

**CONTECH**<sup>®</sup>  
ENGINEERED SOLUTIONS  
A QUIKRETE<sup>®</sup> COMPANY

## Rehabilitating Aging Infrastructure Sewers, Culverts & Bridges



Reline Done Right<sup>™</sup>

# The New Infrastructure

## The New Infrastructure

When storm and sanitary sewers, culverts and bridge infrastructure reaches the end of a useful service life, the decision to excavate and replace is commonplace. Rehabilitation or relining of these storm and sanitary sewers, culverts and small bridges can be a faster and less expensive option that imparts little to no impact on traffic maintenance.

### Rehabilitation — Get In, Get Out, Stay Out™

Contech® offers a variety of products and systems, combined with more than 100 years of experience, to facilitate rehabilitation of storm and sanitary sewers, culverts and bridges.

### Design Considerations for Rehabilitation versus Replacement

Rehabilitating or relining a drainage or sanitary pipeline or structure requires a site-specific analysis. There is no one-size-fits-all approach. Every reline project needs to be examined closely by qualified professionals.

From an engineering perspective, the design approach must take into account the usual design parameters and must carefully evaluate the current condition of the pipe or structure and the supporting fill that surrounds it. The primary areas where an engineer should be concerned are:

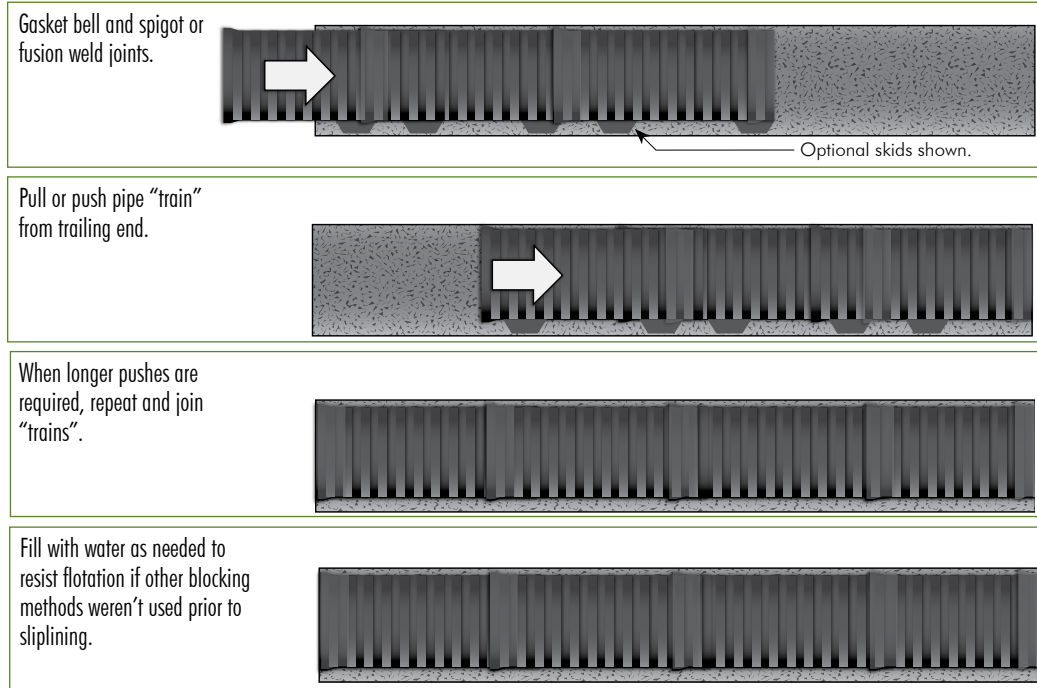
- Geometric shape and condition of existing pipeline or structure (and access structure)
- Hydraulic requirements and limitations
- Optimum shape, size and materials
- Constructability
- Design service life
- Structural analysis and design
- Specification goals

## Variety of Products for More Efficient Rehabilitation

|            | SPAN RANGE     | PRODUCT                                   | DESCRIPTION                                                                                                                                |
|------------|----------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| DRAINAGE   | 12" – 36"      | A2™ Liner Pipe                            | PVC corrugated pipe with smooth interior wall                                                                                              |
|            | 18" – 102"     | ULTRA FLO®                                | Spiral rib aluminum, aluminized and polymer coated steel pipe                                                                              |
|            | 12" – 144"     | Corrugated Metal Pipe                     | Corrugated aluminized and polymer coated steel and aluminum alloy helical pipe                                                             |
|            | 30" – 120"     | DuroMaxx®                                 | Steel reinforced polyethylene pipe                                                                                                         |
| SEWER      | 12" – 36"      | A2™ Liner Pipe                            | PVC corrugated pipe with smooth interior wall                                                                                              |
|            | 30" – 120"     | DuroMaxx®                                 | Steel reinforced polyethylene pipe                                                                                                         |
| STRUCTURES | 4' – 20' +     | Tunnel Liner Plate                        | Steel and aluminum 2- flanged liner plate                                                                                                  |
|            | 5' – 23' +     | ALSP<br>MULTI-PLATE®                      | Aluminum structural plate<br>Galvanized steel structural plate                                                                             |
|            | 8'-9" – 35'-5" | ALBC                                      | Aluminum box culvert                                                                                                                       |
|            | 19'-5" – 65'   | SUPER SPAN™<br>SUPER-PLATE®<br>BridgeCor® | Galvanized steel structural plate long spans<br>Aluminum structural plate long spans<br>Deep corrugation galvanized steel structural plate |
|            | 12' – 102'     | CON/SPAN® and BEBO®                       | Precast concrete arches                                                                                                                    |

