Texas Commission on Environmental Quality

Waste Permits Division
Coal Combustion Residuals Surface Impoundment
Draft Technical Guideline No. 31
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Topic: Coal Combustion Residuals (CCR) Surface Impoundment

Contents

Introduction

Coal combustion residuals waste are generated from the combustion of coal in a boiler to produce steam for powering a turbine-generator to generate electricity. CCR waste are one of the largest waste streams generated in the United States, with roughly half used for "beneficial reuse" and half disposed in surface impoundments or landfills. CCR waste includes fly ash, bottom ash, boiler slag, and flue gas desulfurization materials, and are generated in a wet or dry condition. Some dry CCR waste may be mixed with water ("sluiced") to facilitate handling/transport of the CCR waste in the power generation facility.

CCR waste are classified by the Texas Commission on Environmental Quality (TCEQ) as a nonhazardous industrial solid waste. This classification is consistent with the EPA's determination of CCR waste as nonhazardous solid waste detailed in 40 Code of Federal Regulation (CFR) 257, Subpart D. The waste classification for CCR waste in Texas is conducted in accordance with TCEQ guidance RG-022 – Guidelines for the Classification and Coding of Industrial and Hazardous Waste.

Part 1 – Applicable Requirements

1.1 General

In accordance with 30 Texas Administrative Code (TAC) Chapter 352, Coal Combustion Residuals Waste Management, the TCEQ prepared this Technical Guideline No. 31 (TG-31) to assist electric utilities and independent power producers with the management and disposal of CCR waste in surface impoundment(s).

TG-31 does not include all requirements applicable to surface impoundment(s) used to store, manage, and dispose of CCR waste. The detailed technical and administrative requirements for

managing CCR waste in surface impoundment(s) are contained in 30 TAC Chapter 352. Table 1-1 lists the technical requirements for existing, new, and lateral expansions of CCR surface impoundment(s).

A CCR surface impoundment can be a natural topographic depression, a manmade excavation, or a diked area of earthen materials designed to hold (on a temporary or permanent basis), accumulate, treat, and dispose of CCR and liquids. An incised surface impoundment is constructed by excavating entirely below the natural ground surface, holds the CCR accumulation entirely below the adjacent natural ground surface, and does not consist of any constructed dike portion.

To be covered by the Texas CCR regulations, an impoundment must meet both of the following criteria: (1) is designed to hold an accumulation of CCRs and liquid, and (2) used for treating, storing or disposing of CCR waste.

The CCR regulations do not apply to surface impoundment(s) that stopped receiving CCR waste and were closed, dewatered, and could no longer impound liquid, before October 19, 2015.

Surface impoundment(s) must also be designed to prevent liquids from flowing over the top ("overtopping"), and to ensure the long-lasting structural integrity of any diked portions.

Table 1-1 CCR Surface Impoundment Requirements

Requirements		Existing surface impoundment		New surface impoundment and lateral expansions	
		Surface impoundment is five feet high AND 20 acre-feet; or 20 feet high		Surface impoundment is five feet high AND 20 acre-feet; or 20 feet high	
		Yes	No	Yes	No
Location Restrictions, 40 CFR §257.60-.64	Placement above the uppermost aquifer	√	√	√	√
	Wetlands	√	√	√	√
	Fault areas	√	√	√	√
	Seismic impact zones	√	√	√	√
	Unstable areas	√	√	√	√
40 CFR §257.3-1	Floodplains [1]	√	√	√	√
40 CFR §257.3-2	Endangered species [1]	√	√	√	√
Design Criteria, 40 CFR §257.70-.74	Composite liner	√	√	√	√
	Leachate collection	-	-	-	-
Structural Integrity Criteria, 40 CFR §257.73-.74	Permanent identification marker [2]	√	√	√	√
	Hazard potential classification assessments [2]	√	√	√	√

Requirements		Existing surface impoundment		New surface impoundment and lateral expansions	
		Surface impoundment is five feet high AND 20 acre-feet; or 20 feet high		Surface impoundment is five feet high AND 20 acre-feet; or 20 feet high	
		Yes	No	Yes	No
	Emergency action plan [2]	√	√	√	√
	History of construction	√	-	-	-
	Construction plan	-	-	√	-
	Structural stability assessments	√	-	√	-
	Safety factor assessments	√	-	√	-
Operating Criteria, 40 CFR §257.80-.84	Fugitive dust control plan	√	√	√	√
	Annual fugitive dust control report	√	√	√	√
	Hydrologic and hydraulic capacity	√	√	√	√
	Surface water protection[1]	√	√	√	√
	Weekly inspections by a qualified person	√	√	√	√
	Annual inspection and report by a qualified Texas licensed professional engineer	√	-	√	-
Groundwater Monitoring and Corrective Action, 40 CFR §257.90-.98	Groundwater monitoring system	√	√	√	√
	Groundwater monitoring sampling and analysis plan	√	√	√	√
Closure and Post-Closure Care, 40 CFR §257.100-.104	Closure plan	√	√	√	√
	Deed notations[3]	√	√	√	√
	Post-closure plan	√	√	√	√

√ = Required
- = Not required
[1] Existing regulations in 40 CFR Part 257, Subpart A "Classification of Solid Waste Disposal Facilities and Practices".
[2] This requirement does not apply to incised surface impoundment(s).
[3] This requirement does not apply if closure is by removal of all CCR waste.

