1.0 PURPOSE

The purpose of this procedure is to inspect concrete floor slab surfaces and exposed wall, equipment and building foundations; identify cracks and failures in the concrete; and repair any identified crack and failures to minimize potential seepage through the concrete.

2.0 APPLICABILITY

This procedure applies to the Ore Truck Dump Platform, One-Acre Ore Pad, Truck Wash Station, Sedimentation Trap, Ore Handling and Conveying, Pulp Storage and Pre-Leach, Grinding and Leach Building, CCD Thickener Area, Solvent Extraction Building, Precipitation and Packaging Building, Reagent Storage, and Reagent Unloading Areas. The work to be performed may also be subject to the Radiation Work Permits Procedure (see Section 7.1.2 below).

3.0 EQUIPMENT

3.1 *EQUIPMENT*

3.1.1 Hand held illumination device.

3.1.2 Small tools.

3.1.3 Power supply and high-pressure air supply.

3.1.4 Pneumatic or hand held chipping, scarifiers and scrabblers.

3.1.5 Sandblasting machines, hoses and nozzles.

3.1.6 Shotcrete machines, batch plants, pumps, hoses and nozzles.

3.1.7 Finishing tools.

3.1.8 Personal Protective Equipment (PPE).

3.1.8.1 Standard site PPE includes identity and safety badges, hardhat, safety glasses, gloves and steel-toe boots.

3.1.8.2 The sandblast crew may require earplugs or additional ear protection, helmet and low-pressure air supply system and protective cape.

3.2 *MATERIALS*

3.2.1 Concrete inspection forms, clipboard, writing instrument.

3.2.2 Plastic sheeting, tarps, wood, fasteners, barrier tape.

3.2.3 Sandblasting repair materials.

3.2.4 Concrete repair materials.

3.2.5 Shotcrete repair materials.

4.0 OTHER DOCUMENTS

4.1 *REFERENCES*

4.1.1 Radiation Work Permits Procedure RH-060.

4.1.2 Architectural Technology, “Concrete Solutions to Concrete Rehabilitation,” Journal of Issue 2/2006, Volume 23, No. 2.

4.2 *APPENDICES*

4.2.1 Appendix A – Concrete Inspection Forms:

PM 10000-01 Area 100- Ore Handling and Conveying
PM 10000-02 Area 200- Pulp Ore Storage and Pre-Leaching
PM 10000-03 Area 100/200- Grinding and Leaching
PM 10000-04 Area 300- CCD Thickeners
PM 10000-05 Area 400- Solvent Extraction- Building West
PM 10000-06 Area 500- Solvent Extraction- Building East
PM 10000-07 Area 700- Precipitation and Packaging Building
PM 10000-08 Area 500- Precipitation and Packaging Building
PM 10000-09 Area 500- Precipitation and Thickening Area
PM 10000-10 Area 800- Sulfuric Acid and Kerosene
PM 10000-11 Area 900- Diesel Storage

5.0 RESPONSIBILITY

5.1 The Radiation Safety Officer (RSO) will review the concrete inspection schedule and determine the need for a Confined Space and/or Radiation Work Permit.

5.2 The Radiation Safety Officer (RSO) or his designee will inspect the concrete and report the results to the General Mill Foreman (GMF).

5.3 The General Mill Foreman is responsible for:

5.3.1 Determining the concrete inspection schedule.

5.3.2 Ensuring that the RSO is proceeding according to proper procedures.

5.3.3 Ensuring that the Mill Foreman has cleaned the areas scheduled for concrete inspection to a satisfactory level.

5.3.4 Obtaining progress reports from the RSO.

5.3.5 Reviewing and analyzing the concrete inspection forms and determining if any corrective actions are required.

5.3.6 Scheduling any concrete repair work with the Maintenance Foreman.

5.4 The Mill Foremen are responsible for:

5.4.1 Having all necessary materials and supplies in place before proceeding with the cleaning of the concrete area(s) scheduled for inspection.

5.4.2 Ensuring that the concrete cleaning personnel are properly trained and aware of the cleaning methodology.

5.4.3 Periodically checking on the cleaning operations and verifying that the cleaning procedure is being followed by the cleaning crew.

5.4.4 Verifying that all equipment and material used for cleaning is removed and returned to its proper storage location.

5.5 The Maintenance Foremen is responsible for:

5.5.1 Having all necessary materials and supplies in place before proceeding with the concrete repairs.

5.5.2 Ensuring that the concrete repair personnel are properly trained.

5.5.3 Periodically checking on the repair operations and verifying that the crews are following the repair procedure.

5.5.4 Verifying that all equipment and material used for repair work is removed and returned to its proper storage location.

6.0 PREREQUISITE INFORMATION

6.1 *SAFETY*

6.1.1 See Piñon Ridge Mill Health and Safety Plan.

6.2 *FREQUENCY*

6.2.1 Once per year. Areas of concern may require increased concrete inspections as determined by the General Mill Foreman.