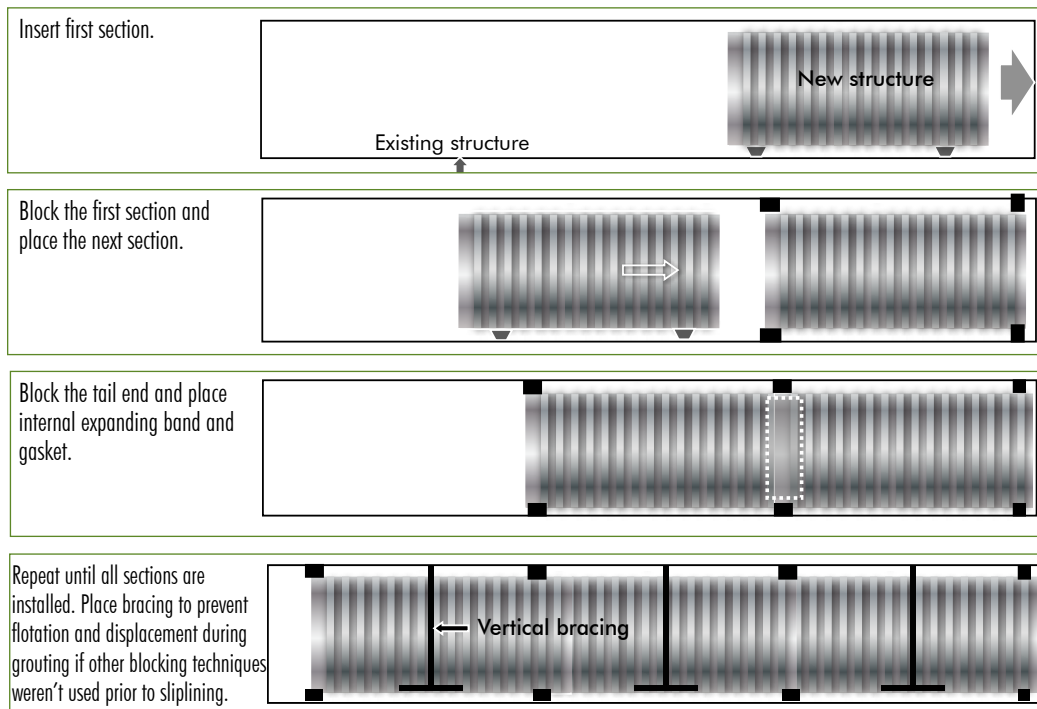
## Segmental Sliplining Process for Steel Reinforced Polyethylene

These include DuroMaxx® and A2™ Liner products. Consult your local Contech representative for more details.



## Segmental Sliplining Process for Corrugated Metal Pipe

These include HEL-COR®, ULTRA FLO®, CORLIX® and SmoothCor™ products. Consult your local Contech representative for more details.



# Relining with Pipe

## Steel Reinforced Polyethylene Pipe (SRPE) — DuroMaxx®

DuroMaxx is designed with a smooth inner wall for outstanding hydraulic capacity and provides the properties you can count on for long-term service and performance in the most demanding environments. By providing the strength of steel and the durability of plastic, DuroMaxx is an optimal reline solution in many situations.

### Features

- 80 ksi steel reinforced ribbed profile walls.
- Pressure-rated polyethylene (PE) resin.
- Diameters from 30 to 120 inches.
- Standard lengths of 14 or 24 feet with QuikJoint®. Custom lengths available.
- Watertight bell and spigot joints.
- Leak-free welded coupler (WC) joints available.



