solvent type joints, unless stated otherwise as rubber ring joints (RRJ)

5. All PE joins are electrofusion type joints

For further details contact 0800MARLEY (0800 627 539) for POA & availability.
MOQ & lead times may apply to customer specific requests or non stocked items (e.g. Size, Duty, Colour)

CALIBRE TRENCHLESS

SIZE (OD)	DUTY	MATERIAL	COIL LENGTH 50m	COIL LENGTH 100m	COIL LENGTH 150m	COIL LENGTH 200m	COIL LENGTH 500m	COIL LENGTH 1000m
25	MD	MDPE				600.25MD.200.GN		
32	MD	MDPE				600.32MD.200.OR 600.32MD.200.GN 600.32MD.200.RD	600.32MD.500.OR 600.32MD.500.GN	600.32MD.1000.OR 600.32MD.1000.GN
40	MD	MDPE				600.40MD.200.OR		
50	HD	HDPE		600.50HD.100.OR 600.50HD.100.GN 600.50HD.100.RD				
63	HD	HDPE	600.63HD.50.GN	600.63HD.100.OR 600.63HD.100.GN 600.63HD.100.RD	600.63HD.150.OR 600.63HD.150.GN			
90	HD	HDPE		600.90HD.100.OR				
110	HD	HDPE	600.110HD.50.OR 600.110HD.50.GN	600.110HD.100.OR 600.110HD.100.GN 600.110HD.100.RD				
125	HD	HDPE		600.125HD.100.OR				
140	HD	HDPE	600.140HD.50.OR	600.140HD.100.OR				
160	VHD	HDPE	600.160VHD.50.OR	600.160VHD.100.OR				

NOTES:

1. Product Code Suffix
   a. OR = orange for Power application & comply with AS/NZS 61386
   b. GN = green for Communication applications (also RD=red and SM=salmon)
2. Comply to AS/NZS 61386 unless otherwise stated.
3. In accordance to AS/NZS 61386.21, cable duct designation is typically defined as follows:
   a. Cable Duct Size ≥ DN100 mm: Duty Classification is based on Ring Stiffness (SN number) & Impact testing
   - Medium Duty ≥ SN4
   - Heavy Duty ≥SN10
   - Very Heavy Duty ≥ SN25

   b. Cable Duct Size < DN100 mm: Duty Classification is based on resistance to Compression & Impact testing
4. Dimensional parameters satisfy AS/NZS 4130 Table 2 (mean OD, mean ID and wall thickness) and achieve an equivalent SDR 17 or smaller.
5. For communication related installations (non Chorus)
   a. CALIBRE® product (with product suffix code GN) is equivalent to Chorus specification
   b. Must not be used for Chorus work (refer Chorus Approved product listing)
   c. Size DN<40 satisfy AS/NZS 61386 Medium Duty (MD) mechanical duty rating

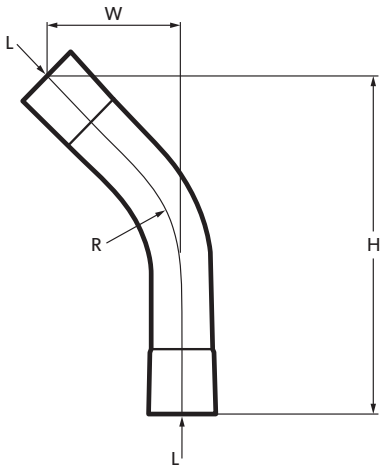
For further details contact 0800MARLEY (0800 627 539) for POA & availability.
MOQ & lead times may apply to customer specific requests or non stocked items (e.g. Size, Duty, Colour)

6.6 TRENCH CABLE DUCT BENDS

(Dimensions for standard PVC Bends – DN100/150, Angle 90/45/22/11 degree)

Sweep Bend

CALIBRE CODE	DIAMETER (DN)	ANGLE (A)	RADIUS (R)	HEIGHT (H)	WIDTH (W)	LENGTH (L)
703.100MD.11.OR 703.100HD.11.OR	100	11	275	560	60	560
703.100MD.22.OR 703.100HD.22.OR		22	275	600	120	630
703.100MD.45.OR 703.100HD.45.OR		45	275	650	280	750
703.100MD.90.OR 703.100HD.90.OR		90	275	550	550	900
703.150MD.11.OR 703.150HD.11.OR	150	11	400	785	70	785
703.150MD.22.OR 703.150HD.22.OR		22	400	800	150	800
703.150MD.45.OR 703.150HD.45.OR		45	400	850	380	950
703.150MD.90.OR 703.150HD.90.OR		90	400	950	950	1300



Sweep Bend (long radius)