1.2 Purpose

30 TAC Chapter 352 establishes a CCR registration and management program to regulate CCR waste and requires the Owner/Operator to obtain a CCR registration and implement a groundwater detection/monitoring program.

TG-31 provides recommendations for siting, design, operation, inspection, closure and post-closure care (PCC), financial assurance, recordkeeping, notifications, and posting of information to the internet to meet requirements for CCR surface impoundment(s). Facilities are also subject to 30 TAC Chapter 335. Please note, pursuant to Texas Health and Safety Code (THSC) §361.090(c), compliance with this technical guideline does not relieve the Owner/Operator of the facility from compliance with other requirements under Texas Water Code, Chapter 26, and other state and federal regulatory requirements, except 30 TAC Chapter 350, which is not applicable.

1.3 Professional Certifications

In accordance with 30 TAC §352.4, all engineering plans, specifications, and related documents submitted to the TCEQ shall be prepared by, or under the supervision of, a qualified Texas licensed professional engineer (Texas P.E.), and shall be signed, sealed, and dated by the qualified Texas P.E., as required by the Texas Engineering Practice Act.

In accordance with 30 TAC §352.4, all geoscientific information submitted to the TCEQ shall be prepared by, or under the supervision of, a qualified Texas licensed professional geoscientist (Texas P.G.), and shall be signed, sealed, and dated by a qualified Texas P.G., as required by the Texas Geoscience Practice Act.

Part 2 – Surface Impoundment Siting Requirements

2.1 General

The CCR rules under 30 TAC 352, Subchapter E, Location Restrictions, contain five location restrictions: placement above the uppermost aquifer; wetlands; fault areas; seismic impact zones; and unstable areas.

For existing surface impoundment(s), the Owner/Operator must demonstrate compliance with these five location requirements and obtain certification from a qualified Texas P.E. For new surface impoundment(s), or lateral expansions of existing surface impoundment(s), successful location demonstrations must be made before placing CCR waste in the unit.

Existing surface impoundment(s) unable to successfully demonstrate compliance with the siting requirements and compliance dates must conduct closure in accordance with 30 TAC 352, Subchapter J, Closure and Post-Closure Care.

2.2 Placement Above the Uppermost Aquifer

Existing, new and lateral expansions of CCR surface impoundment(s) must be constructed with a base at least 5 feet above the upper limit of the uppermost aquifer; or demonstrate in accordance with 30 TAC §352.601/40 CFR §257.60 that there will not be a hydraulic connection between the base of the CCR surface impoundment(s) and the uppermost aquifer due to normal fluctuations in groundwater elevations (including groundwater elevation variations during the wet season). The Owner/Operator of existing CCR surface impoundment(s) unable to make a successful aquifer location demonstration must close or retrofit in accordance with 30 TAC §352.1211/40 CFR §257.101 or comply with the alternative closure requirements of 30 TAC §352.1231/40 CFR §257.103. Demonstration of compliance with this location restriction must

be prepared, signed, and certified by a qualified Texas P.G. or a qualified Texas P.E. that the demonstration meets the requirements of 30 TAC §352.601/40 CFR §257.60.

2.3 Wetlands

Wetlands refer to areas inundated or saturated by surface or groundwater at a frequency and duration to support vegetation adapted for life in saturated soil conditions. Wetlands include marshes, swamps and bogs commonly located between open water and dry land whose protection has been identified as a high priority. Wetlands are defined in 40 CFR §232.2 and protected under Section 404 of the federal Clean Water Act. The United States Army Corp of Engineers exercises permitting authority over activities that would alter the wetlands environment.

Existing, new, and lateral expansions of CCR surface impoundment(s) must not be in wetland areas unless the Owner/Operator can demonstrate compliance the requirements of 30 TAC §352.611/40 CFR §257.61. The Owner/Operator must complete the demonstration and obtain certification from a qualified Texas P.E. no later than the initial receipt of CCR in the CCR surface impoundment(s).

2.4 Fault Areas

Existing, new, and lateral expansions of CCR surface impoundment(s), must not be located within 200 feet of the outermost damage zone of a fault that had displacement in the Holocene time, unless the Owner/Operator demonstrates that the structural integrity of the CCR surface impound or lateral expansion will not be compromised at a setback distance of less than 200 feet. The demonstration must be certified by a qualified Texas P.E. that the demonstration meets the requirements of 30 TAC §352.621/40 CFR §257.62 before receipt of initial CCR waste in the surface impoundment.

