REINFORCED FILL PRODUCT DESIGN DATA SHEET No. RF 2/2025 For TechFab TechStrap

Date Issued: 4 July 2025
Valid Until: 3 July 2027

Reinforced Fill Products:	TechFab TechStrap TS30, TS40, TS50, TS60, TS75, TS85 and TS100 Polymeric Strips
Manufacturer:	TechFab India Industries Ltd. 46/47, Maker Chamber VI, Nariman Point, Mumbai, Maharashtra-400021, India
Product distributor:	TechFab India Industries Ltd. Factory, survey no. 60/4P, Plot-18, Village Karajgam, Silvassa – 396230, India

Important Notice and Disclaimer

This Design Data Sheet is intended for geotechnical professionals designing with TechFab TechStrap polymeric strips for application in Hong Kong only. Users are solely responsible for (1) selecting the appropriate TechFab TechStrap polymeric strips for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and other safety, regulatory or other requirements. Civil Engineering and Development Department of HKSAR Government makes no representation as to the presence or absence of patent rights subsisting in the product and/or as to the legal right of the manufacturer and product distributor to market, install or maintain the product.

Where the TechFab TechStrap polymeric strips are used in permanent reinforced fill structures in Hong Kong, the design tensile strengths of the product shall comply with the values specified in Tables 3 to 9 of this Design Data Sheet, and the design shall be in accordance with Geoguide 6 – Guide to Reinforced Fill Structure and Slope Design (GEO, 2022).

This Design Data Sheet shall cease to be valid if the product data or specifications are withdrawn or re-issued in an amended form by the manufacturer. Applications for amendment to this Design Data Sheet shall be made to the Deputy Head of Geotechnical Engineering Office (Planning and Testing) of the Civil Engineering and Development Department by the manufacturer for all cases of changes in the products, the manufacturing details or the conditions of use, or of changes of the product distributor.

This Design Data Sheet is subject to change without notice. Users of this Design Data Sheet are advised to check the prevailing requirements as stipulated in the latest version of the Design Data Sheet by referring to the Civil Engineering and Development Department's website at https://www.cedd.gov.hk/eng/public-services-forms/geotechnical/reinforced/index.html.

TechFab TechStrap polymeric strips

TechFab TechStrap polymeric strips are intended to be used as reinforcing elements in reinforced fill structures. The products consist of parallel bundles of high tenacity polyester – Polyethylene Terephthalate (PET) yarns encased in an outer sheath made of extruded liner low density polyethylene (LLDPE), which contain a minimum 2.0 % of carbon black master batch as stabilizer for protection against UV degradation. The products have a minimum molecular weight of 25,000 g/mol and a maximum carboxyl end group count of 30 mmol/Kg, tested according to ASTM D 4603 / GRI-GG8 and ASTM D 7409 / GRI-GG7 respectively.

The plan view, cross-sectional view and zoomed view of the product are shown in Figure 1, Figure 2 and Figure 3 below respectively. Figure 4 below shows images of the products TS 40 and TS 100 as examples.

The typical dimensions, mass and identification of the products are given in Table 1.

