

Installation Guide

MULTIduct™



Installation Depths

MULTIduct™ has been extensively tested in order to determine the maximum loading on each unit section. These tests demonstrate the suitability of burying MULTIduct™ for road applications at various depths by simulating the highest possible loading, when continuously and point loaded, at that depth.

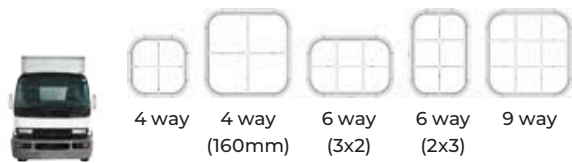
Continuous Loading



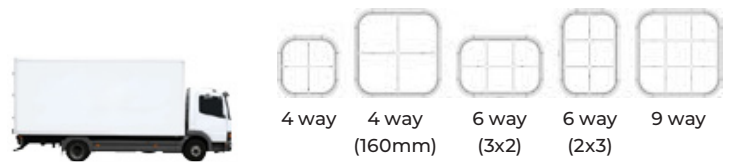
Point Loading



MULTIduct™ Configuration

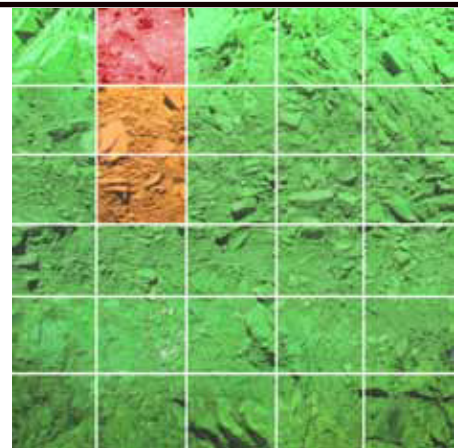


MULTIduct™ Configuration



Depth of cover

- 100mm
- 200mm
- 300mm
- 400mm
- 500mm
- 600mm

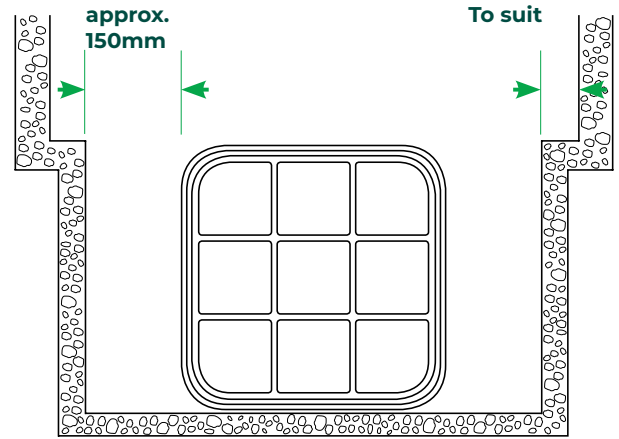


Not suitable without structural backfill
 Can be considered - consult technical support
 Suitable for all installations

Buried installations

This method covers under track crossings, buried cable routes, under road crossings and linear routes. Whatever method of excavation is used, MULTIduct™ will speed and simplify the overall installation process.

Trench Width



Normal trench formation showing clearance required for conduit.

If wider trenches become necessary, the enlargement should be restricted in depth to a grade at or above the top of the final duct formation to minimise backfill loading.

To minimise backfill loading on the MULTIduct™ and for the most economical construction, the trench width should be no greater than that required to provide adequate and safe working space in the trench and to permit proper placement and consolidation at the sides of the MULTIduct™ of the initial backfill materials. This width is approximately 300mm greater in total than the duct formation.

Trench Depth

Trench depth will vary depending on the duct formation, the cover requirement and any other local regulations.

Extensive testing has been carried out on MULTIduct™ which shows it can be buried much shallower than traditional ducts, pipes and conduits.

