GeoSol Associates

ISO 9001:2008 CERTIFIED

SITE QAQC FOR – GEOMEMBRANE - PEHD

1. INTRODUCTION

1.1 Purpose

This document is to outline the Quality Control Program utilized for installation and quality control procedures associated with HDPE Geomembrane installation in order to assure quality, workmanship, performance and the integrity of the executed works for the Landfill or pond for CLAINT.

2.1 Storage of material at site

The rolls are to be stored on a smooth surface free of stones and debris which could damage the rolls. The rolls shall be kept clean.

3 HDPE GEOMEMBRANE INSTALLATION

3.1 Sub-grade Preparation

The subgrade will be prepared as per the approved drawing and specification. Approval will be taken from CLAINT before the laying. Due care will be taken to ensure that the surface where to be laid be free from any pooling water and lumps.

3.2 HDPE Geomembrane Placement

3.2.1 Panel Layout

Geomembrane will be installed over the subgrade as per the approved layout drawing and approved shop drawing. In case there is any deviation during the installation of the Geomembrane, the same will be done after taking proper approval of CLAINT engineer and the actual field panel placement will be incorporated and submitted in the as-built drawing after the completion of the job.

The as built drawing will show the panel location, panel identification, pipe penetration, repairs & destructive test locations.

3.2.2 Panel Identification

Each panel installed will be given a distinctive number. The panel numbering system should reflect the actual manufacturer's roll number, followed by a letter showing the chronological order deployment (ex.:1-8522-A, 2-8522-B). Panel number will be written on all the panel's during/at installation at site by paint and the same will be incorporated in the as-built drawing.

3.2.3 Panel Placement

Care shall be taken during panel placement, so that no damage is caused to the Geomembrane during laying and after installation. In case any damage has been found the same will be repaired with the due consultation with CLAINT. If any pooling water or lumps are found in sub grade, the same will repaired immediately. Walking and traffic shall be kept to a minimum on all geosynthetic materials.

During panel placement, proper anchoring will be done by keeping weight over the laid Geomembrane i.e.; sand filled bags, earth filled bag, truck tyre, etc.. to prevent wind uplift of the Geomembrane. After installation/testing/repairing if any of the HDPE approval will be taken from CLAINT for laying the successive layer. The laid Geomembrane surface to be covered with successive layer to prevent uplifting due to wind.

3.2.4 Weather Conditions

Whenever weather conditions are uncertain or not adequate for field seaming, no HDPE geomembrane deployment will be done. Extreme temperatures, high humidity, rain etc. are all conditions not favorable to field seaming. The site engineer will determine with due consultation with CLAINT before laying the same, so as to achieve quality seams.

3.3 Field Seaming

In general, all seams will be oriented parallel to the slope, not across. Tie-in seams (perpendicular to the slope) should not be located within five feet (1.5 meter minimum) from the toe of the slope. The field documentation of the seaming procedures includes the seam number, date and time of seaming name of the welding technician, seam length. Before engaging of the welding technician testing carried out on sample welded piece by Tensiometer after successful test the welder till be allowed for welding.

The welding technician before starting the welding will ensure that the seam area is free of dimoisture and any other object that could affect the seam quality. All panel intersections (“T” seam) shall be extrusion welded to ensure a proper seal. The location shall be properly cleaned and dried using soft broom / Brush.

3.3.1 Seaming Procedures

The primary seaming method used should be the hot wedge welder. This automated equipment allows for greater welding speed as well as a much more consistent welding method. Geomembrane panels are overlapped from (100mm) to six inches (150 mm) as required for allowing adequate double fusion welding and leaving enough material to perform peel and shear tests on seam samples taken in place. These welds include an air channel allowing for air-pressure testing of the seam.

In restricted areas such as corners and close patches where the wedge welder cannot be adequately used, a manual extrusion fillet welder is employed. Prior to any fillet extrusion welding Geomembrane shall be ground to insure proper adhesion of the extruded material.

3.3.2 Trial Seams

Trial seams are conducted prior to every shift. The test seams shall reproduce the same conditions (type of material, ambient temperature, etc) as those found when field welding is to be done for the Geomembrane.

For each trial seam, the Site Engineer cuts four one-inch (25mm) wide specimens. The specimens are then tested for peel adhesion and shear strength using a field Tensiometer. All four specimens must meet or exceed the project requirements for peel and shear testing, and exhibit a Film Tear Bond (FTB) type of break.

Trial seams are tested and approved by the CLAINT. The Site Engineer shall document every trial seam with the following information, trial seam number, equipment number, date and time, peel and shear testing results, etc. as it appears on Fusion Trial Testing form and Extrusion Trial Testing form.