### DuroMaxx Jacking Loads, Pushing Distances and Grouting Pressure

| Diameter (in) | Safe Jacking Load (lbs) | Allowable Jacking Distance <sup>1</sup> (ft) | Allowable Jacking Distance <sup>2</sup> (ft) | Recommended Grout Pressure* <sup>3</sup> (psi) |
|---------------|-------------------------|----------------------------------------------|----------------------------------------------|------------------------------------------------|
| 30            | 2,000                   | 426                                          | 1,064                                        | 10.3                                           |
| 36            | 2,400                   | 407                                          | 1,017                                        | 8.5                                            |
| 42            | 2,800                   | 415                                          | 1,037                                        | 6.7                                            |
| 48            | 3,750                   | 487                                          | 1,218                                        | 6.4                                            |
| 54            | 4,240                   | 470                                          | 1,175                                        | 5.6                                            |
| 60            | 4,710                   | 439                                          | 1,098                                        | 4.9                                            |
| 66            | 5,260                   | 370                                          | 924                                          | 5.0                                            |
| 72            | 5,810                   | 354                                          | 886                                          | 3.9                                            |
| 78            | 6,260                   | 358                                          | 895                                          | 4.2                                            |
| 84            | 6,910                   | 362                                          | 906                                          | 4.6                                            |
| 96            | 8,010                   | 368                                          | 921                                          | 3.1                                            |
| 108           | 9,110                   | 365                                          | 914                                          | 2.2                                            |
| 120           | 10,220                  | 375                                          | 938                                          | 1.6                                            |

<sup>1</sup> Based on Sliding Coefficient of 0.25

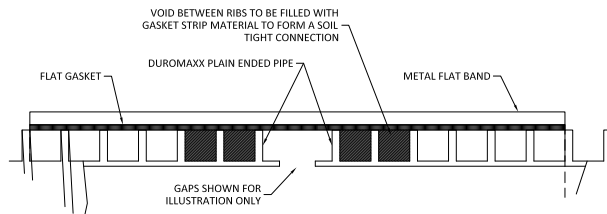
<sup>2</sup> Based on Sliding Coefficient of 0.10

<sup>3</sup> Contact your local Contech representative for more information about recommended grout pressure and grout procedures

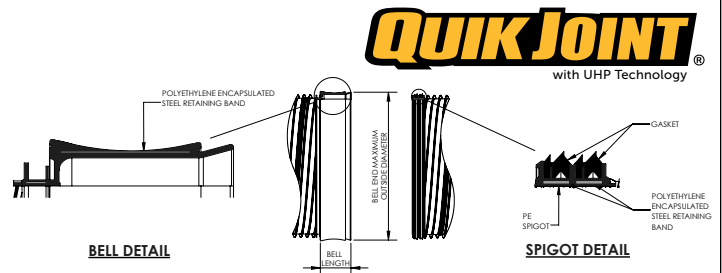
\* Includes a Factor of Safety (FS) = 3.0 for DuroMaxx liner pipe that is installed perfectly round or a FS = 2.0 for liner pipe with 5% deflection.

### The Design Behind the Performance — Joint Options

#### Soil Tight (ST) Joint Detail



#### QuikJoint® UHP Joint Details

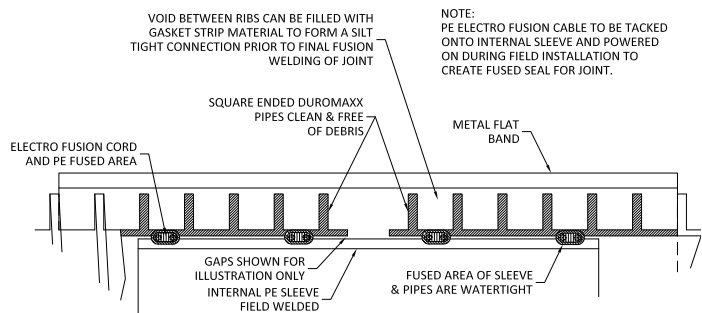


# Rehabilitating Aging Infrastructure

A proven trenchless installation method providing cost-effective rehabilitation and easy installation with a joint tightness on which you can depend.

- Manning's "n" of .012 restores hydraulic capacity to your sewer.
- Eliminates costly bypass operations as normal flow is maintained.
- Provides excellent durability and resistance to abrasion.
- Meets the joint tightness test requirements of ASTM D3212.

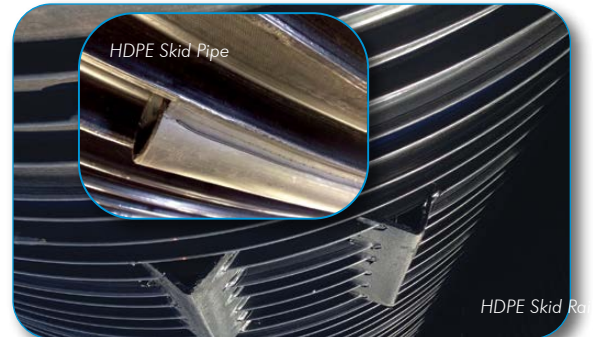
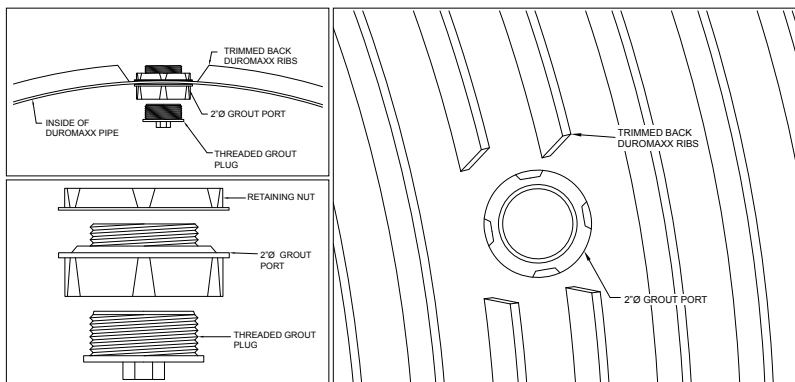
## Welded Coupler Joint Detail