CALIBRE CODE	DIAMETER (DN)	ANGLE (A)	RADIUS (R)	HEIGHT (H)	WIDTH (W)	LENGTH (L)	PIECES
703.100MD.90.R900.OR 703.100HD.90.R900.OR	100	90	900	1150	1150	1830	1
703.100MD.90.R1200.OR 703.100HD.90.R1200.OR			1200	1370	1370	2200	1
703.100MD.90.R1500.OR 703.100HD.90.R1500.OR			1500	1630	1630	2700	1
703.150MD.90.R900.OR 703.150HD.90.R900.OR	150	90	900	1200	1200	2000	1
703.150MD.90.R1200.OR 703.150HD.90.R1200.OR			1200	1508	1508	2500	1
703.150MD.90.R1500.OR 703.150HD.90.R1500.OR			1500	1722	1722	2800	1
703.150MD.90.R2000.OR 703.150HD.90.R2000.OR			2000	2470	2470	4070	2
703.150MD.90.R2500.OR 703.150HD.90.R2500.OR			2500	3078	3078	4870	2
703.150MD.90.R3000.OR 703.150HD.90.R3000.OR			3000	3662	3662	6000	3

NOTE:

Due to fabrication process, all dimensions listed are:

1. Nominal and subject to variation
2. In mm
3. Dimensions table referenced to cable duct centre-line
4. Radius = radius of curvature (applies only to a section of the bend, not the entire length)
5. MOQ & lead times may apply to customer specific requests or non stocked items (e.g. Size, Duty, Colour)

6.7 CHEMICAL RESISTANCE CHART (uPVC / PE)

Three different classes of chemical resistance degree are conventionally used in this guide ie:

Class 1: **HIGH RESISTANCE** (corrosion-proof) - all materials belonging to this class are completely or almost completely corrosion-proof against the conveyed fluid, according to the specified operating conditions.

Class 2: **LIMITED RESISTANCE** - the materials belonging to this class are partially attacked by the conveyed chemical compound. The average life of the material is therefore shorter, and it is advisable to use a higher safety factor by selecting a higher SN rating pipe.

Class 3: **NO RESISTANCE** - all material belonging to this class are subject to corrosion by the conveyed fluid and they should therefore not be used.

The absence of any class indication means that no data are available concerning the chemical resistance of the material in respect of the conveyed fluid.

ABBREVIATIONS

sat = saturated solution at 20°C, **nd** = undefined concentration,
deb = weak concentration, **comm** = commercial solution. **dil** = diluted solution

Figure 16

	FORMULA	CONC %	TEMP (°C)	PVC	PE
ACETALDEHYDE	CH_3CHO	100	25	3	1
			60	3	
- AQUEOUS SOLUTION		40	25	3	1
			60	3	2
ACETIC ACID	CH_3COOH	≤ 25	25	1	1
			60	2	1
		30	25	1	1
			60	2	1
		60	25	1	1
			60	2	1
		80	25	1	1
			60	2	
- GLACIAL		100	25	2	1
			60	3	2
ACETIC ANHYDRIDE	$(CH_3CO)_2O$	100	25	3	2
			60	3	2
ACETONE (DIMETHYL KETONE)	CH_3COCH_3	10	25	3	1
			60	3	
		100	25	3	2
			60	3	2
ACETOPHENONE (ACETYLBENZENE OR PHENYL METHYL KETONE)	$CH_3COC_6H_5$	nd	25		
			60		
ACRYLONITRILE (ACRYLONITRILE OR VINYL CYANIDE)	CH_2CHCN	technically pure	25		1
			60	3	1
ADIPIC ACID AQUEOUS SOLUTION	$(CH_2CH_2CO_2H)_2$	sat.	25	1	1
			60	2	1
ALLYL ALCOHOL	CH_2CHCH_2OH	96	25	2	1
			60	3	2
ALUM AQUEOUS SOLUTION (POTASH ALUM.SOL.)	$Al_2(SO_4)_3K_2SO_4nH_2O$	dil	25	1	1
		dil	60	2	1
		sat.	60	2	1
ALUMINIUM - CHLORIDE	$AlCl_3$	all	25	1	1
			60	1	1
- FLORIDE	AlF_3	100	25	1	1
			60	1	1
- HYDROXIDE	$Al(OH)_3$	all	25	1	
			60	1	-
NITRATE	$Al(NO_2)_3$	nd	25	1	
			60	1	-
SULFATE	$Al(SO_4)_3$	deb	25	1	
			60	1	1
		sat	25	1	1
			60	1	1
AMMONIA - AQUEOUS SOLUTION	NH_3	deb	25	1	1
			60	2	1
		sat	25	1	
			60	2	
- DRY GAS		100	25	1	1
			60	1	1
- LIQUID		100	25	2	1
			60	3	1
AMMONIUM - ACETATE	CH_3COONH_4	sat	25	-	1
			60	2	1
- CARBONATE	$(NH_4)_2CO_3$	all	25	1	1
			60	2	1