7.0 PROCEDURE

7.1 *PRE-INSPECTION PLANNING PROCEDURES*

7.1.1 The GMF will plan and schedule the concrete inspections.

7.1.2 The RSO will determine the applicability of the Radiation Work Permits Procedure RH-060 based on the concrete areas to be inspected and repaired.

7.1.3 The MF will notify the GMF and RSO that the area(s) scheduled for concrete inspection are cleaned and available.

7.2 *CONCRETE INSPECTION PROCEDURE*

7.2.1 The Radiation Safety Officer or designee will:

7.2.1.1 Verify that the proper concrete inspection form is in hand, that the area to be inspected is clean and free of obstructions; such as tool lockers, workbenches and mobile equipment.

7.2.1.2 Advise the mill operations that concrete inspections are commencing.

7.2.1.3 Inspect the concrete floor slab, equipment, wall and building foundations in a systematic manner and note any cracking, crazing, dry shrinkage, plastic shrinking cracking, thermal cracking, alkali-aggregate reaction, spalling, chipping and loss of support beneath concrete structures.

7.2.1.4 Formalize the concrete inspection report and discuss the results with the GMF and MF.

7.3 *CONCRETE REPAIR PROCEDURES*

7.3.1 Thoroughly clean the concrete to be repaired by removing all loose materials with light-duty chipping hammers, scarifiers or scrabblers and exposing clean, solid, unaffected concrete underneath. The surface preparation and cleanliness should be per repair product manufacturer's recommendations.

7.3.2 Undercut cracks greater than ½" in width by chiseling to cut the crack wider below the surface than at the surface, a process called undercutting. Undercutting prevents the patching material from being forced out in response to temperature changes.

7.3.3 Any necessary structural repair work should be done before applying the repair fill or coating.

7.3.4 Protect the concrete repair area to prohibit surface water runoff from entering into the repair work by placing a barrier upstream of the repair work.

7.3.5 If necessary, build temporary plastic sheet or tarp tents over concrete repair areas exposed to precipitation events.

7.3.6 Apply the selected cementitious or liquid coating, such as Xypex Patch'n Plug® or Radon Seal Crack Weld®, or equals, per manufacturer's recommendations.

7.3.7 Finish the repaired surface per the manufacturer's recommendations.

7.3.8 Provide the manufacturer's recommended curing environment for the selected cementitious or liquid coating.

7.3.9 Remove the temporary equipment after the repair is cured.

7.4 ***SHOTCRETE REPAIR PROCEDURES***

7.4.1 Thoroughly clean the shotcrete repair area by removing all loose materials with light-duty chipping hammers, scarifiers or scrabblers. Remove loosened or flaked concrete by sandblasting or water blasting to remove concrete "bruised" by the initial removal operation and exposing clean, solid, unaffected concrete underneath. The objective is to create a clean, sound surface with the proper surface roughness to receive the shotcrete.

7.4.2 Saturate the substrate with clean water and then let the surface dry to a saturated, but surface dry condition.

7.4.3 Do not apply shotcrete to a bone-dry surface, as the substrates will absorb water in the shotcrete mixture intended for hydration of the cement. A bone-dry surface will tend to allow the formation of plastic and dry shrinkage cracks to form. Alternately, an overly saturated substrate will result in a high water-cement water ratio at the interface between the substrate and shotcrete resulting in significantly lower bond strengths.

7.4.4 Protect the shotcrete repair area to prohibit surface water runoff from entering into the repair work by placing a barrier upstream of the repair work.

7.4.5 If necessary, build temporary plastic sheet or tarp tents over shotcrete repair areas exposed to precipitation events.

7.4.6 An ACI nozzle certified person should apply the shotcrete for large-scale repairs.

7.4.7 Moist cure the shotcrete repaired area. If moist curing is not feasible, membrane-curing compounds may be used.

7.4.8 Remove the temporary equipment after the repair is cured.

8.0 DEFINITIONS

The following definitions are from the article "Concrete Solutions to Concrete Rehabilitation" in the Journal of Architectural Technology, Issue2/2006, Volume 23, No. 2.

Cracking: Cracking can be the result of one or a combination of factors such as drying,

shrinkage, thermal contraction, poor placement, restraint (external or internal) to shortening, subgrade settlement and applied loads.

Crazing: A pattern of fine cracks that do not penetrate much below the surface and generally pose only a cosmetic problem. They are barely visible, except when the concrete is drying after the surface has been wet.

Plastic Shrinkage: Plastic shrinkage is the result of improper curing, occurring when water evaporates from the surface of freshly placed concrete faster than it is replaced by bleed water(excess water in the mix that works its way to the surface during the initial stages of curing), causing the surface concrete to shrink. These cracks often are wide at the surface. This type of cracking usually appears within two days of placement.