2.5 Seismic Impact Zones

Existing, new and lateral expansions of CCR surface impoundment(s) must not be located in "seismic impact zones", unless the Owner/Operator can demonstrate in accordance with 30 TAC §352.631/40 CFR §257.63 that all structural components (ex. liners, leachate collection and removal systems, and surface water control) of the surface impoundment(s) are designed to resist the maximum horizontal acceleration in lithified earth material for the site before the initial receipt of CCR in the CCR surface impoundment. The demonstration must be certified by a qualified Texas P.E that the demonstration meets the requirements of 30 TAC §352.631/40 CFR §257.63.

The maximum horizontal acceleration in lithified earth material means the maximum expected horizontal acceleration at the ground surface as depicted on a seismic hazard map, with a 90% or greater probability that the acceleration will not be exceeded in 250 years; or the maximum expected horizontal acceleration based on a site-specific seismic risk assessment.

30 TAC §330.557/40 CFR §258.14 defines seismic impact zones as areas having a greater than 10% probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10-g in 250 years.

2.6 Unstable Areas

Existing, new, and lateral expansion of CCR surface impoundment(s) must not be located in an unstable area, unless the Owner/Operator can demonstrate in accordance with 30 TAC §352.641/40 CFR §257.64 that recognized and generally accepted good engineering practices were incorporated in the design of the CCR surface impoundment(s) to ensure that the integrity

of the structural components will not be disrupted. Factors to consider when determining whether an area is unstable includes soil conditions, differential settling, and local geologic and human-made features. This demonstration must be conducted before the initial receipt of CCR waste in the CCR surface impoundment(s).

2.7 Other Siting Considerations

To further evaluate the siting requirements, the siting selection criteria should include: General Siting Criteria, Technical Siting Criteria, and Other Siting Issues. General siting criteria are those necessary to complete a preliminary assessment of a potential CCR surface impoundment(s) site. Technical siting criteria are those that must be addressed to fully evaluate the suitability of a site. Other siting issues include floodplains (40 CFR §257.3-1), endangered species (40 CFR §257.3-2), surface water (40 CFR §257.3-3), local jurisdiction, public participation, and technical guidelines and resources.

After the initial field investigation, which should include soil test borings and geophysical surveying, the best site can be chosen for comprehensive hydrogeologic evaluation, impact assessment, and engineering analysis. The factors which should be considered in site selection are: safety, enough time to react to groundwater contamination from the surface impoundment(s), adequate space for containment or corrective action measures, adequate groundwater monitoring distances, and nuisance conditions. Additional concerns which should be considered are: hurricane storm surge, low lying areas with subsidence, sole source aquifer recharge areas, and areas of historic or archaeologic significance. The resources which may be helpful in evaluation of the site may include, but are not limited to: land resource map, soils map, geologic maps, aerial photos and satellite imagery, groundwater map, floodplains and surface water maps, and critical habitat maps. Information sources may include, but are not limited to: U.S. Geological Survey, Texas Bureau of Economic Geology, U.S. Department of Agriculture, TCEQ, Texas Water Development Board, Texas Department of Transportation, Texas State Soil and Water Conservation Board, Federal Emergency Management Agency, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department, and Texas Natural Resources Information System.

Part 3 – Surface Impoundment Design Criteria

3.1 General

The CCR rules under 30 TAC 352, Subchapter F, Design Criteria, contain requirements for existing, new, and any lateral expansion of a CCR surface impoundment(s).

A surface impoundment design should provide efficiency, safety, and environmental protection during active operation, and should specify interim and final surface impoundment(s) closure procedures that will assure long-term waste containment with minimum PCC maintenance.

3.2 Waste Characterization

The CCR waste is an industrial solid waste in Texas and must be characterized and classified. TCEQ RG-022, "Guidelines for the Classification and Coding of Industrial and Hazardous Waste" provides information on the waste classification system used by the TCEQ. In addition, if non-CCR waste, i.e., Class 1 or 2 waste, is disposed of in a CCR surface impoundment, the TCEQ recommends testing the effect of the waste on the soils or lining materials to be used as waste containment barriers. One method available for determining the effects of waste leachate on a soil or geosynthetic liner is EPA Method 9090 (see TCEQ Technical Guideline No. 4 "Nonhazardous Industrial Solid Waste Surface Impoundments"). This testing will determine if the fluid constituents or the water extractable constituents of the waste have any detrimental

effect (causing dissolution, shrinkage, increase in permeability, etc.) on the soils or liner materials that are used. In addition to advancements in manufacturing of liners using polyethylene resin which are resistant to wide variety of chemicals, extensive studies have been done demonstrating compatibility of leachate with the liner system. To verify compatibility of leachate with the liner system, the landfill facilities may submit alternate demonstration in lieu of EPA Method 9090. Industrial solid waste that have a significant and detrimental effect on materials used as permanent barriers for waste containment should not be used unless the waste can be treated to eliminate the detrimental effects. Waste should be evaluated for compatibility with other waste.