	FORMULA	CONC %	TEMP (°C)	PVC	PE
- FLUORIDE	NH_4F	25	25	1	1
			60	2	1
- HYDROXIDE	NH_4OH	28	25	-	1
			60	2	1
- NITRATE	NH_4NO_3	sat	25	1	1
			60	1	1
- PHOSPHATE DIBASIC	$NH_4(HPO_4)_2$	all	25	1	1
			60	1	1
- PHOSPHAT META	$(NH_4)_4P_4O_{12}$	all	25	1	
			60	1	
- PHOSPHATE TRI	$(NH_4)_2HPO_4$	all	25	1	
			60	1	
- PERSULFATE	$(NH_4)_2S_2O_8$	all	25	1	
			60	1	
- SULFIDE	$(NH_4)_2S$	deb	25	1	1
			60	2	1
		sat	25	1	1
			60	1	1
- SULFHYDRATE	NH_4OHSO_4	dil	25	1	1
			60	2	1
		sat	25	1	1
			60	1	1
AMYLACETATE (PENTYL ACETATE)	$CH_3CO_2CH_2(CH_2)_3CH_3$	100	25	3	1
			60	3	2
AMYLALCOHOL	$CH_3(CH_2)_3CH_2OH$	nd	25	1	1
			60	2	1
ALNILINE (PHENYLAMINE OR AMINOBENZENE) - CHLORHYDRATE (ANILINE HYDROCHLORIDE)	$C_6H_5HN_2$	all	25	3	2
			60	3	2
	$CH_6H_5NH_2HCl$	nd	25	2	2
			60	3	2
ANTIMONY - TRICHLORIDE	$SbCl_3$	100	25	1	1
			60	1	1
ANTHRAQUINONE (SULFONIC ACID)	suspension	25	1	1	
			60	2	-
AQUA REGIA	$HCl+HNO_3$	100	25	2	3
			60	2	3
ARSENIC ACID	H_3ASO_4	deb	25	1	1
			60	2	1
		80	25	1	1
			60	2	1
BARIUM CARBONATE	$BACO_3$	all	25	1	1
			60	1	1
- CHLORIDE	$BaCl_2$	10	25	1	1
			60	1	1
- HYDROXIDE	$Ba(OH)_2$	all	25	1	1
			60	1	1
- SULFATE	$BaSO_4$	nb	25	1	1
			60	1	1
- SULFIDE	BaS	sat	25	1	
			60	1	
BEER		comm	25	1	1
			60	1	
BENZALDEHYDE	C_6H_5CHO	nd	25	3	2
			60	3	2

	FORMULA	CONC %	TEMP (°C)	PVC	PE
BENZENE (BENZOL)	C_6H_6	100	25	3	3
			60	3	
- + LIGROIN		20/80	25	3	
			60	3	
- MONOCHLORINE	C_6H_3Cl	technically pure	25	3	2
			60		
BENZOIC ACID	C_6H_5COOH	sat	25	1	1
			60	2	1
BENZYL ALCOHOL	$C_6H_5CH_2OH$	100	25	1	
			60	2	
BORIC ACID (BORACIC ACID)	H_3BO_3	deb	25	1	1
			60	2	1
		sat	25	1	1
			60	2	1
BRINE		comm	25	1	
			60	1	
BROMIC ACID	$HBrO_3$	10	25	1	1
			60	1	1
BROMINE - LIQUID	Br_2	100	25	3	3
			60	3	3
- VAPOURS	low	25	2	3	
			60		3
BUTADIENE	C_4H_6	100	25	1	
			60	1	3
BUTANEDIOL AQUEOUS	$CH_3CH_2CHOHCH_2OH$	10	25	1	
			60	3	
		concentrated	25	2	2
			60	3	3
BUTANE GAS	C_4H_{10}	10	25	1	1
			60		1
BUTYL - ACETATE (BUTANATE)	$CH_3CO_2CH_2CH_2CH_2\ CH_3$	100	25	3	3
			60	3	3
- ALCOHOL (BUTANOL)	C_4H_9OH		25	1	1
			60	2	1
- PHENOL	$C_4H_9C_6H_4OH$	100	25	2	3
			60	2	3
BUTYLENE GLYCOL	$C_4H_6(OH)_2$	100	25		1
			60	2	1
BUTYRIC ACID (BUTANOIC ACID)	$C_2H_5CH_2COOH$	20	25	1	1
			60	2	2
		concentrated	25	3	3
			60	3	3
CALCIUM - BISULFITE	$Ca(HSO3)_2$	nd	25	1	1
			60	1	1
- CARBONATE	$CaCO_3$	all	25	1	1
			60	1	1
-CHLORATE	CaHCl	nd	25	1	1
			60	1	1
- CHLORIDE	$CaCl_2$	all	25	1	1
			60	2	1
- HYDROXIDE	$Ca(OH)_2$	all	25	1	
			60	1	
- HYPOCHLORITE	$Ca(OHI)_2$	sat	25		1
			60	2	1
- NITRATE	$Ca(NO_3)_2$	50	25	1	1
			60	1	
- SULFATE	$CaSO_4$	nd	25	1	1
			60	1	1
- SULFIDE	CaS	sat	25	1	2
			60	1	2
CAMPHOR OIL		nd	25	1	3
			60		3
CARBON - DIOXIDE AQUEOUS SOLUTION	CO_2	-	25	1	1
			60	2	1
- GAS		100	25	1	1
			60	1	1
- DISULFIDE	CS_2	100	25	2	2
			60	3	
- MONOXIDE	CO	100	25	1	1
			60	1	1
- TETRACHLORIDE	CCl_4	100	25	2	2
			60	3	3
CARBONIC ACID - AQUEOUS SOLUTION	H_2CO_3	sat	25	1	
			60	1	
- DRY		100	25	1	
			60	1	
- WET		all	25	1	
			60	2	
CARBON OIL		comm	25	1	
			60	1	

