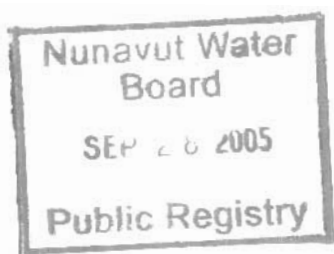


Tahera Diamond Corporation

JERICO PROJECT
EAST DAM AND SOUTHEAST DAM
CONSTRUCTION SPECIFICATIONS



1100060.004

August 2005

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1.0 GENERAL

The East and Southeast Dams are zoned rockfill dams used to retain tailings within the Jericho Processed Kimberlite Tailings Facility.

The structural body of all of the dams is tills and rockfill shell. A geomembrane liner will be constructed in the center of the dam.

2.0 DEFINITIONS OF TERMS USED

Construction Drawings:	the design drawings as issued for construction of the dams.
Construction Specifications:	this document.
Contract	the legal and binding agreement between the Contractor and Tahera regarding construction of the dam(s).
Contractor:	the general contractor responsible for constructing the dam(s).
Engineer	EBA Engineering Consultants Ltd. (EBA) representative on site during dam construction or related activities.
Owner:	Tahera Diamonds Corporation
Site:	the area in which dam construction or related activity is occurring
Unsuitable:	not meeting the requirements stated herein or not receiving the Engineer's approval.

3.0 MATERIALS

The material zones referenced in these specifications are designated on the Construction Drawings. Total material quantities have been estimated as follows:

TABLE 1001.1: DAM MATERIAL QUANTITIES							
Structure	Geomembrane (m ²)	Geotextile (m ²)	Fill Material Type				Coarse Tailings (m ³)
			Bedding (m ³)	Transition (m ³)	Rock Fill Shell (m ³)	Till (m ³)	
East Dam	4,900	9,800	6,800	2,100	17,000	8,400	12,000
Southeast Dam	4,200	8,400	5,800	2,600	14,000	8,600	12,000

Note: Quantities are "in-place". Seaming allowance and contingencies must be added to geomembrane and geotextile quantities. It is recommended that 20% extra quantities be available on site. Bulking factors and contingencies must be added to fill quantities; 20% should be added to reported quantities for stockpile volumes.

- .1 Volumes have been calculated based on 1.0 m bathymetry and topographic data provided by Tahera. The survey was carried out by Sub-Arctic Surveys.
- .2 The depth and volume of key trench excavation is dependent on the conditions encountered. The required depth will be determined during construction by the Geotechnical Engineer.

4.0 SITE CLEANUP

The Contractor shall remove all temporary structures and shall clean up the construction areas, borrow areas, and stockpile areas.

1.0 GENERAL

- 1 Water control for construction of East Dam and Southeast Dam is described in this section.
- 2 The key trench and dam footprint areas shall be dewatered as required to allow for fill placement in a dry environment.
- 3 The key trenches for all of the dams must be protected from erosion by freshet run off.
- 4 Water control and dewatering is the responsibility of the Contractor.

2.0 DEWATERING SUMP(S)

- 1 Any inflow of ground water or surface run off water into the key trench or dam footprint must be controlled using suitably placed and sized sumps and pumps.
- 2 Water collected in the sumps must be discharged into the PKCA area of the dam construction area. Discharge of water must not cause erosion or decrease of water quality in the receiving water body.
- 3 Construction, operation and maintenance of the sump(s) and pump(s) are the responsibility of the Contractor.

3.0 EROSION CONTROL

- 1 The key trench backfill must be protected from erosion during freshet.

1.0 GENERAL

- .1 Foundation preparation for dams is presented in this section.

2.0 NON-KEY TRENCH FOUNDATIONS

- .1 Open graded boulders must be removed as determined by the Engineer.
- .2 Ice rich or other soils beneath the liner system and deemed to be unsuitable by the Engineer must be removed.