3.3 Surface Impoundment Liner Design

The CCR rule 30 TAC 352, Subchapter F, Design Criteria, describes the liner requirements for existing, new, and lateral expansions of surface impoundment(s).

3.3.1 Existing Surface Impoundment Liner Determination

The Owner/Operator of existing CCR surface impoundment(s) must determine if the liner is constructed of compacted soil only ("clay-lined"). Clay-lined surface impoundment(s) are classified as "unlined" and as such are required to retrofit or close under 30 TAC §352.1221/40 CFR §257.102.

A qualified Texas P.E. must certify whether the existing CCR surface impoundment(s) liner is in compliance with the design requirements of 30 TAC §352.711. The compliance demonstration must meet the requirements of 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet.

3.3.2 New Surface Impoundment Liner Design

New, existing and lateral expansion of existing CCR surface impoundment(s), must be designed and constructed with either a composite liner or an alternative composite liner consisting of two components meeting the requirements of 30 TAC §352.721/40 CFR §257.70/40 CFR §257.72.

- A composite liner consisting of two components; the upper component consisting of, at a minimum, a 30-mil geomembrane liner, and a lower component consisting of at least a two-foot thick layer of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ centimeters per second; or
- An alternate composite liner consisting of two components; the upper component consisting of, at a minimum, a 30-mil geomembrane liner; and a lower component, that is not a geomembrane, with a hydraulic conductivity of no greater than $1x10^{-7}$ centimeters per second. The hydraulic conductivity of the liner shall be determined using the following formula derived from Darcy's Law for gravity flow through porous media:
    - $Q/A = q=k\ (h/t + 1)$

      Where,

      Q = flow rate (cubic centimeters/second);
      A = surface area of the liner (squared centimeters);
      q = flow rate per unit area (cubic centimeters/second/squared centimeter);
      k = hydraulic conductivity of the liner (centimeters/second);
      h = hydraulic head above the liner (centimeters); and
      t = thickness of the liner (centimeters).

The primary consideration when choosing a liner is the physical and chemical characteristics of CCR waste and their effects on the liner material. See TCEQ Technical Guideline No. 4 "Nonhazardous Industrial Solid Waste Surface Impoundments" for additional information. Special precautions should be taken to seal and test all seams to ensure that membrane integrity is maintained during construction.

A qualified Texas P.E. must certify both prior to construction and after construction that the liner meets the requirements of 30 TAC 352, Subchapter F, Design Criteria.

A construction quality assurance program will help ensure new surface impoundment(s) and lateral expansion will meet required design criteria. The quality assurance plan identifies how construction materials will be tested and how construction methods will be monitored, verified and recorded.

Compliance demonstrations must meet the requirements of 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet.

3.4 Structural Integrity Criteria

30 TAC 352, Subchapter F, Design Criteria, describes the structural integrity requirements for existing, new, and lateral expansions of CCR surface impoundment(s).

To prevent damage that may be caused by structural failures of CCR surface impoundment(s), structural integrity assessments must be regularly performed. The Owner/Operator of existing CCR surface impoundment(s) (except incised surface impoundment(s)) must conform with the following four requirements of 30 TAC §352.731/40 CFR §257.73:

- Identify the unit by a permanent, six-foot (minimum) tall CCR unit identification marker;
- Maintain vegetation height on slopes of dikes at a height not to exceed six inches;
- Conduct initial and periodic hazard potential classification assessments; and
- Obtain certification from a qualified Texas P.E. that the hazard potential classification assessments in the initial and subsequent periodic reports are conducted in accordance with this subchapter.

3.4.1 Hazard Potential Classification Assessment

The following criteria can assist in assigning a surface impoundment's hazard potential classification (40 CFR §257.53):

- High hazard surface impoundment(s) - failure or mis-operation causes loss of human life in addition to economic loss, environmental damage, and disruption of lifeline systems. Lifeline systems are those systems considered to be an important and integral part of the surrounding area's infrastructure (water supply, electric supply, telecommunications, transportation network, etc.).
- Significant hazard surface impoundment(s) - failure or mis-operation of the surface impoundment causes economic loss, environmental damage, and/or disruption of lifeline facilities, but causes no loss of human life.
- Low hazard surface impoundment(s) - failure or mis-operation would not cause loss of human life, and only low economic loss and/or environmental damage to the facility property and surrounding area.

The classification assigned should be based on the worst-case probable scenario or mis-operation of the CCR unit.

3.4.2 History of Construction

Existing CCR surface impoundment(s) with a height of five feet or more and a storage volume of 20 acre-feet or more; or a height of 20 feet or more are required to compile a history of construction providing the information in 40 CFR §257.73(c). The information compiled should be relevant and factual to the design and construction of the CCR surface impoundment(s). Changes to the information furnished in the history of construction shall be updated as needed and placed in the facility's operating record.