	FORMULA	CONC %	TEMP (°C)	PVC	PE
CHLORAMINE	NH_2Cl	dil	25	1	1
			60		
CHLORIC ACID	$HClO_3$	20	25	1	1
			60	2	3
CHLORINE	Cl_2	sat	25	2	
			60	3	
- DRY GAS		10	25	1	
			60	2	
		100	25	2	
			60	3	
- WET GAS		5 g/m3	25	1	
			60	3	
		10 g/m3	25	2	2
			60	2	
		66 g/m3	25	2	2
			60	2	
- LIQUID		100	25	3	3
			60		
CHLOROACETIC ACID	$ClCH_2COH$	85	25	1	2
			60	2	3
		100	25	1	3
			60	2	3
CHLOROBENZENE	C_6H_5Cl	all	25	3	
			60	3	
CHLOROFORM	$CHCl_3$	all	25	3	2
			60	3	
CHLOROSULPHONIC ACID	$ClHSO_3$	100	25	2	3
			60	3	3
CHROME ALUM	$KCr(SO_4)_2$	nd	25	1	1
			60	2	1
CHROMIC ACID	CrO_3+H_2O	10	25	1	2
			60	2	3
		30	25	1	2
			60	2	3
		50	25	1	2
			60	2	3
CHROMIC SOLUTION	$CrO_3+H_2O+H_2SO_4$	50/35/15	25	1	3
			60	2	3
CITRIC ACID AQ.SOL.min.	$C_3H_4(OH)(CO_2H)_3$	50	25	1	1
			60	1	1
COPPER - CHLORIDE	$CuCl_2$	sat	25	1	1
			60	1	1
- CYANIDE	$CuCN_2$	all	25	3	
			60	3	
- FLUORIDE	CuF_2	all	25	1	1
			60	1	1
- NITRATE	$Cu(NO_3)_2$	nd	25	1	1
			60	2	1
- SULFATE	$CuSO_4$	dil	25	1	1
			60	1	1
		sat	25	1	1
			60	1	1
COTTONSEED OIL		comm	25	1	
			60	1	
CRESOL (HYDROXY TOLUENE)	$CH_3C_6H_4OH$	≤90	25	2	1
			60	3	
		≥90	25	3	
			60	3	
CRESYLIC ACID	$CH_3CH_6H_4COOH$	50	25	2	
			60	3	
CYCLOHEXANE	C_6H_{12}	all	25	3	1
			60	3	
CYCLOHEXANONE	$C_6H_{10}O$	all	25	3	1
			60	3	
DECAHYDRONAFTALENE	$C_{10}H_{18}$	nd	25	1	1
			60	1	2
DEMINERALIZED WATER		100	25	1	1
			60	1	1
DIBUTYPATHALATE	$C_6H_4(CO_2C_4H_9)_2$	100	25	3	3
			60	3	
DICHLORO-ACETIC ACID	$Cl_2CHCOOH$	100	25	1	1
			60	2	2
DICHLOROETHANE (ETHYLENE DICHLORIDE)	CH_2ClCH_2Cl	100	25	3	3
			60	3	3
DICHLOROETHYLENE	$Cl(CH)_2Cl$	100	25	3	3
			60	3	3
DIETHYL ETHER	$C_2H_5OC_2H_5$	100	25	3	3
			60	3	3
DIGLYCOLIC ACID	$(CH_2)_2O(CO_2H)_2$	18	25	1	1
			60	2	1
DIMETHYLAMINE	$(CH_3)_2NH$	100	25	2	
			60	3	2