3.0 KEY TRENCH

- .1 The key trench must be excavated into ice saturated, permanently frozen soil or rock as determined by the Engineer. The base of the excavation must have no natural or excavation related open voids or joints.
- .2 The depth of excavation will be determined in the field by the Engineer. The depth of the key trench may be increased in some areas at the discretion of the Engineer to confirm the suitability of the foundation soils beneath the key trench.
- .3 Excavation of rock shall be conducted in a manner that avoids excessive fracturing of underlying rock.
- .4 The key trench can be excavated using mechanical or drill and blast means. Drill and blast excavation may be limited by the Engineer if excessive cracking of rock or soil beneath the key trench occurs.
- .5 Final cleaning of the key trench must be conducted with hand excavation, brooms and compressed air or other appropriate equipment such as rippers, jack hammers etc. to remove all loose, broken or altered material from the base of the key trench. Snow and ice must be removed from the key trench prior to fill placement.
- .6 Ice rich soil exposed on the upstream face of the key trench excavation shall be removed from areas underlying the liner system. Additional excavation beyond the limits of the key trench excavation may be required at the Engineer's discretion.
- .7 Any inflow of water into the key trench excavation shall be controlled by sumps and pumps in a manner that minimizes thaw and erosion of the key trench base.

4.0 DRILLING AND BLASTING

- .1 The Contractor is responsible for ensuring that blasting procedures used are within guidelines set by all regulatory bodies and authorities having jurisdiction on Site.
- .2 The Contractor must use excavation methods that minimize fracturing beyond excavation limits.

- .3 Care must be taken in locating the drill holes, orienting the drills and during drilling so that accurate positioning and alignment of the drill holes is achieved.
- .4 The method of excavation must produce a key trench base that is free of abrupt changes in elevation.
- .5 The Contractor will drill test holes for use in percolation tests prior to drilling and blasting in the key trench area as instructed by the Engineer.
- .6 Controlled blasting techniques must be used to satisfy the excavation requirements stated herein. The initial explosive type and quantity, blasting sequence and delay pattern must be flexible in order to meet these requirements.
- .7 The Contractor shall submit complete details of any proposed blast to the Engineer twenty four (24) hours prior to commencement of drilling for each blast. Submitted data shall include the following:
 - the location, depth and area of the blast,
 - the type, strength, quantity, column load and distribution of explosives to be used per hole, per day and per blast,
 - the sequence and pattern of the delay, and
 - the description and purpose of any special methods to be adopted.
- .8 If, in a specific area, a plan that was previously adopted does not produce conditions in accordance with the requirements stated herein, the Contractor must submit a revised blasting plan to the Engineer before continuing with drilling and blasting in adjacent areas.

5.0 FOUNDATION APPROVAL

- 1 The foundation must be inspected and approved by the Engineer before any fill material is placed. The Contractor shall give not less than twenty-four (24) hours notice to the Engineer regarding required approval of a length of completed key trench excavation. The notice must include chainages of the areas requiring approval

1.0 GENERAL

- .1 The material specifications for fill materials used in construction of the dams are presented in this section.
- .2 Material quantities are presented in Section 1001

2.0 MATERIAL SOURCES

- .1 No material shall be borrowed or excavated without the Owner's prior approval.
- .2 Pits and quarries must be maintained and managed in accordance with the requirements set out in the Owner's Land Use and Quarry Permits.
- .3 The Contractor must process all materials to meet the gradations specified herein.
- .4 Bedding material may be processed from material obtained from the Jericho pit or sources approved by the Owner provided the final product meets the requirements specified herein. Processing will be required to achieve the specified gradation.
- .5 Transition -200 mm material shall be obtained from Jericho pit or other sources approved by the Owner providing the final product meets the gradations specified herein. Processing will be required to achieve the specified gradation.
- .6 Run-of-mine material, 700 mm maximum shall be obtained from Jericho pit or other sources approved by the Owner, provided the final product meets the requirements stated herein. Specific quarrying and/or processing procedures may be required to achieve the specified maximum top size.
- .7 Till shall be obtained from the Jericho pit or other sources approved by the Owner.
- .8 The parent rock from which all fill materials are derived from must be hard, durable rock. The rock in a potential quarry sources must be approved by the Engineer prior to quarrying. The Engineer may require trial crushing and durability testing
- .9 The parent rock sources for dam fill materials must be inspected by the Engineer throughout material processing and dam construction activities to ensure the requirements stated herein are being met.

3.0 MATERIAL SPECIFICATIONS

- .1 Bedding Material (-20 mm minus)
 - a. The Bedding material must consist of hard, durable particles, be free of roots, topsoil or deleterious material and have a grain size distribution falling within the limits set forth in Table 1005.1.