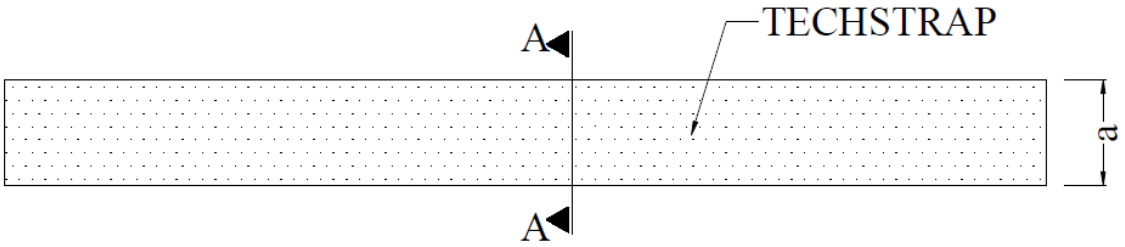


Figure 1 – Plan view of TechStrap

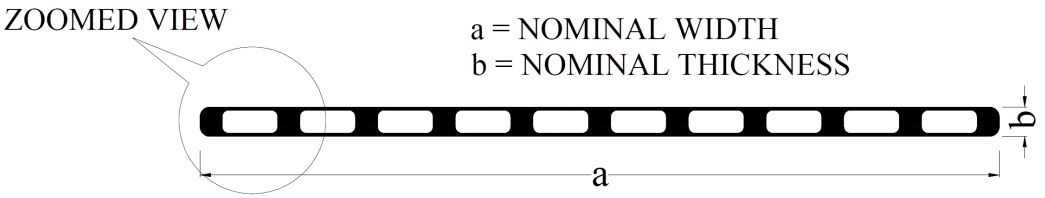


Figure 2 – Cross-section (A-A) view of TechStrap

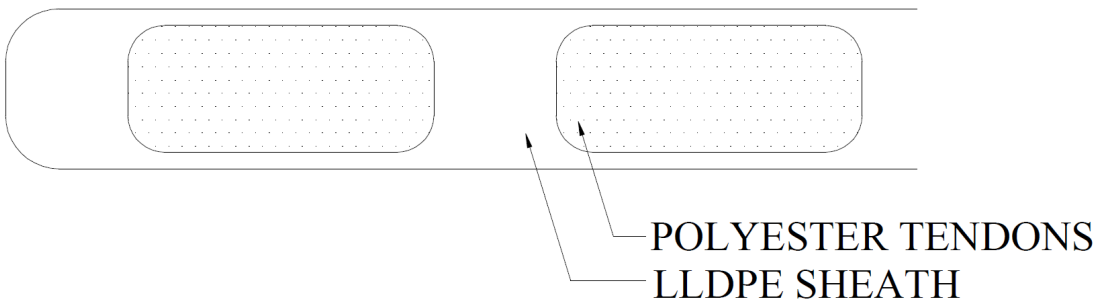


Figure 3 – Zoomed view of TechStrap

Figure 4 – Product images (TS 40 on top; TS 100 at bottom)

Product grade	TS 30	TS 40	TS 50	TS 60	TS 75	TS 85	TS 100
Nominal thickness, b (mm)	1.4	1.6	1.8	1.9	2.4	2.5	2.6
Nominal width, a (mm)[1]	88	88	90	90	95	95	95
Coil/roll length (m)[2]	100	100	100	100	100	100	100
Mass (kg) per coil length (100 m)	10.5	12.5	13.7	16.6	17.6	20.5	23.5
Colour Code	Blue	Black	Yellow	Milky White	Brown	Green	Red

Note:
1 – Tolerance of +/- 3 mm.
2 – Tolerance of + 20 cm. Roll/coil length can be customised.

Table 1 – Dimensions, mass and identification of TechStrap

Tensile strength and load-strain properties

Quality control tensile tests are performed on specimens in accordance with BS EN ISO 10319:2015 (BSI, 2015). The characteristic short-term tensile strengths in the longitudinal (wrap) direction of the polymeric strips guaranteed by TechFab India are provided in Table 2. The load-strain properties of the polymeric strips are shown in Figure 2. The actual strain at break is approximately 11 %.

