Laminated GCL product range

Unmodified powder or polymer modified powder | Standard or Heavy Duty | Two film options

Kontain HDL-GCL is specified in sixteen combinations. Four base constructions are available with sodium bentonite powder without polymer addition (U) or polymer-modified sodium bentonite powder (P) and either film thickness. Standard grades use a woven carrier; Heavy Duty grades add a nonwoven to form a composite carrier. The numbers 37 and 40 identify minimum dry bentonite loadings of 3,700 and 4,000 g/m².

The schedules define minimum and maximum supply values for each grade. Production acceptance uses the agreed test schedule and traceable roll and lot records.

Grade	Dry bentonite min g/m²	Carrier min g/m²	0.20 mm codes U / P	0.50 mm codes U / P
Standard 37	3,700	100	S37U-020 / S37P-020	S37U-050 / S37P-050
Standard 40	4,000	100	S40U-020 / S40P-020	S40U-050 / S40P-050
Heavy Duty 37	3,700	300	H37U-020 / H37P-020	H37U-050 / H37P-050
Heavy Duty 40	4,000	300	H40U-020 / H40P-020	H40U-050 / H40P-050

All grades: cover nonwoven ≥200 g/m² and carrier woven ≥100 g/m². Heavy Duty grades add carrier nonwoven ≥200 g/m², giving composite carrier ≥300 g/m². U identifies sodium bentonite powder without polymer addition; P identifies polymer modification.

Mechanical requirements

Property	Method	Standard grades	Heavy Duty grades
Tensile MD / CMD	ASTM D6768	≥10 / ≥10 kN/m	≥10 / ≥10 kN/m
Internal GCL peel	ASTM D6496	≥360 N/m	≥360 N/m
CBR puncture	EN ISO 12236	≥1,600 N	≥2,500 N
Hydrated peak internal shear at 10 kPa normal stress	ASTM D6243	≥30 kPa	≥35 kPa
PE to cover peel in bonded areas	Agreed PE/nonwoven peel procedure	≥300 N/m	≥300 N/m

Film selection

020: 0.20 mm nominal LDPE; no extrusion sealing. 050: 0.50 mm nominal LDPE; manufacturing and extrusion procedure qualification are required. Neither option is wedge weldable. Film is specified by resin type and nominal thickness; select GCL-W for a GM17 membrane.

Bentonite and hydraulic requirements

Property	Specified value	Method or reporting basis
Bentonite formulation	U: unmodified powder P: polymer-modified powder	Controlled formulation and lot traceability
P powder grading	P only: ≥80% passing 75 µm	Sieve or validated particle-size method
Moisture content	≤13%	ASTM D5993; stated reporting basis
Fluid loss	U Standard ≤18 mL U Heavy Duty ≤16 mL P all grades ≤18 mL	U: ASTM D5891 within scope. P: D5891-based modified procedure; confirm preparation.
U swell in reagent water	≥24 mL/2 g	ASTM D5890; minimum 16 h; note 1
P swell in reagent water	≥28 mL/2 g at 16 h	D5890-based modified procedure; note 1
P swell in saline liquid	≥22 mL/2 g at 16 h	20,000 mg/L NaCl; modified procedure; note 1

Core hydraulic property	Standard 37 and 40	Heavy Duty 37 and 40
Conductivity in fresh water max m/s	5.0×10^{-11}	3.0×10^{-11}
Conductivity in 20,000 mg/L NaCl max m/s	P: 1.0×10^{-10} U: not declared	P: 1.0×10^{-10} U: not declared
Fresh-water index flux q10 max $m^3/m^2/s$	2.7×10^{-9}	2.7×10^{-9}

1 Swell methods. U grades: ASTM D5890 in reagent water, with a minimum 16 h hydration period after the final clay increment; extend and report readings as required by the method. P grades: D5890-based modified procedure, reporting at 16 h after the final increment in reagent water or 20,000 mg/L NaCl. Reagent water is distilled or deionised water meeting ASTM D1193. D5890-25 excludes polymer-containing clays, so P results are reported as modified tests.

Supplier reference values for modified bentonite are ≥28 mL/2 g in tap water and ≥22 mL/2 g in unspecified 20,000 ppm salt water. The specified reagent-water, NaCl and 16 h conditions define acceptance targets. Select U grades for saline applications using liquid-specific compatibility testing.

2 Hydraulic assessment. Hydraulic values apply to the geotextile-backed GCL core, not the PE film or the completed joint. Confirm confinement, hydraulic gradient, hydration sequence, permeant composition and equilibrium criteria in the order test schedule. Report index flux using ASTM D5887 and conductivity using ASTM D5084 with an agreed GCL setup; use D6766 within scope for chemical permeation and identify any adaptations. Assess the film-backed assembly separately. The Standard-grade fresh-water flux is a construction-specific acceptance target based on the same bentonite formulation as Heavy Duty. Specify ASTM D5887 acceptance testing for the selected construction and confinement.