## Dimensions & Handling Weights

| Pipe Dia.<br>(in) | Min. O.D.<br>(in) | Max. I.D.<br>(in) | QuikJoint® Bell O.D.<br>(in) | Approx. Weight<br>(lbs/ft) |
|-------------------|-------------------|-------------------|------------------------------|----------------------------|
| 30                | 30.9              | 29.6              | 33.9                         | 18.8                       |
| 36                | 37.0              | 35.5              | 39.8                         | 23.6                       |
| 42                | 42.9              | 41.4              | 45.7                         | 27.0                       |
| 48                | 49.4              | 47.3              | 52.3                         | 30.8                       |
| 54                | 55.4              | 53.2              | 58.2                         | 36.1                       |
| 60                | 61.4              | 59.1              | 64.1                         | 42.9                       |
| 66                | 67.8              | 65.1              | 70.9                         | 56.9                       |
| 72                | 73.7              | 71.0              | 76.8                         | 65.6                       |
| 78                | 80.0              | 76.8              | 82.7                         | 71.0                       |
| 84                | 85.8              | 82.9              | 88.6                         | 76.3                       |
| 96                | 97.7              | 94.7              | 100.4                        | 87.0                       |
| 108               | 111.3             | 108               | 114.0                        | 99.7                       |
| 120               | 121.3             | 118.3             | 124.1                        | 109.0                      |

## Grout Plug and Coupling Detail



## Corrugated Metal Pipe — ULTRA FLO<sup>®</sup> and SmoothCor<sup>™</sup>

Restoration of failed or deteriorating pipe can be accomplished by relining with ULTRA FLO or SmoothCor. Their low-wall profile can yield an inside diameter that approaches the original pipe, while the hydraulic capacity is improved. Contech's corrugated metal pipe is light weight and can be provided in custom lengths to meet individual site conditions, making the lining process easier.

### Features

- A variety of options with estimated service life of 75+ years in recommended environments.
- A variety of premium coatings available.
- Lengths of up to 40 feet.
- Diameters from 18 to 144 inches.
- Custom lengths and diameters available.
- Smooth interior – Manning's "n" of 0.012

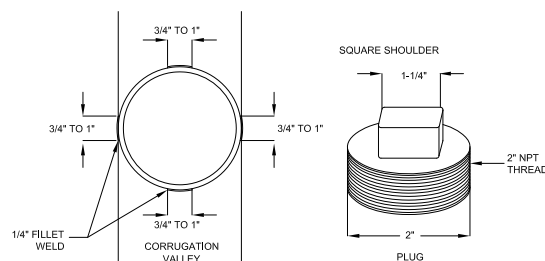
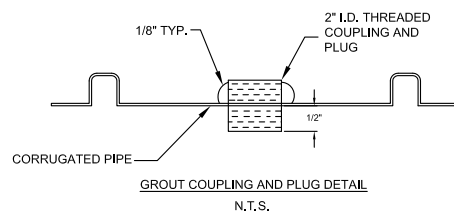
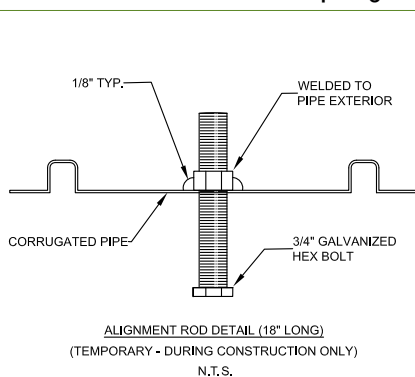
### ULTRA FLO and SmoothCor Jacking Loads and Pushing Distances