Product grade	TS 30	TS 40	TS 50	TS 60	TS 75	TS 85	TS 100
Characteristic short-term tensile strength (kN per width)	30	40	50	60	75	85	100

Table 2 – Characteristic short-term tensile strength (longitudinal direction)

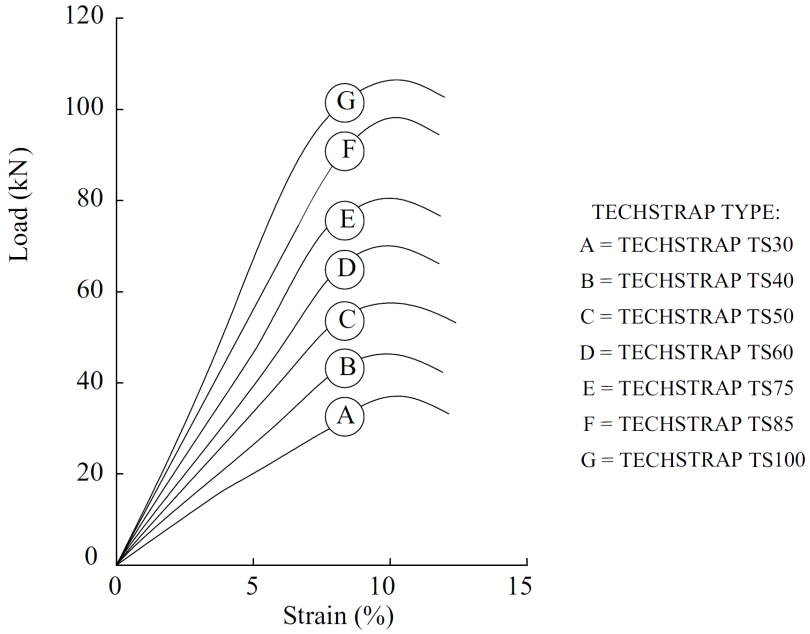


Figure 2 – Typical short-term load-strain properties (Longitudinal direction)

Quality assurance

TechFab TechStrap polymeric strips supplied to Hong Kong are manufactured by TechFab India Industries Ltd in Mumbai, India. The TechFab TechStrap polymeric strips TS 30, TS 40, TS 50, TS 60, TS 75, TS 85 and TS 100 are manufactured in a facility with ISO 9001 Quality Assurance Certificate. The testing laboratory is accredited with ISO/IEC 17025:2017 and Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAI-LAP).

Identification

TechFab TechStrap polymeric strips are imported into Hong Kong from India. Each coil/roll of TechFab Techstrap polymeric strips has an identification label with particulars of the product and its manufacturing code and it is wrapped with a tape having a specific colour (Table 1). A copy of the manufacturer's test certificate will accompany each shipment of delivery and the test certificate is available from the product distributor.

Design tensile strength

According to Geoguide 6 – Guide to Reinforced Fill Structure and Slope Design (GEO, 2022), the design tensile strength, T_D, per unit width of reinforcement is:

$$T_D = \frac{T_{ult}}{\gamma_m \gamma_n}$$

where T_{ult} = characteristic short-term tensile strength guaranteed by TechFab India (see Table 2)

γ_m = partial material factor on tensile strength of polymeric strips

γ_n = partial consequence factor to account for consequence of failure

The design tensile strength values of the TechFab TechStrap polymeric strips in the longitudinal direction given in Tables 3 to 9, which have been agreed with TechFab India, shall be used.

Particle size of fill material (mm)	γm	Design tensile strength (kN)	
		γn = 1.0	γn = 1.1
$D_{85} \leq 10$	1.84	16.3	14.8
$10 < D_{85} \leq 25$	1.84	16.3	14.8
$25 < D_{85} \leq 40$	1.84	16.3	14.8

Table 3 – Design tensile strengths of TechFab TechStrap TS 30 polymeric strips

Particle size of fill material (mm)	γm	Design tensile strength (kN)	
		γn = 1.0	γn = 1.1
$D_{85} \leq 10$	1.82	21.9	19.9
$10 < D_{85} \leq 25$	1.84	21.7	19.7
$25 < D_{85} \leq 40$	1.84	21.7	19.7

Table 4 – Design tensile strengths of TechFab TechStrap TS 40 polymeric strips

Particle size of fill material (mm)	γm	Design tensile strength (kN)	
		γn = 1.0	γn = 1.1
$D_{85} \leq 10$	1.82	27.4	24.9
$10 < D_{85} \leq 25$	1.84	27.1	24.7
$25 < D_{85} \leq 40$	1.84	27.1	24.7