- b. The Bedding material to be used in the key trench shall be 20 mm minus crush granite. The liner bedding in the superstructure can be crush granite or esker material.

TABLE 1005.1 : BEDDING MATERIAL GRAIN SIZE DISTRIBUTION LIMITS

Grain Size (mm)	% Passing
20	100
12.5	65 – 100
5	45 – 70
.63	15 - 35
.08	4 - 10

2 Transition -200 mm Material

- a. The Transition -200 mm material must be free of roots, topsoil and other deleterious material and have a grain size distribution falling within the limits presented in Table 1005.2.

TABLE 1005.2 : TRANSITION -200 MM MATERIAL GRAIN SIZE DISTRIBUTION LIMITS

Grain Size (mm)	% Passing
200	100
100	60 – 100
50	40 - 70
20	20 – 50
10	0 - 30
5	0 - 10

3 Run-of Mine Material

- a. The Run-of-mine material can have a wide variation in gradation with a maximum particle size of 700 mm. Rockfill particles must be hard, durable and angular.
- b. The depth and spacing of drill holes as well as the weight and delay of charges shall be selected to produce run-of-mine material meeting the specification.

- c Any significant concentration of unsuitable materials must be removed and directed to a waste disposal area, other location approved by the Owner or, with the Engineer's approval, mixed with other materials to produce a material meeting specifications.

.4 Till Material

- a The Till material can have a wide variation in gradation with a maximum particle size of 300 mm. Particles must be hard, durable and angular.

1.0 GENERAL

- .1 The placement methods to be used in the construction of the dams are described in this section.
- .2 Construction must be performed in accordance with the best modern practice and with equipment best adapted to the work being performed. Embankment materials must be placed so that each zone is homogeneous, free of stratifications, ice chunks, lenses or pockets, and layers of material with different texture grading not conforming to the requirements stated herein.
- .3 No embankment fill material shall be placed on any part of the foundation until it has been prepared as specified herein and approved by the Engineer. Placement of fill material must conform to the lines, grades and elevations shown on the Construction Drawings, as specified herein or as per the direction of the Engineer. Fill placement must be conducted in such a manner that mixing of fill materials with fill materials in adjacent zones is avoided.
- .4 Embankment construction must not proceed when the work can not be performed in accordance with the requirements of the Construction Specifications. Any part of the embankment that has been damaged by the action of rain, snow or any other cause must be removed and replaced with the appropriate material conforming to the requirements stated herein before succeeding layers are placed.
- .5 Stockpiling, loading, transporting, dumping and spreading of all materials must be carried out in such a manner to avoid segregation or any other condition that does not meet the requirements stated herein. Segregated materials must be removed and replaced with the materials meeting the requirements stated herein and receiving the Engineer's approval.
- .6 The Contractor must remove all debris, vegetation or any other material not conforming to the requirements stated herein. The Contractor must dispose of these materials in an area approved by the Owner.

2.0 BEDDING MATERIAL (KEY TRENCH FILL)

- .1 The key trench foundation must be cleared of all deleterious material as described in Section 1004. The foundation area must be inspected and approved by the Engineer before fill placement proceeds.
- .2 Snow and ice must be removed from the base of the key trench excavation before fill can be placed in that area.
- .3 Key trench backfill placement must be conducted during winter months when air temperatures will freeze a lift of key trench material within 24 hours of placement. Experience has shown that a 250 mm thick lift freezes back within 24 hours when

air temperatures are below -15°C . The time to freezeback will depend on the moisture content, wind speed, air temperature and solar radiation.

