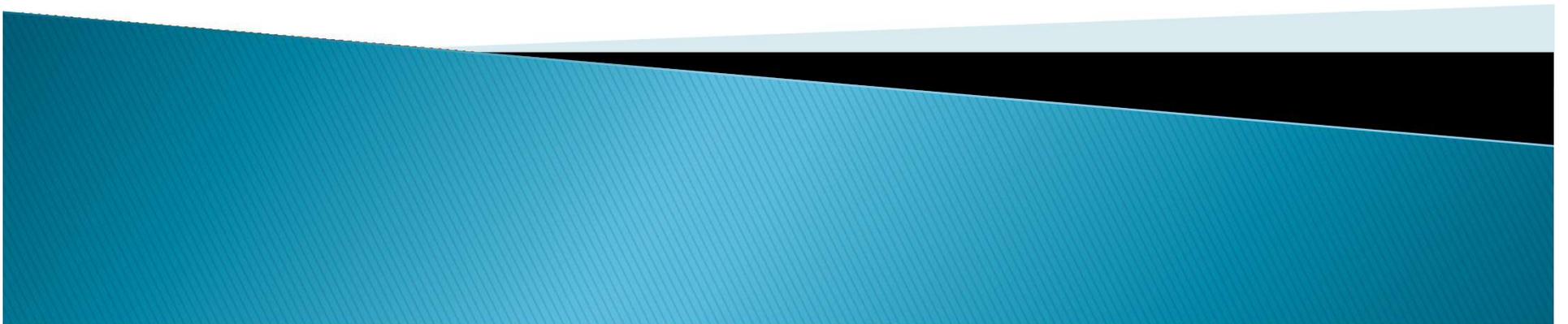


Construction Quality Assurance
Gary Schwerin, DEQ



Construction Quality Assurance (CQA)

- Why have a CQA Plan?



Construction Quality Assurance (CQA)

- ▶ Rule 916 requires the development of a CQA Plan and details what must be included in the Plan.



Construction Quality Assurance (CQA)

- ▶ PROTECT THE ENVIRONMENT



Construction Quality Assurance (CQA)

- ▶ A poor construction project is the result of a poor CQA Plan.
- ▶ A great construction project is the product of a great CQA Plan combined with great implementation.



Construction Quality Assurance (CQA)

- ▶ A simple example would be to require material testing to be completed and the test results reviewed prior to material placement.
- ▶ This requirement does not add to the amount of work required.
- ▶ It simply specifies the timing of the testing and review, but can prevent the additional cost and the lost time of having to remove unacceptable material placed as part of the project.



Construction Quality Assurance (CQA)

- ▶ While the timing of tests and reviews can prevent problems, there is more to a well thought out CQA Plan than the timing of tests and reviews.
- ▶ A great CQA Plan will specify materials that meet the requirements of the Part 115 rules, and are locally available.



Construction Quality Assurance (CQA)

- ▶ Verifying that material that meets the specifications is available locally involves contacting suppliers or completing material testing during CQA Plan development.
- ▶ If the specified material is not available, there is time to review what materials are available, and if they will work for the project, specify that material in the CQA Plan; or ask the suppliers if they are able to produce or locate the material.



Construction Quality Assurance (CQA)

- ▶ Poor CQA Plans are assembled at the last minute, are written very vaguely, and list as few requirements as possible, because the engineer doesn't want to be "too restrictive".
- ▶ If a CQA Plan does not address testing requirements for certain materials that the Part 115 rules require, that doesn't mean the testing does not have to be done.
- ▶ The CQA officer **must** certify the landfill was constructed in accordance with the CQA Plan, the Part 115 Rules, and the approved engineering plans.



Construction Quality Assurance (CQA)

- ▶ If the testing is not addressed in the CQA Plan, the monitor is less likely to remember to complete the testing, which will create obstacles to getting the construction certification approved.
- ▶ **A great CQA Plan clearly indicates the type and frequency of required testing.**



Construction Quality Assurance (CQA)

- ▶ CQA Plans should have a requirement that the monitors have a minimum amount of landfill construction monitoring experience.
- ▶ The Part 115 Rules do not have an experience requirement, but the landfill owners can, and should, require it.



Construction Quality Assurance (CQA)

- ▶ With inexperienced monitors, the CQA Plan tends to be used as a checklist of requirements to be completed because the monitor typically won't understand the reason for the testing or procedure, and are simply not familiar with landfill cell construction.
- ▶ Inexperienced monitors will not have the same expectations as experienced monitors for terms like adequate, suitable, reasonable, etc.



Construction Quality Assurance (CQA)

- ▶ For example, many CQA Plans have a requirement to ensure adequate loading of a geomembrane with sand bags before seaming.
- ▶ An experienced monitor may understand that requirement to mean continuous sandbags, whereas a monitor on their first project may think one sandbag every 5 feet is adequate.
- ▶ After one strong wind gust and several hundred feet of damaged geomembrane, what otherwise could have been a good project, has become a “learning experience” no-one wants to repeat, but was easily preventable.



Construction Quality Assurance (CQA)

- ▶ The final aspect of a great CQA Plan is the implementation.
- ▶ The Part 115 Rules were not intended to be used as checklists for required testing with the ultimate goal of getting a construction project certified and approved.
- ▶ The intent of the rules is to protect the environment by providing some minimum requirements to be followed for construction and operation of waste disposal facilities.