Table 5 – Design tensile strengths of TechFab TechStrap TS 50 polymeric strips

Particle size of fill material (mm)	γm	Design tensile strength (kN)	
		γn = 1.0	γn = 1.1
$D_{85} \leq 10$	1.82	32.9	29.9
$10 < D_{85} \leq 25$	1.84	32.6	29.6
$25 < D_{85} \leq 40$	1.84	32.6	29.6

Table 6 – Design tensile strengths of TechFab TechStrap TS 60 polymeric strips

Particle size of fill material (mm)	γm	Design tensile strength (kN)	
		γn = 1.0	γn = 1.1
$D_{85} \leq 10$	1.82	41.1	37.4
$10 < D_{85} \leq 25$	1.84	40.7	37.0
$25 < D_{85} \leq 40$	1.84	40.7	37.0

Table 7 – Design tensile strengths of TechFab TechStrap TS 75 polymeric strips

Particle size of fill material (mm)	γm	Design tensile strength (kN/m)	
		γn = 1.0	γn = 1.1
$D_{85} \leq 10$	1.82	46.6	42.3
$10 < D_{85} \leq 25$	1.84	46.1	41.9
$25 < D_{85} \leq 40$	1.84	46.1	41.9

Table 8 – Design tensile strengths of TechFab TechStrap TS 85 polymeric strips

Particle size of fill material (mm)	γ_m	Design tensile strength (kN)	
		γ_n = 1.0	γ_n = 1.1
$D_{85} \leq 10$	1.81	55.3	50.3
$10 < D_{85} \leq 25$	1.82	54.8	49.8
$25 < D_{85} \leq 40$	1.82	54.8	49.8

Table 9 – Design tensile strengths of TechFab TechStrap TS 100 polymeric strips

The following notes apply to Tables 3 to 9:

(a) The design tensile strengths given in Tables 3 to 9 are in kN per strip width (not per metre run of the structure). The strip widths can be found in Table 1.

(b) D_{85} is the particle size corresponding to 85 % by weight of particles passing in a grading test.

(c) The partial material factor, γ_m, applies to the tensile strength of the individual grades of TechFab TechStrap polymeric strips. It has taken into account the environmental effects on material durability, construction damage and other special factors including hydrolysis, creep and stress rupture for a 120-year design life at a design temperature of 30°C.

(d) The fill material used within the reinforced fill block shall comply with the requirements specified for the Type I materials given in Geoguide 6 (GEO, 2022). In addition, the maximum particle size and the D_{85} value of the fill material shall not exceed 150 mm and 50 mm respectively.

Fill-to-reinforcement interaction

According to Geoguide 6 (GEO, 2022), the design coefficients of fill-to-reinforcement interaction μ_{dsD} and μ_{pD} relating to direct sliding resistance and pullout resistance respectively are:

$$\mu_{dsD} = \frac{\alpha_{ds} \tan \phi'}{\gamma_m \gamma_n}$$

$$\mu_{pD} = \frac{\alpha_p \tan \phi'}{\gamma_m \gamma_n}$$

where μ_{dsD} = design coefficient of interaction against direct sliding
μ_{pD} = design coefficient of interaction against pullout
γ_m = partial material factor for fill-to-reinforcement interaction
γ_n = partial consequence factor to account for consequence of failure
α_{ds} = direct sliding coefficient
α_p = pullout coefficient

In preliminary design, the direct sliding coefficient, α_{ds} and the pullout coefficient, α_p given in Table 10 below, which have been agreed with TechFab India, may be used. The partial material factor, γ_m, for fill-to-reinforcement interaction shall be taken as 1.2.

Interaction coefficient	Fill material
	Type I fill
Direct sliding coefficient α_{ds}	0.44
Pullout coefficient α_p	0.80

Table 10 – Direct sliding and pullout coefficients

The design coefficients of fill-to-reinforcement interaction should be verified by tests in accordance with the requirements of Clause A.61 and Clause A.62 given in the Appendix A of Geoguide 6 (GEO, 2022).