	FORMULA	CONC %	TEMP (°C)	PVC	PE
DIOCTYLPHTHALATE		all	25 60	3 3	1 2
DISTILLED WATER		100	25 60	1 1	1 1
DRINKING WATER		100	25 60	1 1	1 1
ETHERS		all	25 60	3 3	
ETHYL - ACETATE (ACETIC ETHER)	$CH_3CO_2C_2H_5$	100	25 60	3 3	1 3
- ALCOHOL	CH_3CH_2OH	nd	25 60	1 2	1 2
(ETHANOL) - CHLORIDE	CH_3CH_2Cl	all	25 60	3 3	2
- ETHER	$CH_3CH_2OCH_2CH_3$	all	25 60	3 3	
ETHYLENE - CHLOROHYDRIN	$ClCH_2CH_2OH$	100	25 60	3 3	
- GLYCOL (ETHANEDIOL OR GLYCOL)	$HOCH_2CH_2OH$	comm	25 60	1 1	1 3
FATTY ACIDS		nd	25 60	1 1	
FERRIC - CHLORIDE	$FeCl_3$	10	25 60	1 2	
		sat	25 60	1 1	1 1
- NITRATE	$Fe(NO_3)_3$	nd	25 60	1 1	1 1
- DEXTRINE (BRITISH GUM OR STARCH GUM)	$C_6H_{12}OCH_2O$	nd	25 60	1 2	1 1
- SULFATE	$Fe(SO_4)_3$	nd	25 60	1 1	1 1
FERROUS - CHLORIDE	$FeCl_2$	sat	25 60	1 1	1 1
- SULFATE	$FeSO_4$	nd	25 60	1 1	1 1
FERTILIZER		≤ 10 sat	25 60 25 60	1 1 1 1	1 1 1 1
FLUORINE GAS DRY	F_2	100	25 60	2 3	2 3
FLUROSILICIC ACID	H_2SiF_6	32	25 60	1 1	1 1
FORMALDEHYDE	HCOH	-	25 60	1 2	1 1
FORMIC ACID	HCOOH	50 100	25 60 25 60	1 2 1 3	1 1 1 1
FRUIT PULP AND JUICE		comm	25 60	1 1	1
FUEL OIL		100 comm	25 60 25 60	1 1 1 1	 - 2
FURFUROLE ALCOHOL	$C_5H_3OCH_2OH$	nd	25 60	3 3	2 2
GAS EXHAUST - ACID		all	25 60	1 1	
- WITH NITROUS - VAPOURS		traces 60	25 1	1 1	1
GAS PHOSGENE	ClCOCl	100	25 60	1 2	2 2
GELATINE		100	25 60	1 1	1 -
GLUCOSE (DEXTROSE)	$C_6H_{12}O_6$	all	25 60	1 2	1 1
GLYCERINE AQ.SOL(GLYCEROL)	$HOCH_2CHOHCH_2OH$	all	25 60	1 1	1 1
GLYCOGLUE AQUEOUS		10	25 60	1 1	1 1
GLYCOLIC ACID	$HOCH_2COOH$	37	25 60	1 1	1 1
HEPTANE	C_7H_{16}	100	25 60	1 2	1 3
HEXANE	C_6H_{14}	100	25 60	1 2	1 2
HYDROBROMIC ACID	HBr	≤10 48	25 60 25 60	1 2 1 2	1 1 1 1