Dry Shrinkage: Dry shrinkage is a common issue found in concrete. Because almost all concrete is mixed with more water than needed to hydrate the cement, much of the remaining water evaporates, causing the concrete to shrink. Restraint to shrinkage, provided by the subgrade, reinforcement, or another part of the structure, causes tensile stresses to develop in the cured concrete. In many applications, dry shrinkage cracking is inevitable. Therefore, contraction (control) joints are placed in concrete to predetermine the site of drying shrinkage cracks.

Thermal Cracks: Thermal cracks are formed when the heat of hydration of cementitious materials leads to rising temperatures, or even during normal temperature swings. As the interior concrete increases in temperature and expands, the surface concrete may be cooling and contracting. This causes tensile stresses that can result in surface thermal cracks if the temperature differential between the surface and center is too great.

Loss of Support: Loss of support beneath concrete structures, usually caused by settling or washout of soils and sub-base materials, can cause a variety of problems in concrete structures from cracking and performance problems to structural failure.

Alkali-Aggregate Reaction: Alkali-aggregate reaction occurs when the active minerals in some aggregates react with the alkali hydroxides in the concrete. Cracks are characterized by crazing- fine cracks that form a pattern similar to that of an alligator skin. These cracks allow more moisture to enter the concrete, further exacerbating the situation.

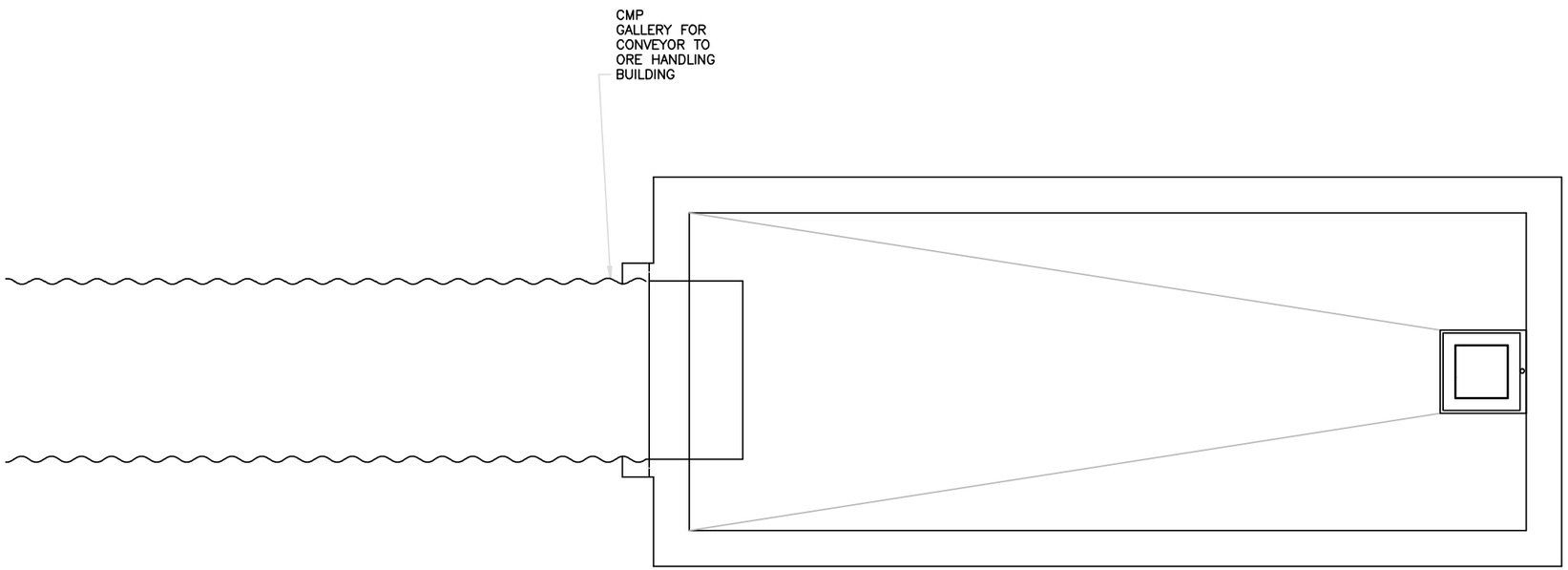
Spalling: The chipping of flaking of concrete where corrosion of embedded items, improper drainage or venting, or freeze/thaw cycling exists.

Concrete Inspection and Maintenance Procedure MP-020

Appendix A

Concrete Inspection Forms

Drawing No. PM 10000-01 1/1



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CONSTRUCTION NOTES	LEGEND	DEPARTMENT	APPROVED BY	DATE	DEPARTMENT COMMENTS / REVISION DESCRIPTION
		DRAWN BY: BLN		09/14/10	

Scale 1/8"=1'-0"