3.4.3 Emergency Action Plan

The Owner/Operator of CCR surface impoundment(s) must develop an Emergency Action Plan (EAP) (30 TAC §352.731/40 CFR §257.73) if the surface impoundment is classified as either high hazard or significant hazard. The purpose of the EAP is to identify responsible persons, determine the events or circumstances of an emergency, and determine response actions to take in the event of a safety emergency. The plan should include procedures the CCR unit the Owner/Operator will follow to communicate and coordinate with the responsible downstream emergency management authorities. Inundation maps identify downstream critical infrastructure and allow planning for evacuation and early warning of the population-at-risk.

To account for population growth, construction of surrounding infrastructure, or changes in the size or operation of the surface impoundment, the EAP should be re-evaluated at a minimum every five years and revised as needed. The EAP and any subsequent amendment/revision, must be certified by a qualified Texas P.E. that the plan meets the requirements. The EAP must meet the requirements of 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet.

3.4.4 Structural Stability Assessments

CCR surface impoundment(s) with a height of five feet or more and a storage volume of 20 acre-feet or more; or a height of 20-feet or more are required to conduct periodic annual inspections throughout the CCR unit's life. The goal of the structural stability assessment is to determine and document whether the design, construction, operation, and maintenance of the CCR surface impoundment(s) is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater impounded therein. The structural stability assessment must meet the requirements of 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet.

3.5 Safety Factor Assessments

The Owner/Operator of existing CCR surface impoundment(s) must conduct initial and periodic safety factor assessments and calculate whether the CCR unit achieves minimum factors of safety for the following loading conditions (30 TAC §352.731/40 CFR §257.73):

Loading Condition	**Minimum Required Safety Factor**
Long-term Maximum Storage Pool (Static)	1.5
Maximum Surcharge Pool (Static)	1.4
Seismic	1.0
Liquefaction (if susceptible)	1.2

Surface impoundment(s) failing to make the safety factor assessments within the required timeframes, or do not meet the minimum safety factors will be required to close in accordance with 30 TAC §352.1211 (30 TAC §352.731/40 CFR §257.73). The safety factor assessment must meet the requirements of 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet.

Part 4 – Operating Criteria

4.1 Fugitive Dust Control Plan

The Owner/Operator of CCR surface impoundment(s) must comply with 30 TAC 352, Subchapter G, Operating Criteria, and adopt control measures that will effectively minimize CCR dust from becoming airborne at their facility. The Owner/Operator must select, and include in the CCR fugitive dust control plan, the CCR fugitive dust control measures that are most appropriate for site conditions, along with an explanation of how the measures selected are applicable and appropriate for site conditions. Examples of typical control measures that may be appropriate include (40 CFR §257.80(b)(1)):

- Locating CCR waste inside an enclosure or partial enclosure;
- Reducing speed of vehicles;
- Covering truck beds used in transporting CCR;
- Operating a water spray or fogging system;
- Reducing fall distances at material drop points;
- Using wind barriers, compaction or vegetative covers;
- Establishing and enforcing reduced vehicle speed limits;
- Paving and sweeping roads;
- Reducing or halting operations during high wind events;
- Maintaining tree lines and vegetative covers; or
- Applying a daily cover.

The written CCR fugitive dust control plan must be placed in the facility's operating record and amended when there is a change in operating conditions. An initial Fugitive Dust Control Plan must be developed and include procedures for:

1. Logging citizen complaints involving CCR fugitive dust events, and
2. How the Owner/Operator will periodically assess the effectiveness of dust control.

The Owner/Operator must have the initial CCR Fugitive Dust Control Plan in place by October 19, 2015 for existing units, or by initial receipt of CCR waste in any new or lateral expanding CCR surface impoundment(s) at the facility. The Owner/Operator must obtain certification from a qualified Texas P.E. that the initial CCR fugitive dust control plan, and any subsequent amendment, meets the requirements of 30 TAC §352.801/40 CFR §257.80. The Annual Fugitive Dust Control Plan must meet the requirements of 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet.

4.2 Annual Fugitive Dust Control Report

The Owner/Operator must also prepare Annual CCR Fugitive Dust Control Reports no later than 14 months after the initial fugitive dust control plan is placed in the facility's operating record. Reports should include drawings, maps and/or aerial photographs identifying the location of the CCR surface impoundment(s) and potential sources of CCR fugitive dust. Subsequent annual reports are due one year after the date of completing the previous report as required by 30 TAC §352.801/40 CFR §257.80(c). The Annual Fugitive Dust Control Report must meet the requirements of 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet.

4.3 Inflow Design Flood Control System

The Owner/Operator of existing or new CCR surface impoundment(s) or lateral expansions must design, construct, operate, and maintain an inflow design flood control system in accordance with 30 TAC §352.821/40 CFR §257.82. The inflow flood control system shall be designed to adequately manage flow into the surface impoundment during and following the peak discharge of the inflow design flood.