	FORMULA	CONC %	TEMP (°C)	PVC	PE
HYDROCHLORIC ACID (MURIATIC ACID)	HCl	≤25 ≤ 37	25 60 25 60	1 2 1 1	1 1 1 2
HYDROCYANIC ACID (PRUSSIC ACID OR HYDROGEN CYANIDE)	HCN	deb	25 60	1 1	1 1
HYDROFLUORIC ACID	HF	10	25 60	1 2	1 1
HYDROGEN	H_2	all	25 60		
HYDROGEN - PEROXIDE (BLEACH)	H_2O_2	30 50	25 60 25 60	1 1 1 1	1 1 2 -
- SULFIDE DRY		sat	25 60	1 2	1 1
- SULFIDE WET		sat	25 60	1 2	1 1
HYDROSUPHITE		≤10	25 60	1 2	
HYDROXYLAMINE SULPHATE	$(H_2NOH)_2H_2SO_4$	12	25 60	1 1	1
ILLUMINATING GAS		100	25 60	1	1
IODINE - DRY AND WET	I_2	3	25 60	2 3	
- TINCTURE		≤3	25 60	2 3	2 3
ISOCTANE	C_8H_{18}	100	25 60	1	2
ISO-OCTANE	$(CH_3)_3CCH_2(CH_3)_2$				
ISOPROPYL -ETHER	$(CH_3)_2CHOCH(CH_3)_2$	100	25 60	2 3	2 3
- ALCOHOL (ISOPROPANOL)	$(CH_3)_2CHOH$	100	25 60	2	
LACTIC ACID	$CH_3COHCOOH$	≤28	25 60	1 2	1 1
LANOLINE		nd	25 60	1 2	1
LEAD ACETATE	$Pb(CH_3COO)_2$	sat	25 60	1 1	1 -
LINSEED OIL		comm	25 60	1 2	2
LUBRICATING OILS		comm	25 60	1 1	3
MAGNESIUM - CARBONATE	$MgCO_3$	all	25 60	1 1	
- CHLORIDE	$MgCl_2$	sat	25 60	1 1	1 1
- HYDROXIDE	$Mg(OH)_2$	all	25 60	1 1	
-NITRATE	$MgNO_3$	nd	25 60	1 1	1 1
- SULFATE	$MgSO_4$	dil sat	25 60 25 60	1 1 1 1	1 1 1 1
MALEIC ACID	COOHCHCHCOOH	nd	25 60	1 1	1 1
MALIC ACID (HYDROXYSUCCINIC ACID)	$CH_2CHOH(COOH)_2$	nd	25 60	1 -	1 -
MERCURIC - CHLORIDE - CYANIDE	$HgCl_2$ $HgCN_2$	sat all	25 1 60 25 60	1 1 1 1	1 1
MERCUROUS NITRATE	$HgNO_3$	nd	25 60	1 1	1 1
MERCURY	Hg	100	25 60	1 2	1 1
METHYL - ACETATE	CH_3COOCH_3	100	25 60	- -	- -
- ALCOHOL (METHANOL OR WOODSPIRIT)	CH_3OH	nd	25 60	1 1	1
- BROMIDE (BROMOMETHANE)	CH_3Br	100	25 60	3	3
- CHORIDE (CHLOROMETHANE)	CH_3Cl	100	25 60	3 3	1
- ETHYLKETONE	$CH_3COCH_2CH_3$	all	25 60	3 3	1 2
METHYLAMINE	CH_3NH_2	32	25 60	2 3	1 2