Facings

The typical facing types recommended by TechFab India for the construction of reinforced fill structures using TechFab TechStrap polymeric strips are presented in Appendix A. The suitability of these facing types should be carefully assessed by the designer and suitably modified to suit the individual design situations and contract requirements. The various design situations that need to be considered in the design of reinforced fill structures are discussed in Geoguide 6 (GEO, 2022).

Compliance Testing

The materials used for the construction of the reinforced fill structures should be inspected and tested on a regular basis during construction. Testing is required to ensure that the materials conform to the specification. Particular attention should be given to materials which can change properties; these include reinforcing elements and fill. Fill from different sources may have different material parameters and should be checked for compliance. Each main delivery of reinforcement should be sampled, tested and properly labelled.

The requirements for the testing of materials are recommended in the Appendix A of Geoguide 6 (GEO, 2022).

References

ASTM (2018). Standard Test Method for Determining Inherent Viscosity of Poly(Ethylene Terephthalate) (PET) by Glass Capillary Viscometer (ASTM D4603-18). American Society for Testing and Materials, USA.

ASTM (2020). Standard Test Method for Carboxyl End Group Content of Polyethylene Terephthalate (PET) Yarns (ASTM D7409-15(2020)). American Society for Testing and Materials, USA.

BSI (2015). Geotextiles – Wide width tensile test (BS EN ISO 10319:2015). British Standards Institution, London.

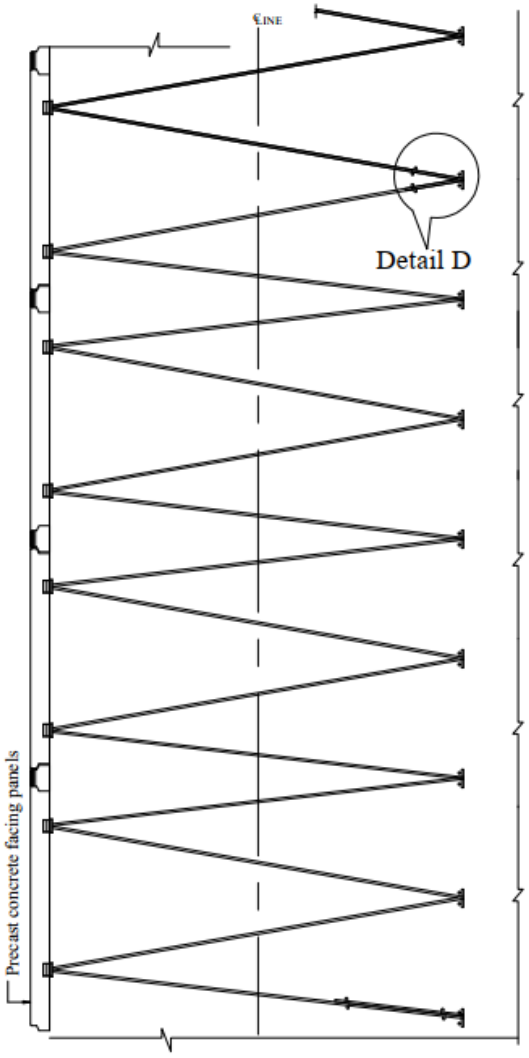
GEO (2022). Guide to Reinforced Fill Structure and Slope Design (Geoguide 6) (Continuously Updated E-Version released on 27 October 2022). Geotechnical Engineering Office, Civil Engineering and Development Department, HKSAR Government, 218 p.