Precipitation design data can be obtained from the National Oceanic and Atmospheric Administration (NOAA) Precipitation Frequency Data Server (PFDS), and the United States Geological Survey (USGS) Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas.

The discharge from a surface impoundment must be controlled in accordance with the surface water requirements of 40 CFR §257.3-3 (Surface Water Protection), facility general stormwater permit(s), and individual discharge Texas Pollutant Discharge Elimination System (TPDES) permit(s).

The Owner/Operator shall develop initial and periodic inflow design flood control system plans that implements and maintains a control system capable of managing stormwater flow into or away from the surface impoundment without overtopping based on the hazard potential assessments (high hazard, significant hazard, or low hazard - see section 3.4.1)

The four design floods for specific hazard potential classifications are shown in the table below and are based on FEMA's guidance "Selecting and Accommodating Inflow Design Floods for Dams", which represents accepted practices in dam engineering.

Inflow Design Flood for Existing, New, and Lateral Expansion of CCR Surface Impoundments (30 TAC §352.731 and §352.741)

High Hazard Potential surface impoundment	Probable maximum flood
Significant Hazard Potential surface impoundment	1,000-year flood
Low Hazard potential surface impoundment	100-year flood
Incise surface impoundment	25-year flood

Because storm duration is not specified in 30 TAC §352.821/40 CFR §257.82, a 24-hour storm duration can be assumed as typically required by 40 CFR §258.26 when calculating precipitation depth for the above listed flood events. The initial inflow design Flood Control System Plan for new and laterally expanded surface impoundment(s) are due no later than initial receipt of CCR waste plans, must be certified by a qualified Texas P.E., and meet the recordkeeping, notification, and internet posting requirements of 30 TAC 352, Subchapter K.

4.4 Inspection Requirements

CCR surface impoundment(s) must be regularly inspected in accordance with 30 TAC §352.831/40 CFR §257.83.

4.4.1 Weekly Inspection

CCR surface impoundment(s) shall be inspected by a qualified person at intervals not exceeding seven days. Qualified persons should inspect for weaknesses that have the potential of disrupting the operation or safety of the surface impoundment.

The scope of visual inspections should include:

- vegetation cover;
- topsoil condition;
- dike condition;
- identification signage markers;
- drainage structures; and
- groundwater monitoring wells.

Discharge of outlets passing beneath the base of the surface impoundment, or through the dike of the surface impoundment, should be inspected for debris, sediment, blockage and abnormal discoloration. CCR unit instrumentation shall be monitored at intervals not exceeding thirty days. Instrumentation installed for monitoring the top elevations of impounded CCR sediment and wastewater can be used with survey data for estimating storage capacity volumes for comparison to previous inspections.

New surface impoundment(s) and lateral expansions must be inspected prior to initial receipt of CCR waste.

The Owner/Operator of existing, new and any lateral expansion of a CCR surface impoundment(s) must initiate the inspection upon initial receipt of the of CCR by the CCR surface impoundment(s). Written documentation of the inspection activity must be recorded in the facility's operating record. If a CCR release or deficiency is found during the inspection, the Owner/Operator must prepare written documentation detailing a corrective action plan to remedy the release or deficiency as soon as feasible. The inspection must meet the requirements of 30 TAC §352.831/40 CFR §257.83.

4.4.2 Annual Inspection and Report

CCR surface impoundment(s) with a height of five feet or more and a storage volume of 20 acre-feet or more; or a height of 20-feet or more are required to conduct periodic annual inspections throughout the CCR unit's life. The Annual Inspection and Report must be prepared by a qualified Texas P.E. to ensure that the operation and maintenance of the CCR surface impoundment is consistent with recognized and generally accepted good engineering standards.

The Owner/Operator must remedy any deficiencies identified during an inspection as soon as feasible and document the response in the facility's operating record (30 TAC §352.831).

Inspection reports must meet the recordkeeping, notification, and internet posting requirements of 30 TAC 352, Subchapter K. If a deficiency under 40 CFR §257.83(b)(5) could result in harm to human health, the environment, or has resulted in a release the Owner/Operator must notify the executive director verbally within 24 hours and in writing

within five days of the deficiency that could result in harm to human health, the environment, or has resulted in a release. All other deficiencies must be notified in writing within 14 days of all other deficiencies under 30 TAC §352.831(b)/40 CFR §257.83(b)(5).

Part 5 - Surface Impoundment Groundwater Monitoring and Corrective Action

The CCR rules under 30 TAC 352, Subchapter H, Groundwater Monitoring and Corrective Action, are applicable to all CCR units, including all existing CCR surface impoundment(s), new and lateral expansions of CCR units.