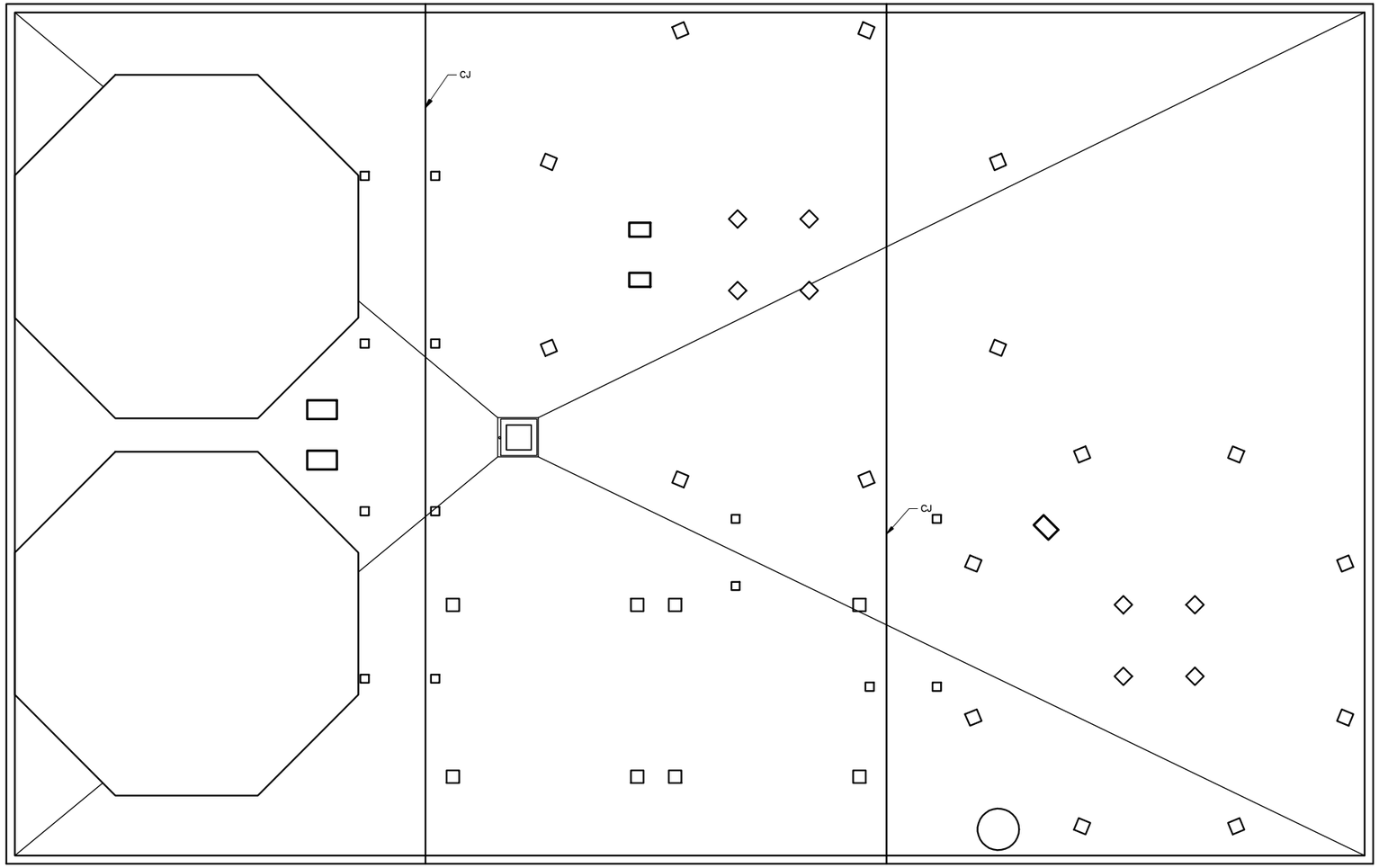
ENERGY FUELS RESOURCES CORP.

Title: Concrete Inspection Form
Area 100 - Ore Handling and Conveying

Dwg.No.: PM 10000-01

Pg. 1 of 1

Drawing No. PM 10000-02 1/1



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Scale 1/16"=1'-0"

ENERGY FUELS RESOURCES CORP.