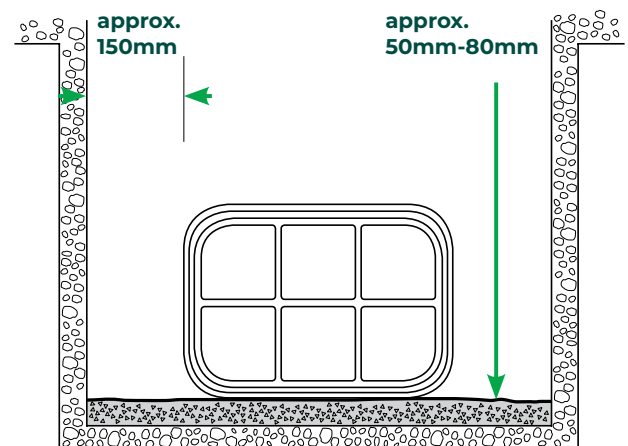
The table on the first page shows the various minimum depths that NAL advise MULTIduct™ can be buried at without structural backfill and without compromising on the installation strength.

Basic Preparation of Foundation and Bedding

MULTIduct™ must be installed over an even, firm and stable foundation. Any low spots in the trench bottom or foundation are to be corrected by firmly tamping, in shallow lifts, free flowing granular material.

To provide evenly distributed support, the top layer of the foundation should consist of a bedding of approximately 50 to 80mm of an uncompacted cushion of granular material of mixed particle size.

This layer must be free of stones and other hard particles larger than about 20mm to prevent a possible concentrated point loading on the MULTIduct™. In most situations, the final hand grading of a trench bottom will produce a satisfactory cushion.



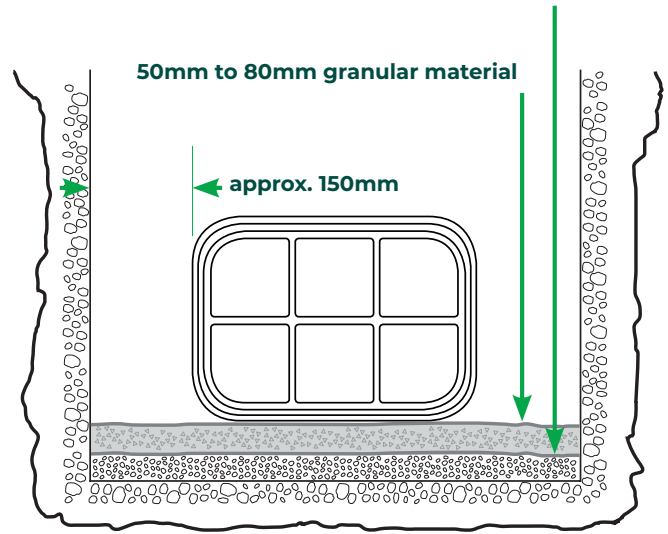
A suitable bedding in stable soil trench is generally produced after final hand grading of the trench as excavated, without the need for special backfills.

Rock / Hard Clay Installations

In rock, rocky soils or extremely hard clay or other materials which will not permit the direct placement of adequate bedding, the trench bottom should be over excavated by approximately 75mm. The correction of low spots in the trench can be done with satisfactory material taken from trench spoils, if this is not available then imported graded stone should be used. This layer should be adequately compacted. A bedding layer of 50 to 80mm of uncompacted granular material of mix particle size as per the standard installation.

When entering an access chamber, building or other rigid structure, the foundation should be particularly firm and stable to ensure the MULTIduct™ will not settle in relation to the rigid structure.

approx. 75mm compacted as dug or graded stone



Other Buried Installations

MULTIduct™ can also be readily assembled and pushed through an already buried casing. The table below indicates the minimum casing size required for various formations.