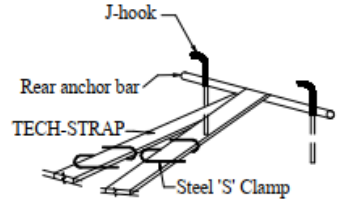
Geotechnical Engineering Office
Civil Engineering and Development Department

May 2025

Appendix A

Arrangement of facing panels





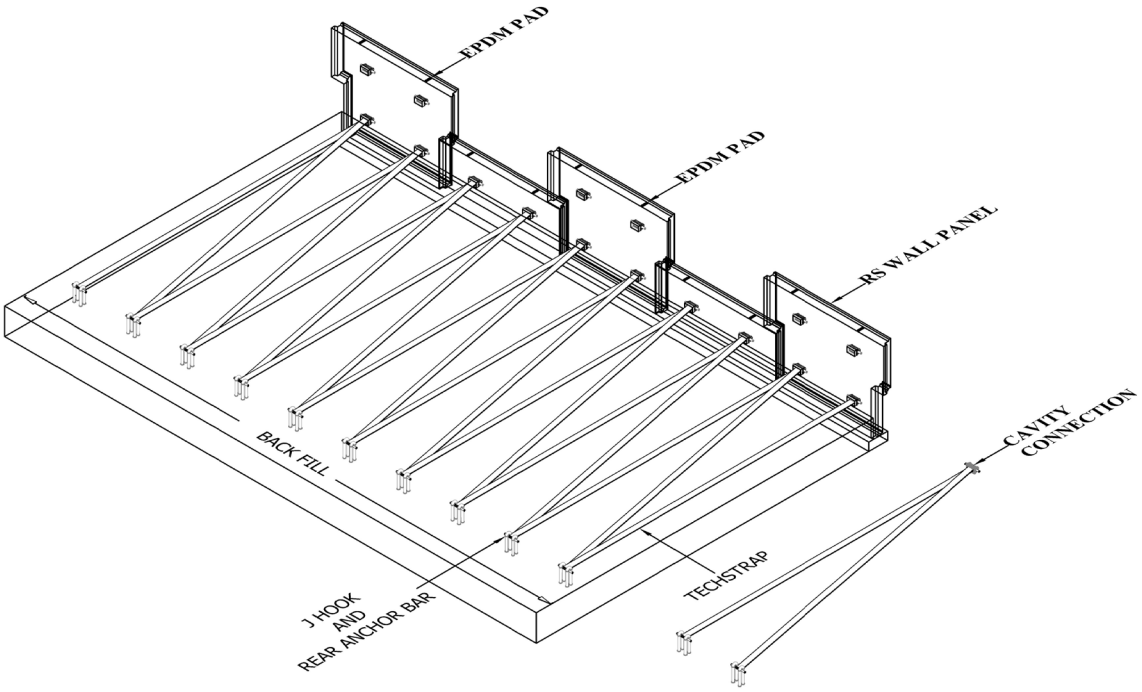
DETAIL - D:
REAR ANCHOR ARRANGEMENT

J - hook

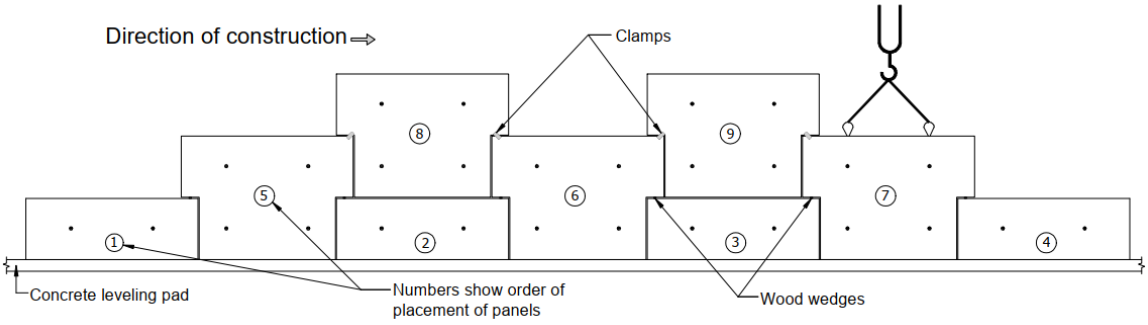
Steel 'S' Clamp

Typical Schematic Layout

Arrangement of facing panels (Cont'd)