Title: Concrete Inspection Form
Area 100 - Pulp Ore Storage and Pre-Leaching

Dwg.No.: PM 10000-02 Pg. 1 of 1

Drawing No. PM 10000-03 1/1

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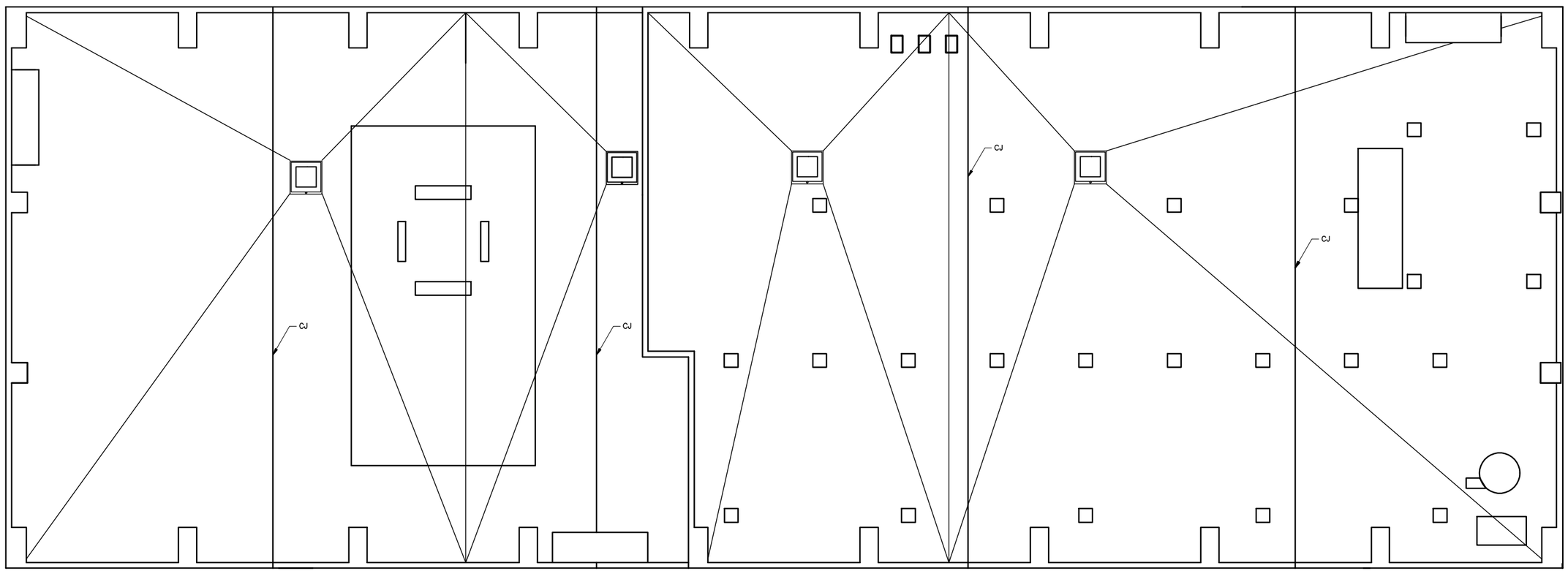

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Scale 1/16"=1'-0"

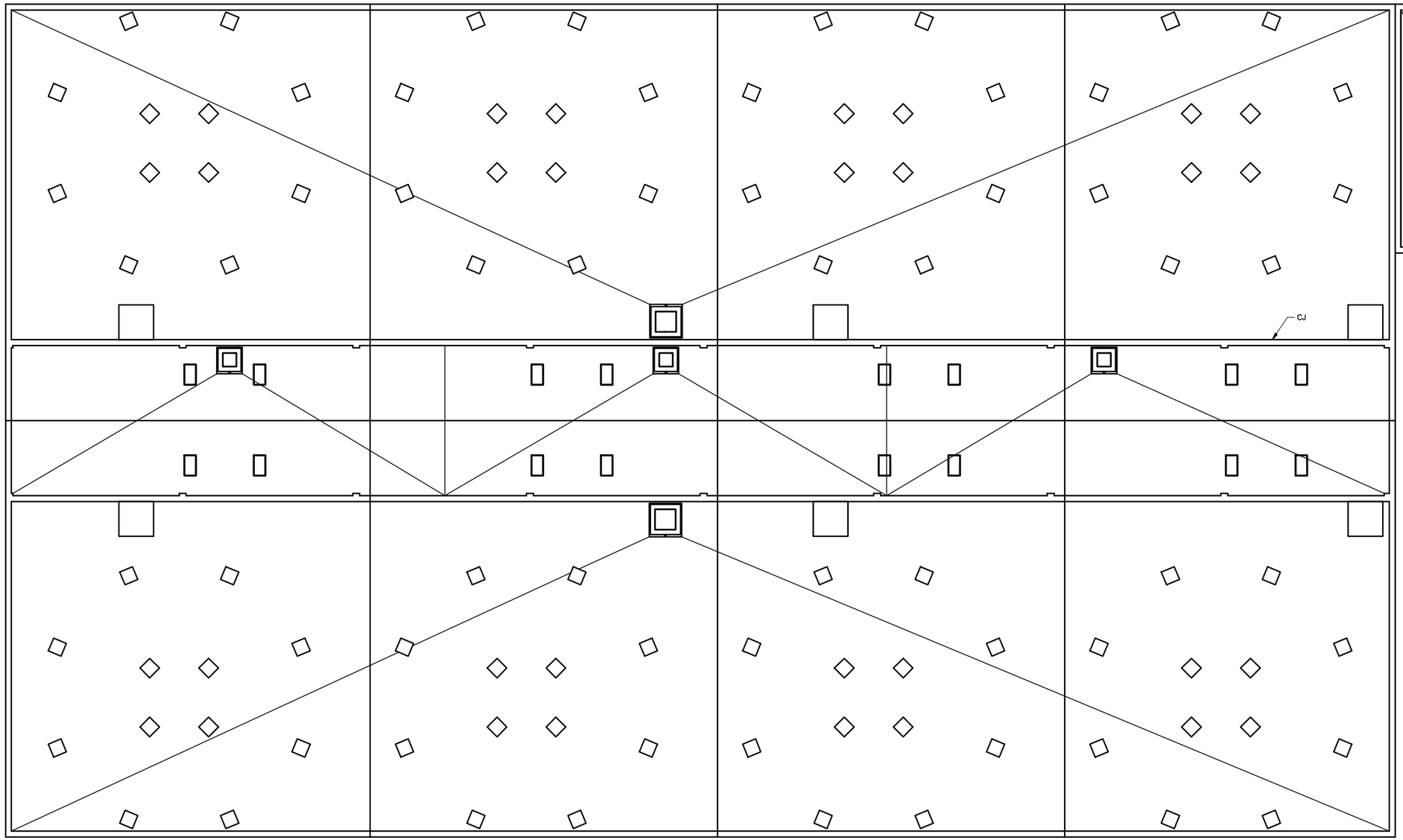
ENERGY FUELS RESOURCES CORP.