- .4 The Bedding material from the stockpile must be mixed with heated water using a method approved by the Engineer to create a homogeneous mix that is fully thawed and not contain interstitial ice. The mix must not freeze until after it is placed and compacted in the key trench excavation. The temperature of the mix water required to meet the requirements stated herein may vary depending on the air temperature, wind speed and solar radiation.
- .5 The placed Bedding material must have a moisture content no less than 2% above the optimum water content determined from the Density Test (ASTM D698-91).
- .6 The Bedding material placed in the key trench must be spread and levelled immediately upon placement. The material must not be reworked, disturbed or rutted after compaction. Extra care should be taken by the Contractor to ensure the surface of the first lift before liner placement is as smooth and even as possible. Additional work, described in Section 1007, may be required if the lift surface is rough or uneven.
- .7 The Bedding material placed in the key trench shall be compacted with a smooth drum vibratory compactor weighing not less than 10 tons. The Bedding material shall be compacted with at least six passes (back and forth being two passes) to achieve the maximum density possible at the placed moisture content. The number of passes may be adjusted at the Engineer's discretion to suit varying conditions.
- .8 The lift thickness must be varied to achieve 100% freezeback prior to placement of the next lift. Freezeback is defined as a maximum temperature of -2°C . The lift thickness may be adjusted depending on the placed moisture content and climatic conditions and results of fill temperature monitoring. Individual lifts must have uniform thickness.
- .9 The key trench fill must be cleared of snow, ice and loose material before a new lift is placed. The surface of each lift must be approved by the Engineer before it is covered by a subsequent lift.
- .10 Small batches of Bedding material may be required to provide localised levelling and smoothing of the first lift surface to ensure the liner system has a level, even subgrade beneath it. Localised frozen high points on the surface of the first lift that the Engineer believes may cause puncture or stressing of the liner system must be removed without disturbing the surrounding lift surface. Equipment suitable for this task may include, but not limited to, an excavator with a toothless bucket or jackhammer. Smoothing and patching with Bedding material must be done if the lift surface is rough or pocketed after the high points is removed.

- .11 The Contractor must ensure that the integrity of the liner system is not compromised during construction. Precautions the Contractor may take to avoid damaging the liner system may include, but will not be limited to, avoid turning tracked vehicles on the first two lifts after liner system installation, providing light plants in the work area to improve operator visibility, or use pylons to mark the lift/liner system interface or any other sensitive areas.
- .12 Any damage to the liner system must be immediately reported to the Engineer. Repair work must commence as soon as possible. Fill placement must cease immediately in an area where the integrity of the liner system or thermosyphons has been compromised. Excavation of fill surrounding the damaged liner system or thermosyphon may have to be excavated, without further damaging the integrity of the liner, to permit repairs to be made. Excavation methods suitable for this task may vary depending on the degree of freezing that may have already taken place.

3.0 BEDDING MATERIAL (SUPERSTRUCTURE)

- 1 The Bedding material placed in the superstructure must not be placed in lifts no thicker than 0.3m. The placement method used must ensure that segregation and nesting of coarse particles is avoided.
- .2 The Bedding material must be free of oversize particles, top soil, roots or other deleterious materials that may compromise the integrity of the liner system.
- .3 The placed Bedding material must be compacted to 95% Density (ASTM D698 91). Moisture conditioning may be required to achieve the specified level of compaction.
- .4 The Contractor must ensure that the integrity of the liner system is not compromised during construction. Precautions the Contractor may take to avoid damaging the liner system may include, but will not be limited to, providing light plants in the work area to improve operator visibility or using pylons to mark the lift/liner system interface.
- .5 Any damage to the liner system must be immediately reported to the Engineer. Repair work must commence as soon as possible. Fill placement must cease immediately in an area where the integrity of the liner system has been compromised. Excavation of fill surrounding the damaged liner system may have to be excavated, without further damaging the integrity of the liner, to permit repairs to be made. Hand excavation must be used to expose damaged portions of the liner for repair.

4.0 TRANSITION -200 MM ROCKFILL MATERIAL

- .1 The Transition -200 mm rockfill material must be placed in lifts not exceeding 0.5 m thickness. The placement method used must ensure that segregation and nesting of coarse particles is avoided.

- 2 The Transition -200 mm rockfill material must be compacted with a smooth drum vibratory compactor weighing not less than 10 tons. Moisture conditioning may be required prior to compaction. The Transition -200 mm rockfill material must be compacted with at least four passes of the compactor (back and forth being two passes). Rolling patterns must be used throughout construction to optimize the number of passes, amount of water added and vibration frequency for compacting the -200 mm rockfill material.

5.0 RUN-OF-MINE ROCKFILL

- 1 The run-of-mine rockfill must be placed in lifts not exceeding 700 mm thickness. The placement method must ensure that segregation and nesting of coarse particles is avoided.
- 2 The run-of-mine rockfill shall be compacted by ensuring that loaded haul truck traffic is routed over the entire surface of each lift. Particles greater than 700 mm diameter must be moved to the upstream or downstream face of the fill.