Construction Quality Assurance (CQA)

- ▶ Rule 916 requires the development of a CQA Plan and details what must be included in the Plan.
- ▶ The implementation of a detailed CQA Plan is key to ensuring construction is completed in a manner that will protect the environment during and after construction.



Construction Quality Assurance (CQA)

- ▶ What I mean by implementation is that the **intent** of the plan, which is environmental protection, is always the first priority.
- ▶ I've seen certifications where material testing is completed at the frequency required in the CQA Plan, but the test reports are not reviewed before placement to make sure the material meets the specifications.



Construction Quality Assurance (CQA)

- ▶ The certification is submitted stating that the required number of tests were completed, without mentioning that the material does not meet the specifications in the hope that the reviewing engineer will not notice.
- ▶ OR
- ▶ Additional samples of the material are taken and retested after the work is done. The certification is submitted stating that the required number of tests were completed and the material meets the specifications in the hope that the reviewing engineer will not notice the laboratory test date is after the date work was completed.



Construction Quality Assurance (CQA)

- ▶ The reviewing engineer **will** notice that either the material does not meet specification, or the lab test date is after work was completed, and ask the certifying engineer to explain the discrepancy.
- ▶ The certifying engineer is then in a position to try to explain why this material should function comparably to the specified material, or how the laboratory test for the “same” material didn’t meet specification before placement, but the laboratory test completed after placement does meet specification.



Construction Quality Assurance (CQA)

- ▶ If environmental protection is the main concern, the reports would be reviewed prior to placement of the material, the supplier would be contacted and asked if they can produce material that meets the specification.



Construction Quality Assurance (CQA)

- ▶ If the supplier can't produce the material, then a search would be made to find a supplier that can provide the specified material.
- ▶ If a different supplier cannot be found, then the project engineer would provide the DEQ engineer with an explanation of the issue, a summary of attempts made to resolve the issue, and an explanation of why the proposed material should function as well as the specified material.



Construction Quality Assurance (CQA)

- ▶ This request, and approval for use of the material, should be made prior to the material being used in the project.
- ▶ A CQA change request prior to use is infinitely better than submitting a certification without identifying the discrepancies and hoping it isn't noticed during the review.
- ▶ The best scenario would be to contact the supplier during the CQA Plan development to make sure they can supply the material being specified.



Construction Quality Assurance (CQA)

- ▶ Landfills should want, and demand, material that meets the specifications because ultimately, any damage to, or leakage through, the liner into the leak detection system or groundwater will be the landfill's responsibility to monitor and/or correct.



Construction Quality Assurance (CQA)

- ▶ Great implementation also means that the CQA monitor needs to not only collect data, but to also watch and understand the construction.
- ▶ For example, during geomembrane seam air testing, the CQA monitor must observe the installer completing the air testing.
- ▶ If the monitor simply records the information the installer writes on the geomembrane, questionable seams will be accepted.



Construction Quality Assurance (CQA)

- ▶ The installer has no incentive to identify seams that fail an air pressure test.
- ▶ In fact, they have every disincentive: more work in locating the source of the leak, the work of repairing the leak, the work of retesting the seam, and the time involved with all of these steps.



Construction Quality Assurance (CQA)

- ▶ The result of this is a seam that leaks, which becomes a long term cost, and potential problem, for the landfill.
- ▶ To ensure proper installation, the monitor must read the pressure gauge to determine the start and end pressures, as well as note the start and end times of the test.



Construction Quality Assurance (CQA)

- ▶ Ideally, the CQA firm has enough monitors to watch every aspect of a construction project. The reality is CQA firms compete for projects and cost is a major consideration for facilities, so there is rarely enough monitors to watch every aspect of a project.
- ▶ How do you decide what to watch continuously and what to watch on a procedural basis?



Construction Quality Assurance (CQA)

- ▶ Every trial weld should be watched by the monitor. Verifying every welder/unit combination is producing acceptable welds prior to production welding can prevent a lot of repair work by identifying a problem before it starts. Seam overlap can be inspected on a procedural basis. The monitor can tell the placement crew the required overlap before placement, and verify the overlap during slow periods or at the end of the day. “Last chance” items need to be watched continuously. These are items that are the last opportunity to verify construction quality. Air pressure tests, vacuum box tests, spark tests are all “last chance” items. Geomembrane seaming is not a “last Chance” item because the seam will be air tested and may be destructively tested. Destructive tests that are completed in the field should be continuously monitored since that is the final strength test on a seam.



Construction Quality Assurance (CQA)

- ▶ When trying to decide how to prioritize, monitor the beginning of each activity to verify it is being completed correctly and then monitor on a procedural basis, continuously monitor the “last chance” activities, verify final construction of activities that had been monitored on a procedural basis during slow periods, at the end of the day, or before being covered by the next layer of material.



Construction Quality Assurance (CQA)

- ▶ The DEQ cannot watch the CQA monitor every day to make sure they are reading the gauges on every seam test, and we shouldn't have to.
- ▶ It is in the best interest of the landfill to have a good project, so landfill staff should be watching how their consultant is doing the job and making sure they are acting in the landfill's best interest.



Construction Quality Assurance (CQA)

- ▶ A well thought out CQA Plan will detail the testing that is required, specify materials that meets the Part 115 requirements and are available locally, and require material tests to be reviewed prior to use.
- ▶ A well implemented CQA Plan requires an experienced CQA Monitor(s), proper prioritization of monitoring activities, detailed documentation, and a commitment to protect the environment.



Construction Quality Assurance (CQA)

Questions?