| Diameter (in) | Steel ULTRA FLO         |                                              |                                              | Aluminum ULTRA FLO      |                                              |                                              |
|---------------|-------------------------|----------------------------------------------|----------------------------------------------|-------------------------|----------------------------------------------|----------------------------------------------|
|               | Safe Jacking Load (lbs) | Allowable Jacking Distance <sup>1</sup> (ft) | Allowable Jacking Distance <sup>2</sup> (ft) | Safe Jacking Load (lbs) | Allowable Jacking Distance <sup>1</sup> (ft) | Allowable Jacking Distance <sup>2</sup> (ft) |
| 18            | 3,220                   | 860                                          | 2,140                                        | 1,610                   | 640                                          | 1,610                                        |
| 21            | 3,660                   | 820                                          | 2,030                                        | 1,830                   | 610                                          | 1,520                                        |
| 24            | 4,070                   | 810                                          | 2,030                                        | 2,940                   | 650                                          | 1,630                                        |
| 30            | 4,950                   | 790                                          | 1,970                                        | 4,380                   | 580                                          | 1,460                                        |
| 36            | 5,090                   | 550                                          | 1,370                                        | 7,800                   | 670                                          | 1,690                                        |
| 42            | 4,950                   | 330                                          | 830                                          | 8,510                   | 650                                          | 1,630                                        |
| 48            | 4,750                   | 280                                          | 700                                          | 9,050                   | 600                                          | 1,500                                        |
| 54            | 5,090                   | 270                                          | 670                                          | 9,540                   | 560                                          | 1,400                                        |
| 60            | 5,510                   | 260                                          | 660                                          | 10,040                  | 540                                          | 1,350                                        |
| 66            | 10,260                  | 440                                          | 1,110                                        | 10,110                  | 490                                          | 1,230                                        |
| 72            | 10,180                  | 400                                          | 1,010                                        | 10,520                  | 460                                          | 1,160                                        |
| 78            | 10,290                  | 380                                          | 950                                          | 11,030                  | 450                                          | 1,120                                        |
| 84            | 14,650                  | 500                                          | 1,260                                        | 11,480                  | 440                                          | 1,100                                        |
| 90            | 14,840                  | 470                                          | 1,180                                        | ---                     | ---                                          | ---                                          |
| 96            | 14,020                  | 420                                          | 1,050                                        | ---                     | ---                                          | ---                                          |
| 102           | 14,420                  | 410                                          | 1,030                                        | ---                     | ---                                          | ---                                          |

<sup>1</sup> Based on Sliding Coefficient of 0.25

<sup>2</sup> Based on Sliding Coefficient of 0.10

### Alignment Rod and Grout Coupling Detail



# Rehabilitating Aging Infrastructure

## ULTRA FLO Pipe Dimensions\*

| Pipe Diameter (in) | Max O.D. (in) | Steel Approx. Weight (lbs/ft) | Aluminum Approx. Weight (lbs/ft) |
|--------------------|---------------|-------------------------------|----------------------------------|
| 18                 | 20.28         | 15                            | 5                                |
| 21                 | 23.28         | 18                            | 6                                |
| 24                 | 26.28         | 20                            | 9                                |
| 30                 | 32.28         | 25                            | 15                               |
| 36                 | 38.28         | 37                            | 23                               |
| 42                 | 44.28         | 59                            | 26                               |
| 48                 | 50.28         | 67                            | 30                               |
| 54                 | 56.32         | 75                            | 34                               |
| 60                 | 62.38         | 83                            | 37                               |
| 66                 | 68.44         | 92                            | 41                               |
| 72                 | 74.50         | 100                           | 45                               |
| 78                 | 80.56         | 108                           | 49                               |
| 84                 | 86.62         | 116                           | 52                               |
| 90                 | 92.68         | 125                           | ---                              |
| 96                 | 98.74         | 133                           | ---                              |
| 102                | 104.80        | 140                           | ---                              |

\* Based on AASHTO M36 Specifications. Custom diameters available upon request.

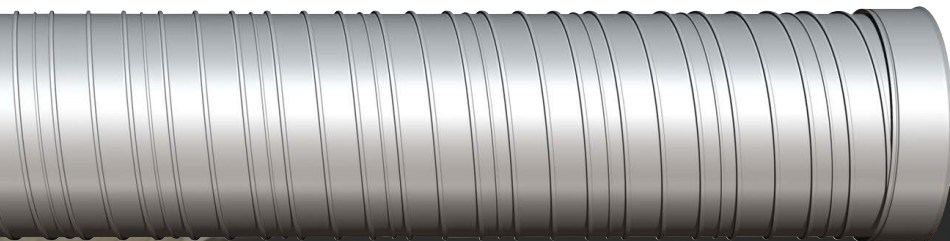
## ULTRA FLO Grouting Pressure

| Liner Diameter (in) | Steel — Max PSI Recommended* <sup>1</sup> |                | Aluminum — Max PSI Recommended* <sup>1</sup> |                |
|---------------------|-------------------------------------------|----------------|----------------------------------------------|----------------|
|                     | Round                                     | 5% Deflection  | Round                                        | 5% Deflection  |
| 18                  | 5 <sup>2</sup>                            | 5 <sup>2</sup> | 5 <sup>2</sup>                               | 5 <sup>2</sup> |
| 21                  | 5 <sup>2</sup>                            | 5 <sup>2</sup> | 5 <sup>2</sup>                               | 5 <sup>2</sup> |
| 24                  | 5 <sup>2</sup>                            | 5 <sup>2</sup> | 5 <sup>2</sup>                               | 5 <sup>2</sup> |
| 30                  | 5 <sup>2</sup>                            | 5 <sup>2</sup> | 5 <sup>2</sup>                               | 5 <sup>2</sup> |
| 36                  | 5 <sup>2</sup>                            | 5 <sup>2</sup> | 5 <sup>2</sup>                               | 5 <sup>2</sup> |
| 42                  | 5 <sup>2</sup>                            | 5 <sup>2</sup> | 5 <sup>2</sup>                               | 5 <sup>2</sup> |
| 48                  | 5 <sup>2</sup>                            | 5 <sup>2</sup> | 5 <sup>2</sup>                               | 5 <sup>2</sup> |
| 54                  | 5 <sup>2</sup>                            | 5              | 5 <sup>2</sup>                               | 5              |
| 60                  | 5                                         | 3              | 5                                            | 3              |
| 66                  | 5                                         | 3              | 4                                            | 3              |
| 72                  | 4                                         | 3              | 3                                            | 2              |
| 78                  | 3                                         | 2              | 2                                            | 2              |
| 84                  | 4                                         | 2              | 2                                            | 1              |
| 90                  | 3                                         | 2              | ---                                          | ---            |
| 96                  | 2                                         | 2              | ---                                          | ---            |
| 102                 | 2                                         | 1              | ---                                          | ---            |