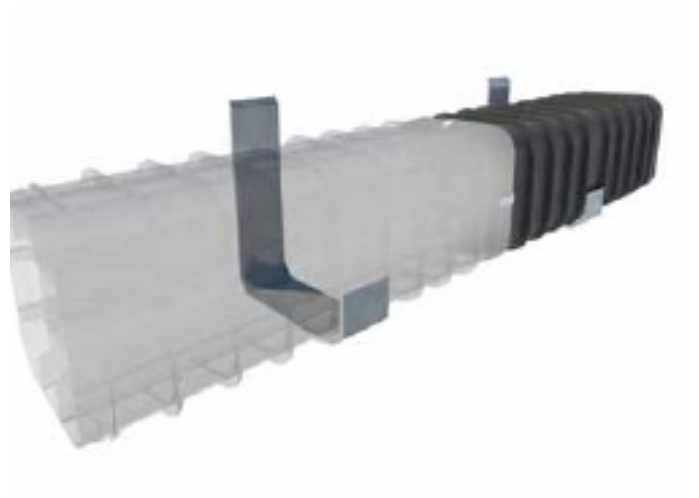


Duct Configuration	No. of Ducts	Min. pipe I/D size
4-Way	1 x 4W	356mm
6-Way	1 x 6W	404mm
8-Way	2 x 4W	559mm
9-Way	1 x 9W	508mm
12-Way	2 x 6W	610mm
12-Way	3 x 4W	559mm
16-Way	1 x 6W & 1 x 9W	737mm
16-Way	4 x 4W	711mm
18-Way	2 x 9W	813mm
18-Way	3 x 6W	838mm
24-Way	4 x 6W	914mm
36-Way	4 x 9W	1067mm

Bridge Crossing Installations

MULTIduct™ can be placed under the span of bridges to provide a route for cables without the need for burial in the bridge deck. This is done by the placement of steel bracketry at 1m spacings onto the side of the bridge upon which the MULTIduct™ can sit and be strapped to.

The project engineer should ensure these brackets are specified accordingly due to the variances in bridge design and MULTIduct™ requirements.



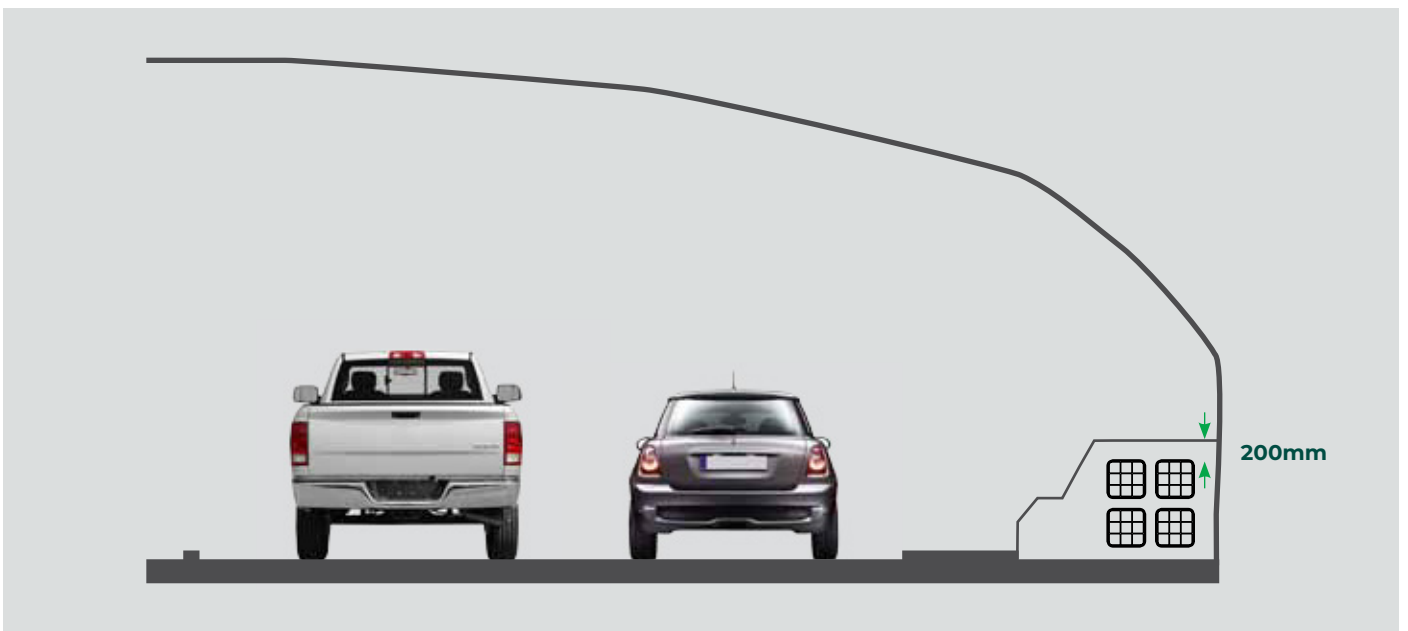
Example of a standard bridge crossing installation and bracket system.