3 Value basis. Lower-bound properties are specified minima; conductivity, flux, fluid loss and moisture are upper limits. Film thickness is nominal. Values use the stated specification-limit basis. Use the selected construction's production test schedule for internal peel, tensile and hydraulic acceptance.

4 Formulation selection. Consider polymer modification where higher resistance to drying and desiccation cracking is sought during extended exposure before covering, or where lime-affected water, highly saline water or certain leachates may hydrate the bentonite instead of typical rainwater. Select and verify the polymer formulation against the actual hydration liquid, pH, dissolved ions, confinement and exposure conditions. Assess lime-treated fill and aggressive liquids against the selected formulation and test conditions. Cover promptly; permanent exposed service requires a separate design. Define chemical, cycling and protection acceptance criteria in the project specification.

Selection and installation

Unmodified bentonite is available for projects where typical low-salinity rainwater or compatible subgrade moisture hydrates the clay, subject to the project chemistry, confinement and hydraulic requirements. Consider polymer modification where higher resistance to drying and desiccation cracking is sought during extended exposure before covering, or where lime-affected water, highly saline water or certain leachates may hydrate the bentonite instead of typical rainwater. Select and verify the polymer formulation against the actual hydration liquid, pH, dissolved ions, confinement and exposure conditions. Assess lime-treated fill and aggressive liquids against the selected formulation and test conditions. Cover promptly; permanent exposed service requires a separate design.

Use hydrated internal and interface shear results for the actual lining system. Peak internal shear values in this guide are index acceptance requirements; they are not residual design strengths or interface-friction parameters. Verify puncture protection for actual aggregate grading, angularity, load and placement method.

Maintain at least 300 mm direct GCL contact beneath a separate 300 mm PE overlap at designated longitudinal joints. A 400 mm released film zone is specified at those edges. Roll ends and field cuts require an issued detail and cannot be inferred from the longitudinal release.

Unsealed film laps rely on the underlying GCL seal. Cover promptly and maintain compatible confinement. Keep plant off uncovered GCL. Confirm membrane integrity, seams, repairs and penetrations in the project quality plan.

Manufacturing quality and traceability

Revision O supersedes Revision N. U and P distinguish unmodified and polymer-modified formulations. Use the complete grade code to identify the construction, clay loading, formulation and film on the order.

Retain bentonite source, formulation, active polymer dose, geotextile components, adhesive, film grade, production lot and roll identifiers. Confirm sampling, test conditions and acceptance limits in the order. A change of source or formulation requires review of the affected properties.

Project testing options

For demanding applications, the project test programme can assess calcium and saline permeation, wet-dry and freeze-thaw cycling, hydraulic recovery, polymer retention, subgrade hydration beneath intact PE and finished-assembly protection. Select the tests and acceptance criteria around the actual exposure conditions.

Source basis

Manufacturer GCL construction schedules and selected Indian bentonite supplier data. ASTM method scopes and laboratory-agreed adaptations govern reporting.

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Bentonite quality and Australian BPEM criteria

Minimum orders: 15,000 m² film laminates; 20,000 m² weldable 0.75/1.00 mm; 3,000 m² unlaminated.

Indian sodium bentonite powder, without polymer modification. Supplier-declared specification limits are shown below.

Bentonite property	Supplier declaration
Origin and form	Indian sodium bentonite powder
Polymer modification	None
Montmorillonite content	≥75%
Methylene blue adsorption	≥300 mg/g
Swelling	≥25 mL (supplier reporting basis)
Fluid loss	≤18 mL
Water adsorption capacity	≥550%; DIN 18132 Enslin–Neff
Particle size	≥80% passing 75 µm
Cation exchange capacity	≥70 meq/100 g
Moisture content	≤13%
Calcium concentration	<2%

BPEM property	BPEM requirement	Supplier specification
Montmorillonite	>70 wt%	≥75%
Powder particle size	e.g. 80% passing 75 µm	≥80% passing 75 µm
Cation exchange capacity	≥70 meq/100 g	≥70 meq/100 g

The supplier-declared montmorillonite content, cation exchange capacity and powder grading meet the corresponding numerical criteria in EPA Victoria's BPEM Appendix E6.1. These source properties apply to the non-polymer range.

The bentonite supplier reports more than nine years supplying an established Malaysian GCL manufacturer whose products are supplied into Australia.

For BPEM projects, specify source certification, carbonate content, bentonite quality criteria, swell-test conditions and batch verification in the project quality plan. Link the bentonite and GCL quality records to the supplied rolls, with project-specific chemical compatibility, design and installation CQA.

Source data are supplier-declared specification limits. Swelling is quoted on the supplier's reporting basis; the GCL schedule defines the acceptance methods and units. Reference: EPA Victoria Publication 788.3, Appendix E6.1. The Heavy Duty schedule specifies a tighter fluid-loss acceptance limit of ≤16 mL.

Weldable GCL-W is covered by its separate TDS, with the complete GM17 membrane schedule, weld-seam requirements and EdgeProtect™ strips. It uses a standard woven carrier without the additional bottom nonwoven.