	FORMULA	CONC %	TEMP (°C)	PVC	PE
METHYLENE CHLORIDE (DICHLOROMETHANE)	CH_2Cl_2	100	25 60	3 3	3
METHYL SULPHORIC ACID	CH_3COOSO_4	50 100	25 60 25 60	1 2 1 2	2 2 3 3
MILK		100	25 60	1 1	1
MINERAL ACIDOULOUS WATER		nd	25 60	1 1	1 1
MOLASSES		comm	25 60	1 2	1 2
NAPHTA		100	25 60	2 3	2 3
NAPHTALINE		100	25 60	1 2	1
NICKEL - CHLORIDE	$NiCl_3$	all	25 60	1 1	1 1
- NITRATE	$Ni(NO_3)_2$	nd	25 60	1 1	1 1
- SULFATE	$NiSO_4$	dil sat	25 60 25 60	1 1 1 1	1 2 1 1
NITRIC ACID	HNO_3	anhydrous 20 40 60 98	25 60 25 60 25 60 25 60 25 60	3 3 1 2 1 1 1 2 3 3	 1 2 - 2 3 3 3
NITROBENZENE	$C_6H_5NO_2$	all	25 60	3 3	2
OLEIC ACID	$C_8H_{17}CHCH(CH_2)_7CO_2H$	comm	25 60	1 1	- 2
OLEUM (FUMING SULPHURIC) ACID OR PYROSULPHURIC ACID)	$H_2S_2O_7$	nd	25 60	3 3	3
- VAPOURS	low high	25 	3 60 25 60	 3 3 3	
OLIVE OIL	comm	25	 60	 2	 3
OXALIC ACID	HO_2CCO_2H	10 sat	25 60 25 60	1 2 1 1	1 1 1 1
OXYGEN	O_2	all	25 60	1 1	1 2
OZONE	O_3	nd	25 60	1 2	2 3
PALMITIC ACID	$CH_3(CH_2)_{14}COOH$	10 70	25 60 25 60	1 1 1 1	- -
PARAFFIN (ALKANE)		nd	25 60	 2	 2
- EMULSION		comm	25 60	1 1	2 2
- OIL (KEROSENE)		nd	25 60	1 1	
PERCHLORIC ACID	$HClO_4$	100 70	25 60 25 60	1 2 1 2	1 1 1 2
PETROL - REFINED - UNREFINED		100 100	25 60 25 60	1 1 1 1	
PHENOL - AQUEOUS SOLUTION (CARBOLIC ACID)	C_6H_5OH	1 ≤90	25 60 25 60	1 2 3	1 1
PHENYL HYDRAZINE	$C_6H_5NHNH_2$	all	25 60	3 3	2 2
- CHLORHYDRATE	$C_6H_5NHNH_3Cl$	sat	25 60	1 3	1 3
PHOSPHORIC - ACID	H_3PO_4	≤ 25 ≤50	25 60 25 60	1 2 1 	1 1 1
- ANHYDRIDE	P_2O_5	≤85 60 nd	25 1 25 60	1 2 1 2	1 1 1
PHOSPHORUS TRICHLORIDE	PCl_3	100	25 60	3 3	1
PHOTOGRAPHIC - DEVELOPER		comm	25 60	1 1	
- EMULSION		comm	25 60	1 1	1
PHTHALIC ACID	$C_6H_4(CO_2H)_2$	50	25 60	- 3	1 1
PICRIC ACID	$HOC_6H_2(NO_2)_3$	1	25 60	1 1	1 -
(2,4,6 TRINITROPENOL)		≥1	25 60	3 3	1
POTASSIUM - BICHROMATE (POTASSIUM HYDROGENCARBONATE)	$K_2Cr_2O_7$	40	25 60	1 1	1
- BORATE	K_3BO_3	sat	25 60	1 2	
- BROMATE	$KBrO_3$	nd	25 60	1 2	
- BROMIDE KBr		sat	25 60	1 1	1
- CARBONATE (POTASH)	K_2CO_3	sat	25 60	1 1	1 1
- CHROLIDE (POTASSIUM MURIATE)	KCl	sat	25 60	1 1	1 1
- CHROMATE	K_2CrO_4	40	25 60	1 1	1 1
- CYANIDE	KCN	sat	25 60	1 1	1 1
- FERROCYANIDE	$K_4Fe(CN)_{63}H_2O$	100	25 60	1 1	1 1
- FLUORIDE	KF	sat	25 60	1 1	
- HYDROXIDE (CAUSTIC POTASH)	KOH	≤60	25 60	1 2	1 1
- NITRATE KNO_3 (NITRE, SALTPETRE)	sat	25	1 60	1 1	1
- PERBORATE	KBO_3	all	25 60	1 1	
- PERBORATE	KBO_3	all	25 60	1	
- PERMANGANATE (PERMANGANATE OF POTASH)	$KMnO_4$	10	25 60	1 1	1 1
- PERSULFATE	$K_2S_2O_8$	nd	25 60	1 2	1 1
- SULFATE	K_2SO_4	sat	25 60	1 2	1 1
PROPANE - GAS	C_3H_8	100	25 60	1	1
- LIQUID		100	25 60	1	2
PROPYL ALCOHOL (PROPANOL)	C_3H_7OH	100	25 60	1 2	1 1
PYRIDINE	$CH(CHCH)_2N$	nd	25 60	3 3	1 2
RAIN WATER		100	25 60	1 1	1 1
SEA WATER		100	25 60	1 1	1 1
SILICIC ACID	H_2SiO_3	all	25 60	1 1	1 1
SILICONE OIL		nd	25 60	1 3	1 2
SILVER - CYANIDE	AgCN	all	25 60	1 1	
- NITRATE	$AgNO_3$	nd	25 60	1 2	1 1
- PLATING SOLUTION		comm	25 60	1 1	
SOAP - AQUEOUS SOLUTION		high	25 60	1 2	
SODIC LYE		≤60	25 60	1 1	
SODIUM - ACETATE	CH_3COONa	100	25 60	1 1	1 1

	FORMULA	CONC %	TEMP (°C)	PVC	PE
- BICARBONATE (SODIUM HYDROGEN CARBONATE)	$NaHCO_3$	nd	25	1	1
		60	1	1	
- BISULFITE	$NaHSO_3$	100	25	1	1
			60	1	1
- BROMIDE	NaBr	sat	25	1	
			60	1	
- CARBONATE	Na_2CO_3	sat	25	1	1
			60	1	1
- CHLORATE	$NaClO_3$	nd	25	1	1
			60	2	1
- CHLORIDE	NaCl	dil	25	1	1
			60	2	1
		sat	25	1	1
			60	1	1
- CYANIDE	NaCN	all	25	1	
			60	1	
- FERROCYANIDE	$Na_4Fe(CN)_6$	sat	25	1	1
			60	1	1
- FLUORIDE	NaF	all	25	1	1
			60	1	1
- HYDROXIDE	NaOH	60	25	1	1
			60	1	1
- HYPOCHLORITE	NaOCl	deb	25	1	1
			60	2	
- HYPOSULFITE	$Na_2S_3O_3$	nd	25	1	
			60	1	
- NITRATE	$NaNO_3$	nd	25	1	1
			60	1	1
- PERBORATE	$NaBO_3H_2O$	all	25	1	
			60	1	
- PHOSPHATE di	Na_2HPO_4	all	25	1	
			60	1	
- PHOSPHATE tri	Na_3PO_4	all	25	1	1
			60	1	1
- SULPHATE	Na_2SO_4	dil	25	1	
			60	1	
		sat	25	1	1
			60	1	1
- SULFIDE	Na_2S	dil	25	1	1
			60	2	1
		sat	25	1	1
			60	1	1
- SULFITE	$NaSO_3$	sat	25	1	
			60	1	
STANNIC CHLORIDE	$SnCl_4$	sat	25	1	1
			60	1	1
STANNOUS CHLORIDE	$SnCl_2$	dil	25	1	1
			60	1	1
STEARIC ACID	$CH_3(CH_2)_{16}CO_2H$	100	25	1	
			60	1	2
SUGAR SYRUP		high	25	1	1
			60	2	1
SULPHUR	S	100	25	1	
			60	2	
- DIOXIDE AQUEOUS	SO_2	sat	25	1	1
			60	2	
- DIOXIDE DRY		all	25	1	1
			60	1	1
- DIOXIDE LIQUID		100	25	2	1
			60	3	2
- TRIOXIDE	SO_3	100	25	2	3
			60	2	3
SULPHURIC ACID	H_2SO_4	≤ 10	25	1	1
			60	1	1
		≤75	25	1	1
			60	2	2
		≤90	25	1	2
			60	2	2
		≤96	25	2	2