<sup>1</sup> Contact your local Contech representative for more information about recommended grout pressure and grout procedures.

<sup>2</sup> Grout pressure limited to 5 psi maximum for practical, safe installation considerations. Higher grouting pressures may be possible and tolerable, depending upon the type of joint system used and other site-specific installation considerations.

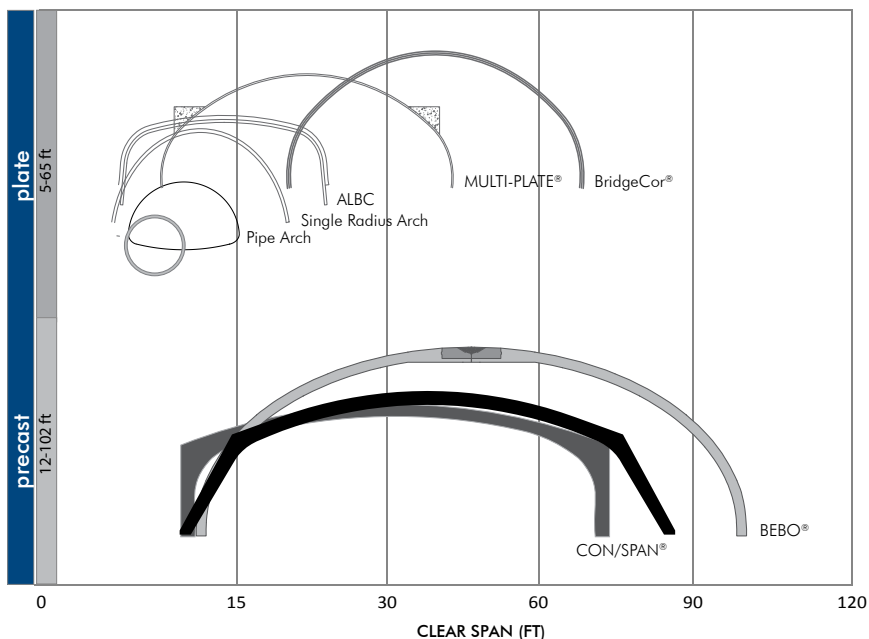
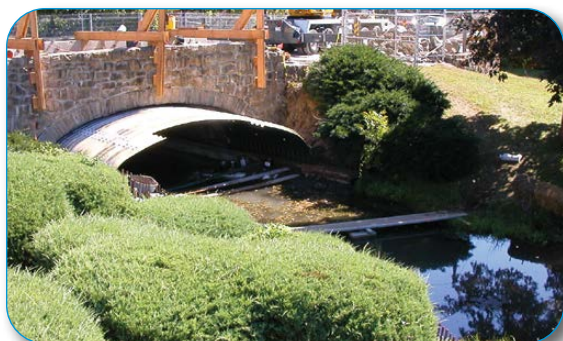
\* Includes a Factor of Safety (FS) = 3.0 for installed ULTRA FLO liner pipe that is perfectly round or a FS = 2.0 for liner pipe with 5% deflection.



## Structures

With a nationwide focus on structurally-deficient and functionally-obsolete bridges, time and cost-effective bridge replacement solutions are in high demand. Contech plate and precast structures have proven records of success for:

- Emergency bridge replacements
- Fast-tracked projects
- Relining and rehabilitation
- Culvert extensions for road widening



### CON/SPAN® and BEBO®

Buried concrete arches provide another alternative for bridge rehabilitation. Precast elements are slid easily underneath existing aging structures to ensure their long-term serviceability.

Because these structures are prefabricated and come with extensive technical support, they allow highway agencies and municipalities to dramatically reduce construction time and traffic disruptions during bridge replacements.

### Steel and Aluminum Box Culverts

Box Culverts are a practical and cost-effective solution for small bridge rehabilitation. These wide-span, low-rise shapes are lightweight, making them fast and easy to install.