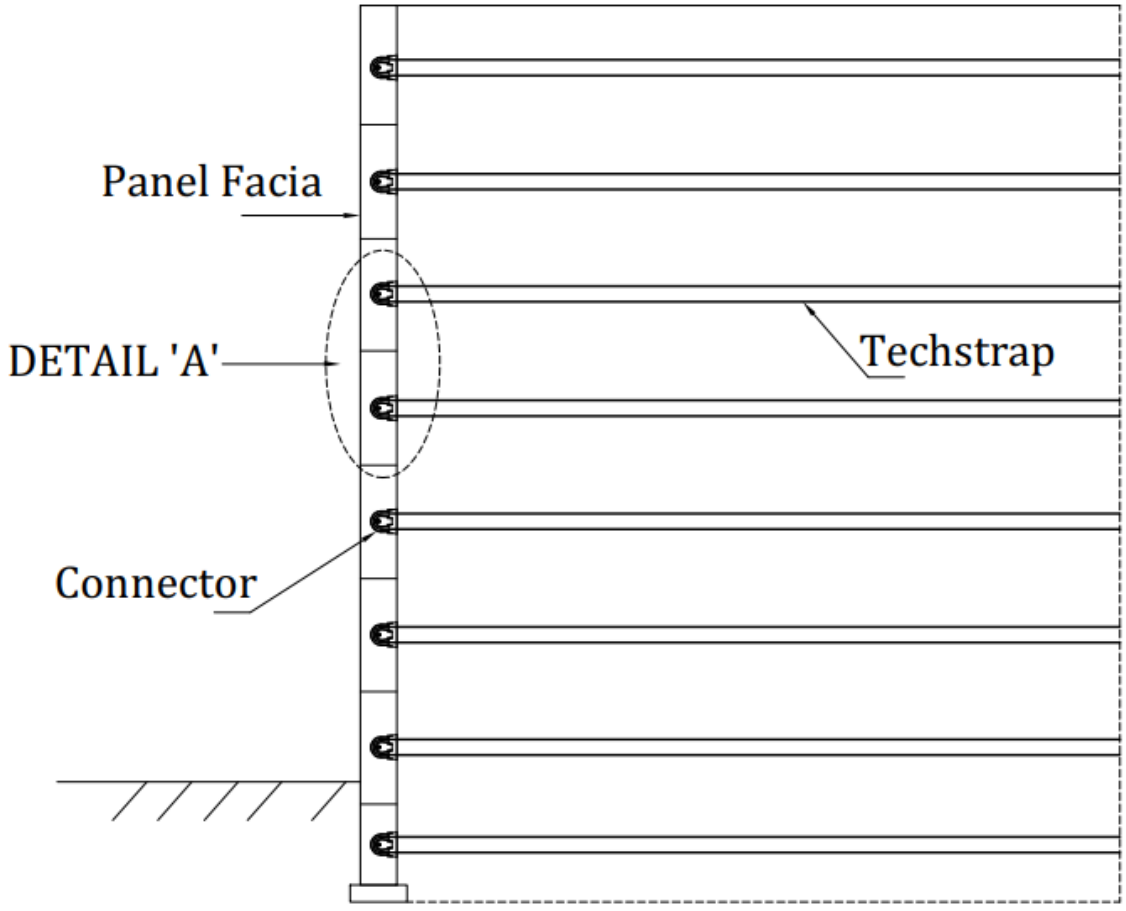
Typical Isometric View of a Reinforced Fill Structure using TechStrap Polymeric Strips with Panel Facia