3.3.3 Documentation

For each seam, the welding technician shall mark on the Geomembrane his initials, equipment number and the time he started welding with white paint.

3.4 Non-Destructive Testing

The continuity of all seams (100%) shall be inspected with a non-destructive testing method. These methods include the air-pressure and the vaccum-box test (most common methods for polyethylene Geomembrane. And seam that fails one of these tests is rebuilt or repaired until a satisfactory result is obtained. A non-destructive test results are recorded on the proper form.

3.4.1 Air Pressure Testing

Air pressure testing is employed as much as it is possible since it is loss-observer dependent and it represents a supplementary mechanical resistance test for the seam. The test consists of injecting air in the center channel of double-track fusion seams at a predetermined pressure of approximately 30 psi (207 kPa). After a five minute monitoring time, the Site Engineer will record the pressure drop and ensure that the pressure drop is below 10%. The pressure will be recorded.

When pressure testing of a seam is completed, the end of the seam opposite to the pressure guage shall be cut to ensure that the air pressure flows freely along the entire seam. If the air pressure is not relieved from the opposite end of the seam, the blockage of the air channel must be located. If the blockage cannot be located visually, the seam shall be cut half way and re-tested on both sides of the cut. The same operation should be repeated until the channel blockage located.

If the seam does not hold the air pressure, verify that both ends are sealed tight and re-test. If the seam still does not hold the pressure and the leak cannot be visually locate, the seam overlap shall be cut and the done again and tested using the vacuum box method. The seam shall be considered satisfactory only when one of the non-destructive testing methods gives a satisfactory result.

3.4.2 Vacuum Testing

Wherever the air pressure test method cannot be used if a leak must be located, the vacuum test method is employed. The test consists of sprinkling soapy water over the area to be tested and applying a negative pressure over that same area so that if there is a puncture or pinhole within the area, bubbles will appear and be detected by the operator.

A box fitted with a transparent upper cover and a neoprens lower rim (gasket) is used to apply the negative pressure over the area to be tested. The negative pressure of approximately –5 psi (-3 kPa) is obtained within the box by using a compressor or an industrial all-purpose, vacuum. In order to obtain a good seal

around the neoprene gasket and to accurately locate a leak, the seam overlap must be trimmed prior to vacuum box testing. Therefore, if destructive testing is required shall be done prior to the removal of the seam overlap and vacuum box testing.

3.5 Destructive Testing.

In order to evaluate field seaming, destructive samples shall be tested in the field for both part of adhesion and shear strength. After successfully welding five panels, one sample will be drawn and sent to for testing of peel adhesion and shear strength by the Quality Assurance Representative. The site destructive samples are usually marked at a frequency of one per 500 feet (150 meters) of seam length. This frequency represents an average frequency for the entire project4.

The location of the samples shall be indicated by either the QA Representative or Site Engineer. Whenever possible, destructive samples shall be taken such that repair procedures will be minimized or unnecessary (ex. in the anchor trench). Under no conditions should a sampling be done inside the pond bed area or center of the panel lengths.

Care shall be taken so that all destructive samples cut from the HDPE 1.50mm (Carbofol 406) geomembrane are patched or covered the same day to avoid possible damage to the sub-grade the overnight rain or heavy wind. The Site Engineer should verify destructive testing with the foreman and advise him of all testing locations so that they are patched later on that same day.

The Site Engineer must test for one inch wide (25mm) specimens for peel and shear strength. When all four specimens meet the project specifications, the seam is considered to pass field testing and the remainder of the sample can be sent to the laboratory for further testing. For laboratory testing purposes, four out of five passing specimens are usually found acceptable.

All the destructive testing will be recorded with the following information; date and time, destructive test number, seam number, location, peel and shear strength results and type of break for each specimen.

In case the location where the destructive sample is drawn falls inside the pond area, the same is to be repaired using close patches and a manual extrusion fillet welder. Prior to any fillet extrusion welding, the Geomembrane shall be ground to insure proper adhesion of the extruded material.

3.5.1 Destructive Test Failure

If a destructive test does not meet the project requirements, additional samples shall be taken on both sides of the initial sample in order to determine the defective seam length. When passing samples are found (on both sides) the defective seam length shall be repaired according to the prescribed procedures. When tracking down a defective seam, care shall be taken to evaluate seams that were produced by the same wedge welder (if more than one are used).

3.6 Repair Procedures

All materials shall be visually inspected for blemishes, punctures and other defects or damages that may have occurred during transport or panel placement. Any defect shall be marked using indelible ink markers/paint and given a repair number. All repair procedures shall be documented and verified (tested) using a non-destructive testing method. The repair will be carried out after due consultation with CLAINT.

Before laying of next successive layer approval will be taken from CLAINT.