Due to the variances of bridge construction; the project engineer should specify the brackets and fixing methods to be used.

Tunnels

MULTIduct™ is also ideal for installation in tunnels where many cables are installed at the side of the road or rail track. Prepare the base and place the MULTIduct™ in the same way as for a buried application.

The MULTIduct™ should then be encapsulated in a recommended minimum of 200mm concrete surround in order to protect it from fire damage. The project engineer should specify the grade and ultimately the thickness of this concrete.



Joining MULTIduct™

MULTIduct™ units are joined by a socket and spigot joint via the push fit design.

These joints allow for pre-assembly of several sections for longer lengths and provide joint integrity during construction and subsequent backfill consolidation.

MULTIduct™ assembly normally originates from a terminal point, such as an access chamber, with the socket end facing the direction of lay. An alternative method is to start at a midpoint in the run with a double socket unit and proceed in both directions. Prior to assembly, the socket and spigot ends should be checked to see that they are free of dirt or other foreign material and that the spigot ends have a properly seated gasket if they are being used.

Push-Fit Assembly Method

1

Raise the socket end by approximately 100mm.



2

Insert the spigot end of the next section into the raised socket end. If a gasket is being used, ensure it is properly located.



3

Raise the free end of this next section to close the top of the joint and push down to close the bottom of the joint.



4

Push entire length until 'pips' click into the corresponding holes in socket end. A hammer can be used to assist.



Pre-assembly

MULTIduct™ may be pre-assembled in longer than unit lengths above the trench as construction allows it. Pre-assembly is accomplished in the same manner as in the trench and then the whole unit can be lowered into the trench as one.



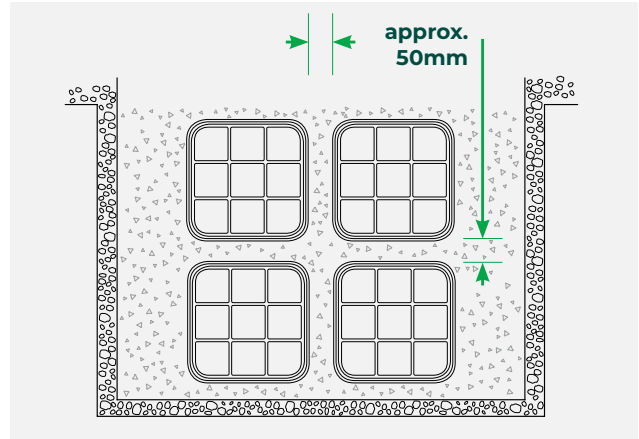
Multiple Banks

MULTIduct™ can be installed in single 4, 6 or 9 way formations or stacked to provide multiple duct banks. As individual sections or multiples are joined together in the trench, care should be taken to maintain the proper alignment and that the formation follows as smooth a course as possible. Both straight and curved runs should be checked to ensure that no joint is deflected more than 2 degrees. Mitres should be used wherever necessary to relieve joints which are deflected beyond the 2 degree limit. A final check of alignment should always precede initial backfilling.