## MULTI-PLATE® and Aluminium Structural Plate

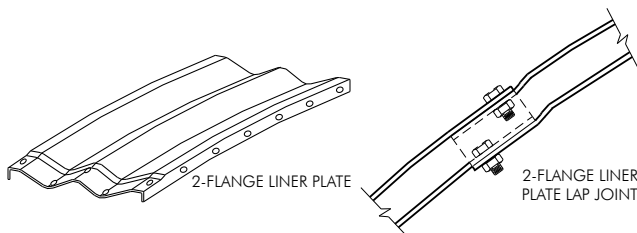
Steel and aluminum structural plate offerings from Contech have a long history of strength, durability and economy. These structures meet a wide range of site-specific challenges with a variety of sizes and shapes available. Additionally, these structures offer unique design elements that include sloped ends, beveled cuts and elbows. Many are suited specifically for rehabilitation due to fast installation accompanied by extensive technical support. These structures provide spans of up to 26 feet.

## SUPER-SPAN™, SUPER-PLATE® and BridgeCor®

- Offering larger spans
- A different family of shapes
- Spans of up to 65 feet

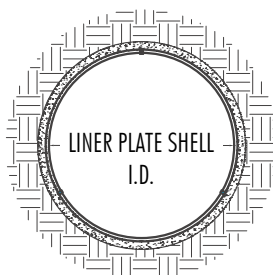
## Tunnel Liner Plate

Contech Tunnel Liner Plate provides optimum stability and protection when constructing new utility tunnels, relining structures under highways and railroads, and lining vertical shafts. It offers the highest continuous ring stiffness and high compression joint strength. The 2-Flange Liner Plate has effective stiffness that is more than double the stiffness of the same gage of 4-Flange Liner Plate.

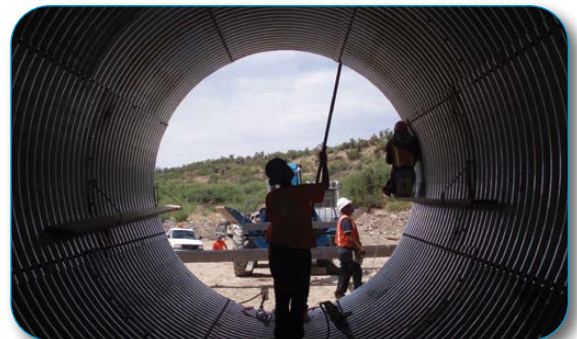
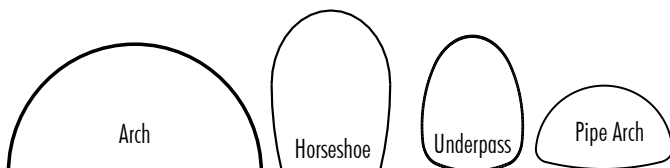


Deep, full-length corrugations and lapped joints for more effective stiffness and ring compression.