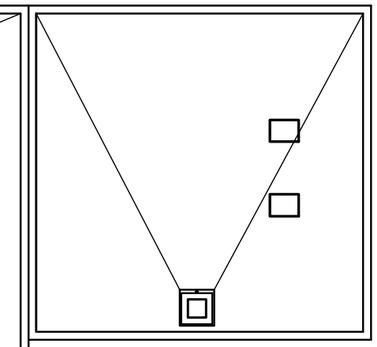
Title: Concrete Inspection Form
Area 100 / 200 Grinding and Leaching

Dwg.No.: PM 10000-03

Pg. 1 of 1

Drawing No. PM 10000-04 1/1





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NOTES	LEGEND	DEPARTMENT	APPROVED BY	DATE	DEPARTMENT COMMENTS / REVISION DESCRIPTION
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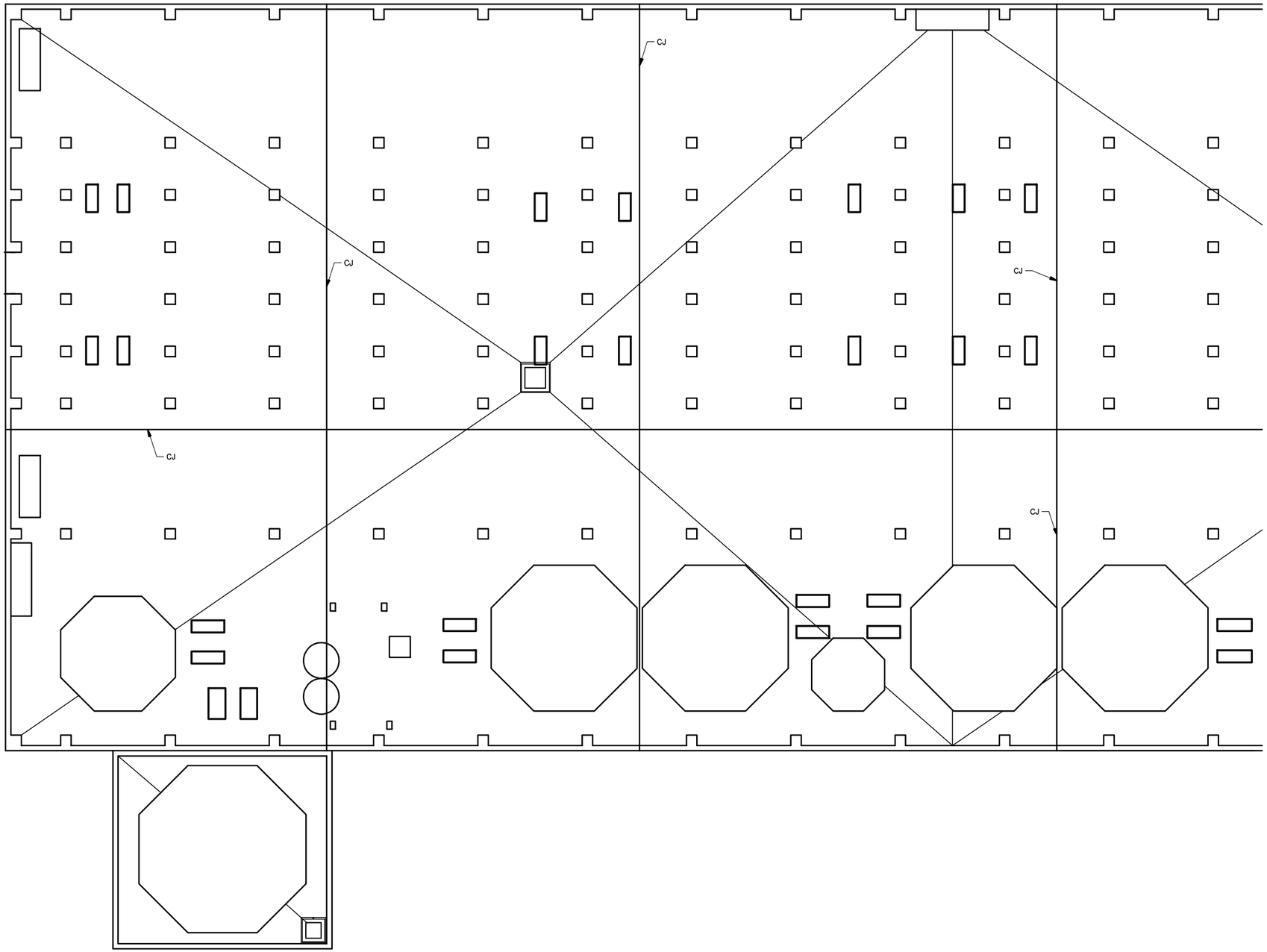
Scale 1/16"=1'-0"