For buried installations, NAL recommends separating horizontal and vertical banks with a minimum of 50mm of granular material.

The granular material should be adequately compacted to ensure that voids are eliminated.

MULTIduct™ units can be stacked as high as required.



Example showing recommended separation using granular material.

Bends and Breakouts

Curves and Grade Changes

The flexibility of the MULTIduct™ joint will allow for slight changes of grade and direction without the use of mitres. Changes which are greater than 2 degrees per joint, either in straight runs or curves, must be accomplished by the use of mitre units. Each mitre allows a direction change of 3 degrees per 305mm and will permit the construction of radii as small as 6 metres. Generally, the joints should be maintained as square as is practical.

Procedures for installation of 'Y' laterals

When installations require removal of one or more cable(s) from an individual bore in the 4, 6 or 9 way MULTIduct™ the use of a 'Y' piece will make the job a simple procedure. Various lateral adapters are available depending on the bore and direction involved (see page 12).

To install a 'Y' follow the following steps;

1. Remove two re-enforcing ribs from the outside of the MULTIduct™ where the fitting will be located.
2. Carefully position the template provided with the fitting onto the MULTIduct™ and mark the ellipse shape over the bore being broken out from. In addition the template shows where the four fixing bolts are located - mark these too.
3. Use a small hand or electric saw to cut through the MULTIduct™ in the shape of the marking. Then drill out the four marked hole locations where the fixing bolts will pass through.
4. Clean away all residue, shaving and bits from the cuts and drill holes made.
5. Pass the four coach bolts provided through the four drilled fixing holes from the inside of the MULTIduct™. The rounded head of the bolt will be on the inside of the bore.
6. Apply a silicone bead around the outside edge of the ellipse hole and the four bolts sticking up through the MULTIduct™ wall.
7. Position the 'Y' fitting over the hole and move into place whilst carefully pushing the four fixing bolts through their corresponding holes.
8. Place a washer and nut on each thread and tighten the 'Y' fitting into place, taking care not to over tighten.

Note: Use extreme caution when cutting into occupied duct to avoid damage to cable.



Termination

Termination at access chambers

Access chamber entry points can be pre-fitted at production if using STAKKAbOX™ or MONOBOX™ for construction. In addition we can also fit a socket or spigot end to make connection even simpler.

MULTIDUCT™ entry can just as easily be done on site by following these steps:

1. When the entry point is known, bring the MULTIDUCT™ up to the outside of the chamber and mark around it on the outside of the chamber wall.
2. Using a 114mm Holesaw, cut a hole in each corner where marked.
3. Using a small hand saw cut the straight line marked which joins the corners up. This will leave a hole perfectly matched to the MULTIDUCT™.
4. Pass the MULTIDUCT™ through the prepared hole and either use a re-enforcing rib to fix to the chamber wall with self tapping screws or simply apply expanding foam or silicone sealant around any gaps between the duct and the chamber.



Backfilling and Cabling

After a final check for proper alignment of the installed MULTIDUCT™, suitable fill should be hand placed on each side of the duct run approximately every 10 metres to help prevent movement during mechanical backfilling.

Initial Backfill

This should consist of free flowing granular material of mixed particle size, free of large stones, lumps and clods, silt, silty clay, clay lumps, organic soils, frozen earth or debris. The initial backfill material should be placed in layers on either side of the run to provide even, void free support.

Mechanical or other compaction to reach a given soil density may be necessary when using free-flowing granular materials. This is dependent upon the job site, local ordinance, road construction, track construction or other applicable requirements. The initial backfill material should be placed in the trench until it covers the top duct run by at least 80mm. This is to protect the MULTIDUCT™ from any large objects which may be included in the final backfill.