All information required by 30 TAC 352, Subchapter H, for the establishment of a groundwater monitoring system, groundwater sampling/analysis program, and data monitoring program must be included in the facility's Annual Groundwater Monitoring and Corrective Action Report.

See Technical Guideline No. 32 Groundwater Monitoring and Corrective Action, for more information on groundwater monitoring, sampling, and corrective action.

Part 6 – Closure and Post-Closure

6.1 General

Closure, post-closure and retrofit requirements are found in 30 TAC 352, Subchapter J, Closure and Post-Closure Care. The Owner/Operator of CCR surface impoundment(s) must use one of two options to close a surface impoundment(s).

First option, 'Clean Closure' requires the removal of all CCR waste along with affected soils. For this option, opportunities for beneficial use should be considered early in the closure planning process. The Owner/Operator should include an evaluation of the chemical and physical properties of the CCR waste. Other factors for consideration are the amount (volume) of CCR waste, the haul distance and resulting cost, and the suitability of the CCR properties for the intended beneficial use.

Second option, 'Close in Place' requires the CCR waste is left in place, and requires, dewatering, stabilization, and a cap or cover meeting the requirements of this subchapter is placed on top of the waste. It is recommended that a geosynthetic and/or clay-rich soil cap be graded, contoured, and overlain with vegetated topsoil to prevent erosion. Continued safe containment of the CCR waste primarily depends on maintaining the integrity of the cover system. Therefore, the cover must be designed and constructed to minimize the need for maintenance. TCEQ recommends that covers with long slopes be designed with terraces, protected waterways, and other structures to prevent or limit excessive runoff velocities during storm events.

Closing in place requires the Owner/Operator to take certain precautions for a minimum of 30 years after closure, known as PCC in accordance with 30 TAC §352.1241/40 CFR §257.104. PCC activities include inspections of the closed CCR surface impoundment(s), monitoring of the groundwater, and maintenance and repair. The Closure and Post-Closure Plan must meet the requirements of 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet.

Inactive surface impoundment(s) are recognized as existing surface impoundment(s) and are subject to the regulations found in 30 TAC 352, Subchapter J, accordingly. Inactive CCR surface impoundment(s) are units that have not completed closure before the effective date of 40 CFR 257 (October 19, 2015).

The Owner/Operator who elects to remove the CCR waste from the unit (clean close) is not subject to the PCC requirements of 30 CFR §352.1241/40 CFR §257.104.

6.2 Closure and Post-Closure Care Plan

6.2.1 Closure Plan

A written closure plan including all steps and schedules identifying major milestones, is required for CCR surface impoundment(s) in accordance with 30 TAC §352.1221/40 CFR §257.102. The written closure plan must be amended whenever there is a change in operation of the CCR surface impoundment, or unanticipated events necessitate a revision.

The closure plan must be certified by a qualified Texas P.E. that the plan meets the requirements of 30 TAC 352, Subchapter J, Closure and Post-Closure Care.

The closure plan must include, at a minimum, the following information:

- A narrative description how the CCR surface impoundments(s) will be closed;
- A description of the removal and decontamination procedure, if the unit is closed by removal of the CCR;
- Design and installation procedure for the final cover system, if the CCR waste is left in place;
- Maximum inventory of the CCR ever on-site and largest area of the surface impoundment(s) requiring final cover; and
- A schedule for completion of all activities, including an estimate of the year in which all closure activities for the CCR unit will be completed.

Initial written closure plan for new CCR surface impoundment(s), and any lateral expansion of a CCR surface impoundment(s) must be placed in the facility operating record, no later than the date of the initial receipt of CCR waste in the CCR unit. The closure plan must be certified by a qualified Texas P.E., that the plan meets the requirements of 30 TAC §352.1221/40 CFR §257.102 and be prepared in a manner consistent with recognized and generally accepted good engineering practices. The Owner/Operator has completed the written closure plan when the plan, including the certification, has been placed in the facility's operating record. The written closure plan may be amended before or after closure activities have commenced, if unanticipated events necessitate a revision.

6.2.1 Post-Closure Care Plan

A written PCC plan, including all steps and schedules identifying major milestones, are required for CCR surface impoundment(s) in accordance with 30 TAC §352.1241/40 CFR §257.104. The closure plan must include, at a minimum, the following information:

- A narrative description of the monitoring and maintenance activities, including maintaining integrity and effectiveness of final cover system, maintaining the integrity and effectiveness of leachate collection system, and maintaining and monitoring the groundwater monitoring system;
- A description providing information about subsequent PCC if the CCR surface impoundment(s) is operating under assessment monitoring at the end of the 30-year post closure period;
- Provide contact information about the facility during the PCC period; and
- A description of the planned uses of the property during the PCC period.

The PCC plan may be amended any time, if unanticipated events necessitate a revision. The PCC plan must be certified by a qualified Texas P.E. that the plan meets the requirements of 30 TAC §352.1241/40 CFR §257.104 and be prepared in a manner consistent with recognized and generally accepted good engineering practices.