## Typical Grout Fill for Tunnel Liner Plate



## Standard Shapes



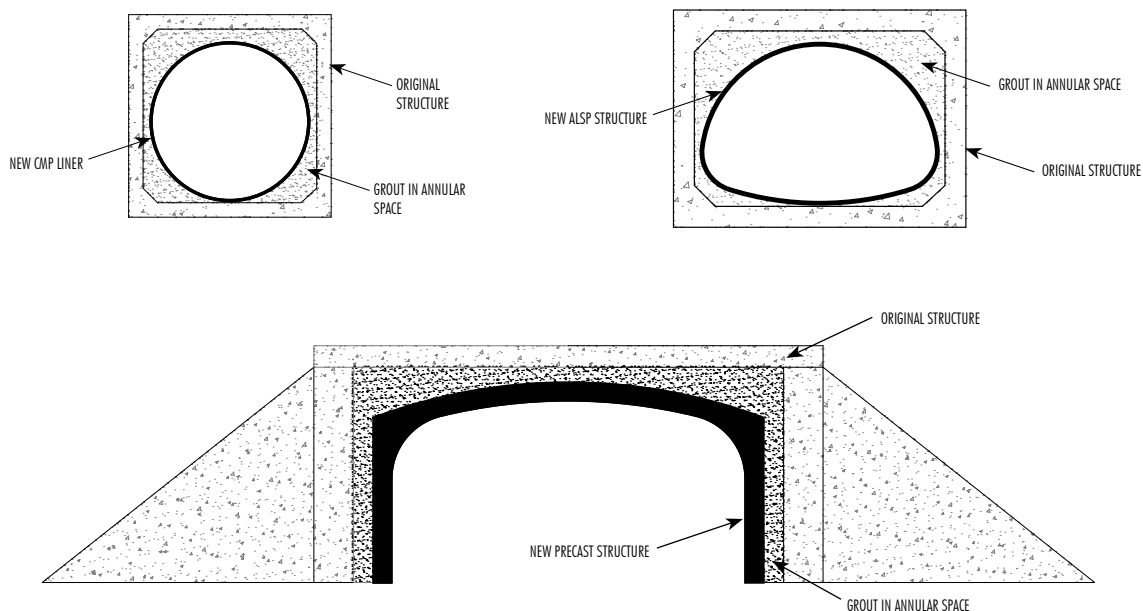
## The Grouting Process



### What is Involved

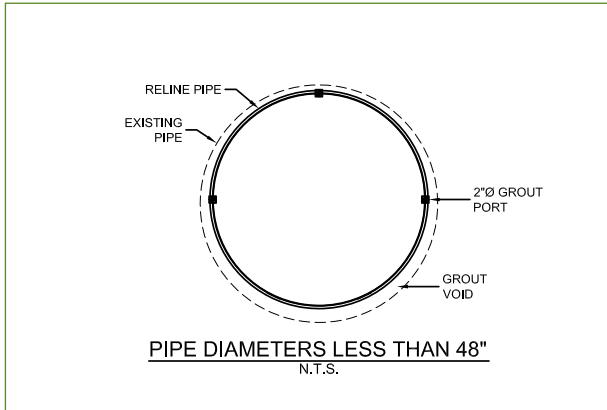
Grouting of the annular space fixes the position of the new liner pipe, provides uniform support and inhibits further failure of the host pipe. High slump, low-strength grout mix containing fly ash or a cellular grout additive will help ensure all voids are filled. Pre-blended, commercially available products and blown-sand methods are other strategies the contractor may consider.

Contech can provide assistance from conceptual ideas to cost estimates to final shop drawings.



## Grouting Techniques

### Small Diameters (less than 48") » Grouting Technique

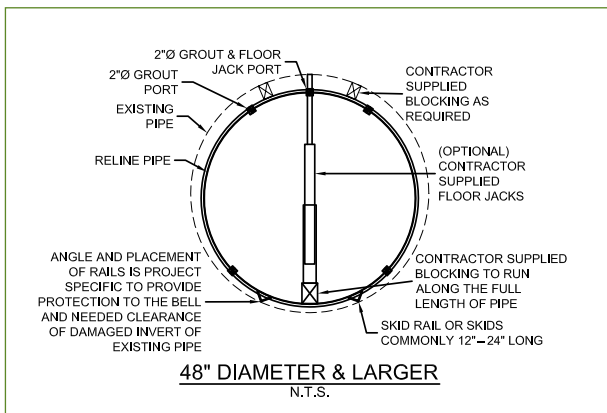


Pipe diameters less than 48" are best suited for a single stage grouting technique.

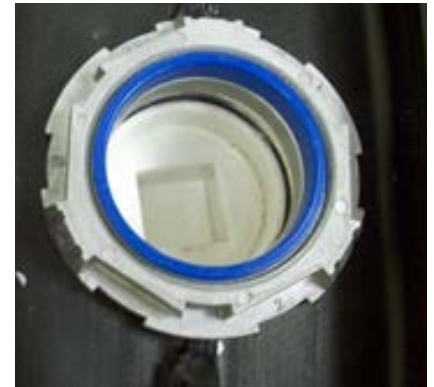
This is done most efficiently by constructing a bulkhead at the ends of the reliner and allowing the new pipe to float to the crown of the existing pipe while grout is pumped into the annular space. Grout should flow in a controlled manner to ensure balanced filling on all sides.



### Large Diameters (48" and larger) » Grouting Technique

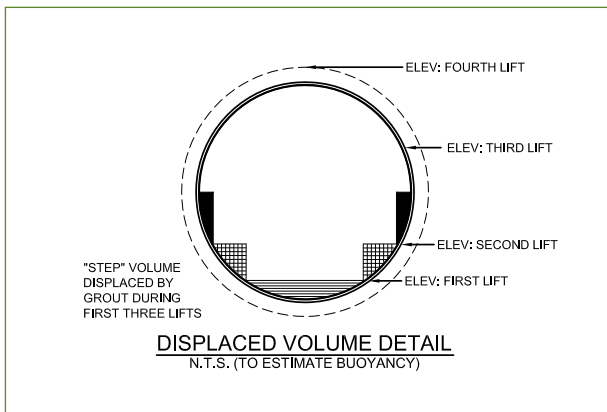


Multiple stage grouting is normally necessary for pipe that is 48" diameter and larger. This approach allows for a large reduction in effective buoyant force of the fluid grout. The technique requires a well-thought bracing and blocking scheme and a full evaluation of shape control, grout slump and mix design and grout pumping rate. Typically, a self-leveling grout product should flow in a controlled manner to ensure balanced filling.



*Optional 2" grout ports shown installed in DuroMaxx® Liner Pipe*

### Multi-Stage Grouting Procedure



Always use a screen on the pump hopper to sift out any large aggregate that can clog the grout line and potentially damage the structure. For more information, contact your Contech representative.

# Project Partner. Contech.

Providing options and support specific to your project needs.



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Enter information and specs to receive a schematic of your bridge.

#### **DYODS® – Design Your Own Detention System**

Compare and size your concrete, metal and plastic detention system solutions.

*Contech Engineered Solutions provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer, and stormwater management products.*

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Rehab Bro 5M 9/17 MC (PDF - 06/25)



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