Final Backfill

This can proceed with remaining trench spoils provided that the materials used and the extent of their compaction satisfy road construction, local ordinances or other applicable requirements. To protect the MULTIduct™ from possible concentrated loading and to ensure stable trench fill conditions, care should be taken to provide backfill which is free of large rocks, boulders, organic soils, stumps, frozen clods, roots and other foreign debris.

Cabling

Mandrelling

Using a standard test mandrel for the applicable bore pass through any two bores laying in diagonally opposite corners of each multi-bore duct run.

Rodding

Rodding can be carried out in lengths of up to 200 metres using standard COBRAs. Due to the low co-efficient of friction on the internal wall of MULTIduct™ and the fact that it lays much straighter than conventional round ducts, longer lengths are also possible. The limiting factor will be the available rod lengths.

Blowing

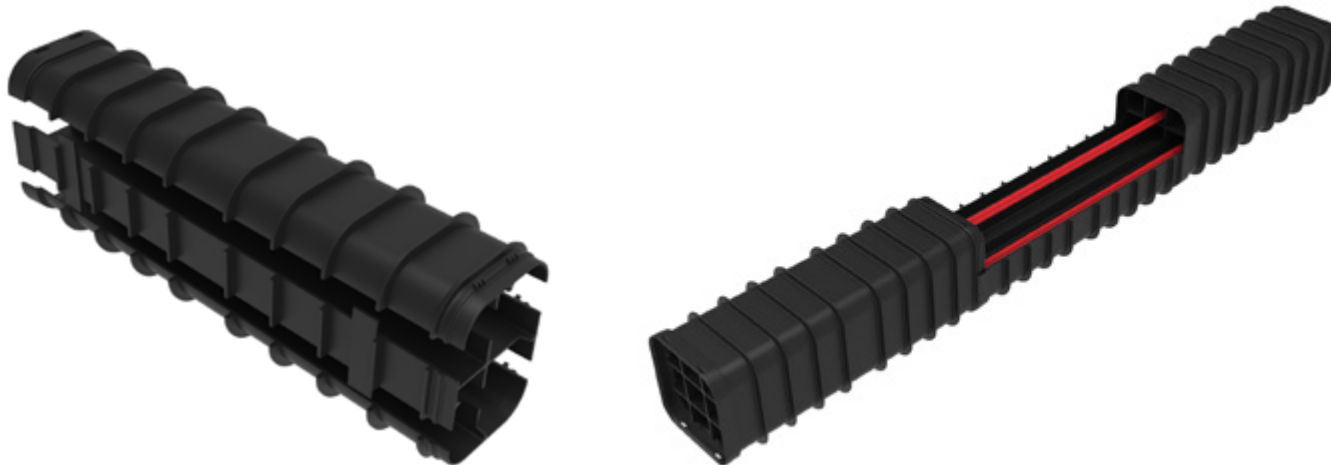
Blowing cables is possible when using specialist equipment. Distances of 250m have been achieved on previous installations.

Maintenance

Repairing a Damaged Cable

Should it become necessary to repair damaged or faulty cable within a run, the damaged area must be carefully excavated to a point extending several duct sections on either side of the damaged area. The MULTIduct™ should then be removed from around this point in such a way as to avoid further damage to cables.

After cable repairs are made, a special split repair kit is used as a replacement for the MULTIduct™ which has been removed. This is done by first inserting the horizontal cable dividers and then banding the outer sections around the run. The seams must then be sealed with duct tape, the entire unit banded tightly and then concrete encased for at least 600mm beyond each end of the repaired section.



Product Code	Description
DUDMD4-400SPLIT-BKDK00000	4 Way Split Repair Kit
DUDMD4-4XLSPLIT-BKDK00000	4 Way (160mm) Split Repair Kit
DUDMD6-600SPLIT-BKDK00000	6 Way Split Repair Kit
DUDMD9-900SPLIT-BKDK00000	9 Way Split Repair Kit