6.3 Initiation and Completion of Closure

The Owner/Operator that selects to "Close in Place" should refer to Section 6.3 – Initiation and Completion of Closure in Technical Guideline No. 30 - Coal Combustion Residuals Landfill, for criteria for conducting closure of CCR Units under 30 TAC §352.1221/40 CFR §257.102.

6.4 Alternative Closure Requirements

Alternative closure requirements of 30 TAC 352, Subchapter J provides the Owner/Operator of CCR surface impoundment(s) subject to closure the ability to continue to receive CCR waste provided certain conditions are met (30 TAC §352.1231/40 CFR §257.103).

Part 7 - Financial Assurance

Financial assurance is required of the Owner/Operator to perform PCC as set out in 30 TAC 352, Subchapter J. Financial assurance must be established and maintained for the duration of the PCC period (30 TAC §352.1241), except for CCR units in which waste is removed and undergoing clean closure.

7.1 Post-Closure Care Cost Estimate

The Owner/Operator is required to perform PCC and shall submit a written cost estimate when submitting the registration application (30 TAC §352.1101). The cost estimate shall be in current dollars for the 30-year PCC period to perform maintenance as required by 30 TAC §352.1241/40 CFR §257.104. The cost estimate shall be based on the costs of hiring a third-party to perform maintenance during the PCC period. When the Owner/Operator is unable to make a successful demonstration for ending the PCC period, they must provide a written cost estimate in current dollars for continuing the PCC period in accordance with 30 TAC §§352.1101 and 352.1241.

A detailed estimate, in current dollars, of the annual cost of monitoring and maintenance of the facility in accordance with the applicable PCC regulations must be included in the report.

There may be additional site-specific issues that must be considered by applicants in order to comply with applicable TCEQ rules and federal regulations. Costs should be developed in detail for a minimum of 30 years of PCC activities to be conducted by a third party, for each applicable unit.

The Owner/Operator should refer to Section 7.1 – Post-Closure Care Cost Estimate, in Technical Guideline No. 30 - Coal Combustion Residuals Landfill for additional information regarding PCC cost estimates.

7.2 Financial Assurance Mechanism

A financial assurance mechanism for PCC is required in accordance with 30 TAC §352.1101/30 TAC 37 Subchapters A – D, except as indicated in 30 TAC §352.1111. The financial assurance amount shall be in an amount no less than the amount specified in the TCEQ approved PCC cost estimate.

Part 8 - Surface Impoundment Recordkeeping, Notifications, and Posting of Information to the Internet

8.1 Recordkeeping Requirements

The CCR rules under 30 TAC 352, Subchapter K, Recordkeeping, Notification, and Posting of Information to the Internet, contain requirements for CCR surface impoundment(s).

The Owner/Operator of CCR surface impoundment(s) must maintain records (files) generated in response to 30 TAC §352.1301/40 CFR §257.105 for at least five years following the date of each occurrence, measurement, maintenance, corrective action, report, record or study, and submit to the TCEQ any demonstration or documentation, if requested,. Information on any demonstration or documentation will include, but not limited to location restrictions, design criteria, certification, construction, operating criteria, groundwater monitoring, corrective action, closure, PCC, and retrofit criteria. Design and construction records must be kept until closure. Corrective action effectiveness reports must be kept until the completion of the remedy. Facilities need only retain the most recent revision in the record for many of the reoccurring plans and reports. 30 TAC §352.1301(b) requires that groundwater monitoring and associated elevation records must be kept for the active life and the PCC period of a CCR surface impoundment(s). Any report, record, demonstration, or other application material provided as part of an application must be kept for the life of the facility.

8.2 Notification Requirements

The Owner/Operator of CCR surface impoundment(s) must notify the TCEQ within 30-days of placing in the facility's operating record information and the Owner/Operator's publicly accessible website on demonstrations and documentation regarding location restriction, design criteria, certification, construction, operating criteria, groundwater monitoring, corrective action, closure, PCC, and retrofit criteria (30 TAC §352.1311/40 CFR §257.106). In addition, the Owner/Operator of CCR surface impoundment(s) must provide notification to the TCEQ of the availability of design information and certification within 60 days of commencing construction of a new CCR surface impoundment and design certification. The Owner/Operator must also place the information on receipt of CCR waste, by the new CCR surface impoundment(s), no later than the initial receipt date and the construction certification of the surface impoundment.

8.3 Internet Site Requirements

The Owner/Operator of CCR surface impoundment(s) must maintain a publicly accessible website titled "CCR Rule Compliance Data and Information" (30 TAC §352.1321/40 CFR §257.107). Information must be posted to the publicly accessible website within 30 days of placing the information in the operating record, as required by 30 TAC §352.1301/40 CFR §257.105. In addition, 30 TAC §352.1321 identifies items the Owner/Operator must post to comply with public participation requirements.