	FORMULA	CONC %	TEMP (°C)	PVC	PE
		60	3	2	
- FUMING (OLEUM)		all	25	2	
			60	3	
- NITRIC AQUEOUS SOLUTION	$H_2SO_4+HNO_3+H_2O$	48/49/3	25	1	3
			60	2	3
		50/50/0	25	2	3
			60	3	3
		10/20/70	25	1	2
			60	1	2
TALLOW EMULSION		comm	25	1	1
			60	1	2
TANNIC ACID	$C_{14}H_{10}O_9$	10	25	1	1
			60	1	1
TARTARIC ACID	$HOOC(CHOH)_2COOH$	all	25	1	1
			60	2	1
TETRACHLORO - ETHANE	$CHCl_2CHCl_2$	nd	25	3	2
			60	3	3
- ETHYLENE (PERCHLOROETHYLENE)	CCl_2CCl_2	nd	25	3	2
			60	3	3
TETRAETHYLLEAD	$Pb(C_2H_9)_4$	100	25	1	1
			60	2	
TETRAHYDROFURAN	C_4H_8O	all	25	3	2
			60	3	3
THIONYL CHLORIDE	$SOCl_3$	-	25	3	3
			60		
THIOPHENE	C_4H_4S	100	25	3	2
			60	3	2
TOLUENE	$C_6H_5CH_3$	100	25	3	2
			60	3	3
TRANSFORMER OIL		nd	25	1	1
			60	2	2
TRICHLORO-ACETIC ACID	CCl_3COOH	≤50	25	1	1
			60	3	2
TRICHLOROETHYLENE	Cl_2CCHCl	100	25	3	2
			60	3	2
TRIETHANOLAMINE	$N(CH_2CH_2OH)_2$	100	25	2	1
			60	3	
TURPENTINE		100	25	2	2
			60	2	3
UREA AQUEOUS SOLUTION	$CO(NH_2)_2$	≤ 10	25	1	1
			60	2	1
		33	25	1	1
			60	2	1
URINE		nd	25	1	1
			60	2	1
URIC ACID	$C_5H_4N_4O_3$	10	25	1	
			60	2	
VASELINE OIL		100	25	1	1
			60	3	2
VINYL ACETATE	$CH_3CO_2CHCH_2$	100	25	3	
			60	3	
WHISKEY		comm	25	1	
			60	1	
WINES		comm	25	1	1
			60	1	
WINE VINEGAR		comm	25	1	1
			60	2	1
ZINC - CHLORIDE	$ZnCl_2$	dil	25	1	1
			60	1	1
		sat	25	1	1
			60		
- CHROMATE	$ZnCrO_4$	all	25	1	
			60	1	
- CYANIDE	$Zn(CN)_2$	all	25	1	
			60		
- NITRATE	$Zn(NO_3)_2$	nd	25	1	
			60	1	
- SULFATE	$ZnSO_4$	dil	25	1	1
			60	1	1
		sat	25	1	1
			60	1	1

Sustainable Manufacturing

Marley is committed to creating environmentally sustainable processes and products and was the first plastics manufacturer in New Zealand to achieve ISO14001 registration. We are also Best Environmental Practice certified for our entire range of manufactured uPVC systems. This means we get our raw materials from sustainable and responsible sources, continuously work on our manufacturing processes to reduce our environmental footprint and accept our products back at the end of their useful life for recycling.

ISO 9001
ISO 14001
BUREAU VERITAS Certification

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