ENERGY FUELS RESOURCES CORP.

Title: Concrete Inspection Form
Area 300 CCD Thickeners

Dwg.No.: PM 10000-04 | Pg. 1 of 1

Drawing No. PM 10000-05 1/1



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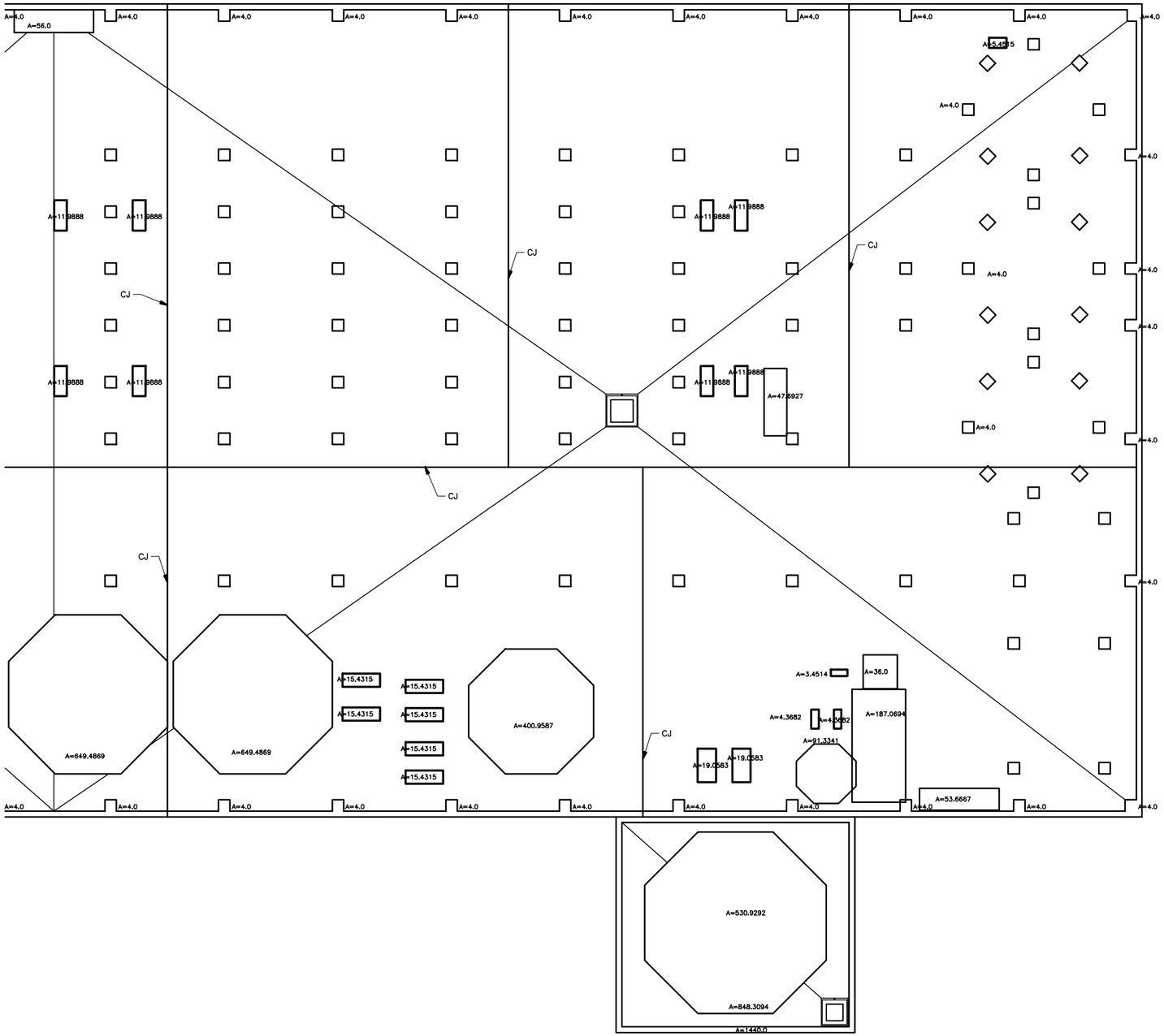
Scale 3/64"=1'-0"

ENERGY FUELS RESOURCES CORP.