Representation of Initial Course for Panel Placement

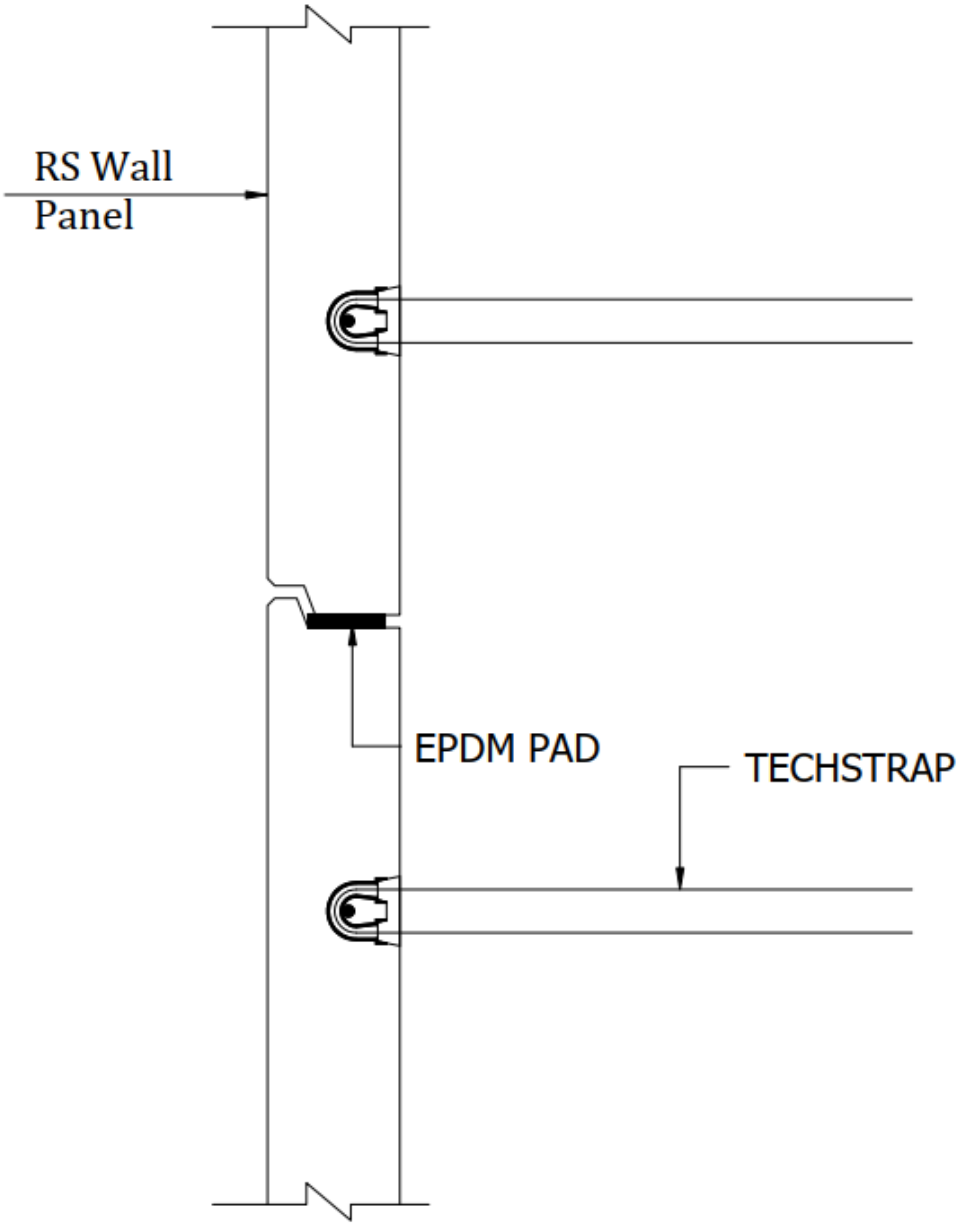
Appendix A

Reinforced fill structures



Typical Section of Reinforced Fill Wall with TechStrap Polymeric Strips and Panel Facia

Reinforced fill structures (cont'd)



Detail 'A' – Typical Connection