6.0 TILL MATERIAL

- 1 The Till material must be placed in lifts not exceeding 0.3 m thickness. The placement method used must ensure that segregation and nesting of coarse particles is avoided.
- 2 The Till material must be compacted with a smooth drum vibratory compactor weighing not less than 10 tons. Moisture conditioning may be required prior to compaction. The Till rockfill material must be compacted with at least four passes of the compactor (back and forth being two passes). Rolling patterns must be used throughout construction to optimize the number of passes, amount of water added and vibration frequency for compacting the Till material.

1.0 GENERAL

- .1 The installation specifications for the non-woven geotextile, polypropylene geomembrane liner system to be used in the dams is presented in this section.

2.0 PRODUCT

- .1 Materials
- a The non-woven geotextile must have a weight of 542 g/m² geotextile. The manufacturer must provide to the Engineer, prior to shipment of materials, a signed manufacturing certification that materials to be shipped to site have test values that meet or exceed the requirements listed in Table 1007.1.
 - b The polypropylene geomembrane must be a 40 mil thick unsupported polypropylene geomembrane or equivalent. The manufacturer must provide to the Engineer, prior to shipment of materials, a signed manufacturing certification that materials to be shipped to site have test values that meet or exceed the requirements listed in Table 1007.2.

TABLE 1007.1: NON-WOVEN GEOTEXTILE – MATERIAL PROPERTIES

Property	Test Method	Units	Value
Grab Tensile	ASTM D4632	N	1690
Elongation	ASTM D4632	%	50
Trapezoidal Tearing Strength	ASTM D4533	N	645
Puncture Strength	ASTM D4833	N	1070
Mass per unit area	ASTM D5261	g/m ²	542

TABLE 1007.2: POLYPROPYLENE GEOMEMBRANE PROPERTIES

Property	Test Method	Units	Value
Thickness (Nominal)	ASTM D1593	mm	1.0
Tensile Strength at Break	ASTM D882	N	334
Elongation	ASTM D882	%	700
Tear Resistance	ASTM D1004	N	53
Puncture Resistance	ASTM D4833	N	169
Low Temperature Impact	ASTM D1790	DegC	-40
Polypropylene Minimum Shop Seam Strengths			
Heat Bonded Seam Strength	ASTM D3083	N/mm	9.1
Heat Bonded Peel Adhesion Strength	ASTM D413	N/mm	3.5
Polypropylene Minimum Field Seam Strengths			
Heat Bonded Seam Strength	ASTM D3083	N/mm	9.1
Heat Bonded Peel Adhesion Strength	ASTM D413	N/m	3.5

3.0 SHIPPING AND STORAGE

- 1 Geotextile
 - a. Any visible damage to the shipment of geotextile must be noted on the freight receipt and project records.
 - b. Storage of geotextile rolls on site must be in a secure location that will minimize exposure to the elements and physical damage.
- 2 Polypropylene Geomembrane
 - a. Polypropylene panels must be shipped in palletized boxes, which are inspected before leaving the factory. Shipping must conform to the manufacturer's requirements and must be conducted in a manner that avoids damage. Any visible damage to the shipment must be noted on the freight receipt and project records.
 - b. The Polypropylene must remain packaged in dry storage until ready for use. The palletized boxes must not be stacked.

4.0 INSTALLATION

1 Geotextile

- a Where applicable, any cracks or voids in the subgrade beneath the geotextile should be filled with Bedding material. The area to be covered by the geotextile must be smooth and free of sharp objects that could pierce or tear the geotextile and damage the polypropylene geomembrane. When placed over the polypropylene geomembrane, placement of the geotextile must be conducted in a manner that will prevent damage to the polypropylene geomembrane. When placed over Bedding material, the installation of the geotextile shall not begin until the sub-base has been approved by the Engineer.
- b Geotextile placement must not be conducted during periods of high wind.
- c The geotextile must be sewn to minimize the number of required overlaps. The sew strength efficiency must be a minimum of 60% as tested using the wide width strength test ASTM D4595-86.
- d The geotextile must be overlapped a minimum of 1.5 m where overlap joints are required.
- e Sufficient temporary anchorage must be used to hold the geotextile in place during placement of the other elements of the liner system or during backfilling.

.2 Polypropylene Geomembrane

- a The area to be lined should be smooth and free of sharp objects that could puncture the polypropylene geomembrane. Placement of the geomembrane must be conducted in a manner that will prevent damage to the underlying geotextile. The installation of the polypropylene geomembrane must not begin until the sub-base has been approved by the Engineer.
- b The panels should not be unfolded during periods of high wind. The panels must not be unfolded when air temperature is below -20°C without first being warmed in a heated enclosure.
- c Care must be taken when the polypropylene geomembrane panels are deployed. Sharp objects, vehicles and equipment must not contact the material.
- d The Polypropylene liner must be placed in a relaxed condition, free of stress or tension. The panels should be positioned so that there is a nominal six (6)-inch seam overlap. Any methods used to temporarily bond adjacent rolls together must not damage the geomembranes.

- c. The contact surfaces of the two sheets should be wiped clean to remove all dirt, dust, moisture or other foreign materials.
 - f. Field seams must be made by hot wedge fusion welding. Trial seams must be made and tested to verify the welding temperature, speed of welding and the effects of ambient air temperature. The machine settings should be adjusted accordingly. Throughout the seaming operation occasional adjustments of welding temperature or speed as the result of changing ambient conditions may be necessary to maintain a consistent seam. A 1.5 inch nominal seam width is required for single-track welds. Dual track weld should have two 0.5-inch nominal seams separated by an air test channel.
 - g. A heated, portable shelter will be required to permit the polypropylene panels to be welded during the key trench liner system placement. The minimum air temperature within the shelter must not drop below -7°C .
 - h. All welders will be required to successfully complete a qualification weld, witnessed by the Engineer prior to starting any welding.
 - i. All welding must be performed under the supervision of a field supervisor who will remain on site and be responsible for all geomembrane installation. The supervisor must have installed or supervised a minimum of one hundred thousand (100,000) m² of polypropylene liner involving the thickness and grade of liner and welding processes required for this project.
 - j. Sufficient temporary anchorage must be used to hold the polypropylene geomembrane in place during placement of the other elements of the liner system and during backfilling.
- 4 Backfilling
- a. The Contractor must take the necessary steps to ensure that the integrity of the liner system is not compromised during key trench backfilling. Frozen key trench fill material adhering to the liner system must not be removed unless repairs are required.
 - b. The liner system must be temporarily anchored so that movement downslope does not occur during backfilling at any stage of construction.
 - c. The Contractor must take the necessary steps to ensure that backfilling does not induce tensile stress in the liner system during backfilling. Care must be taken to avoid any damage to the liner system by making sharp turns, sudden stops or sudden starts adjacent to the liner system. Non-essential heavy equipment traffic in the immediate vicinity of the liner system must be minimized.
 - d. Stresses in the liner imposed by placing backfill on the sloping liner must be released at the top of the slope during cover soil placement.

- e. The Contractor must discuss with the Engineer the schedule for liner system and backfill placement. The Engineer must approve all plans and schedules for backfilling the liner system.

5 Damage

- a. All areas of the liner system components requiring repair due to manufacturing flaws or damage during shipping, handling, or placement shall be recorded and surveyed. The Engineer shall prescribe the method of repair to be used for all liner system materials.
- b. Damaged sections of geotextile must be repaired or replaced at the Engineer's discretion.
- c. The polypropylene geomembrane is the primary water retention barrier in the dams. Polypropylene geomembrane integrity and quality is absolutely essential for the dams to fulfil their design intent.
 - Defects in the polypropylene panels will include roughness or striations, bubbles, blisters, any local variation in sheet thickness that exceeds +/- 20% or exceeds 6 inches in any direction, undispersed raw material or foreign matter present in either the surface or cross section of the sheet and pinholes, tears, gouges or any other through-thickness defect.
 - Any of the defects listed above in the polypropylene geomembrane must be patched with a piece of the same membrane material. Patches must be cut with rounded corners and should overlap the damaged area a minimum of 3 inches. Polypropylene patches will be applied with a hand held heat gun and roller. The patch and damaged membrane area must be clean and dry. The heat gun will be inserted between the patch and the membrane liner, heating the surfaces of each to a molten state. Steel roller pressure over a hard surface must be applied during the heating process in such a way as to smooth out any wrinkles while mating both polypropylene membrane surfaces.