Title: Concrete Inspection Form
Area 400 Solvent Extraction Building West

Dwg.No.: PM 10000-05 | Pg. 1 of 1

Drawing No. PM 10000-06 1/1



Concrete Inspection Log

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NOTES	LEGEND	DEPARTMENT	APPROVED BY	DATE	DEPARTMENT COMMENTS / REVISION DESCRIPTION
		DRAWN BY: BLN		09/14/10	

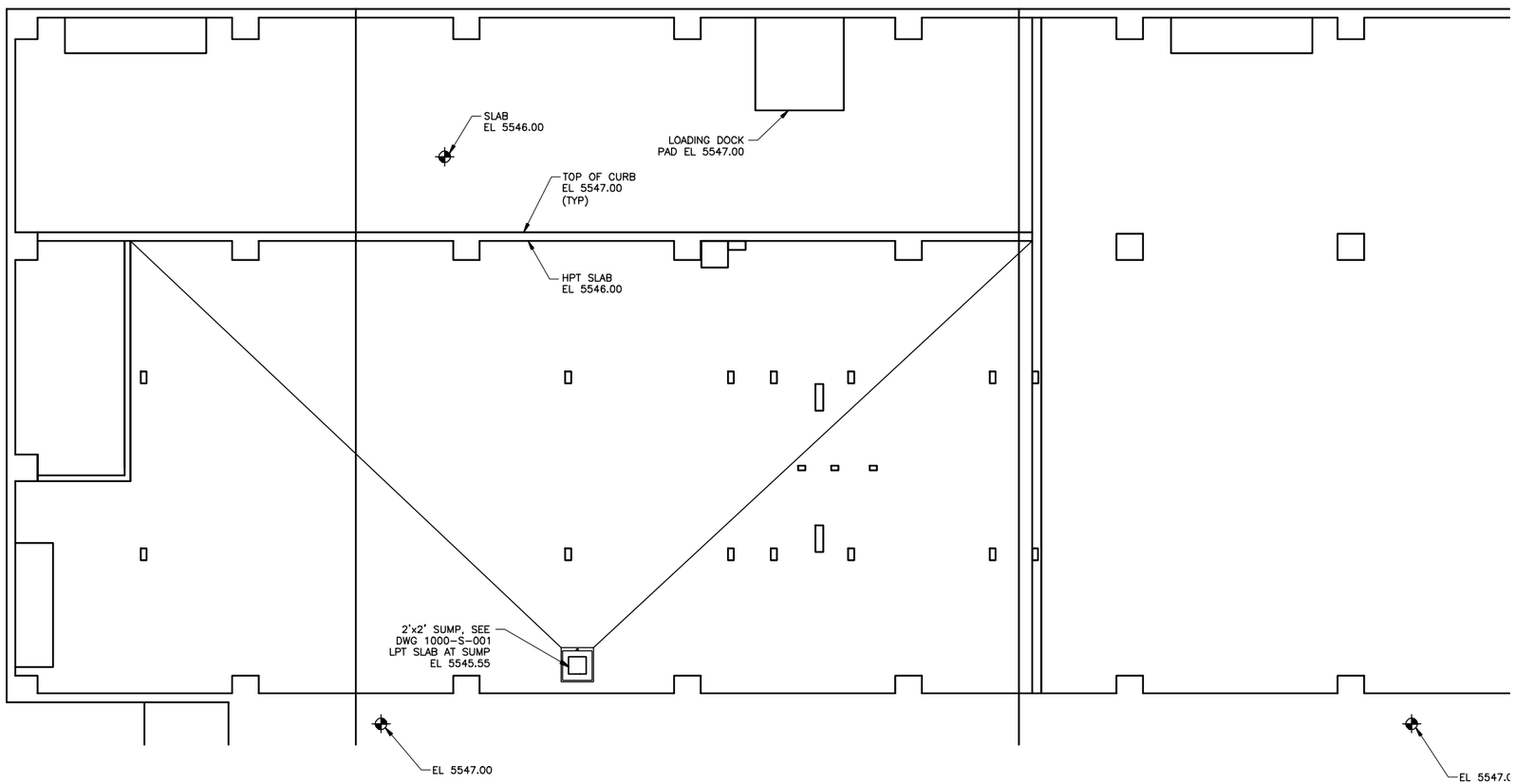
Scale 3/64"=1'-0"

ENERGY FUELS RESOURCES CORP.

Title: Concrete Inspection Form
Area 600 Solvent Extraction Building East

Dwg.No.: PM 10000-06 Pg. 1 of 1

Drawing No. PM 10000-07 1/1



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NOTES	LEGEND	DEPARTMENT	APPROVED BY	DATE	DEPARTMENT COMMENTS / REVISION DESCRIPTION
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Scale 1/16"=1'-0"

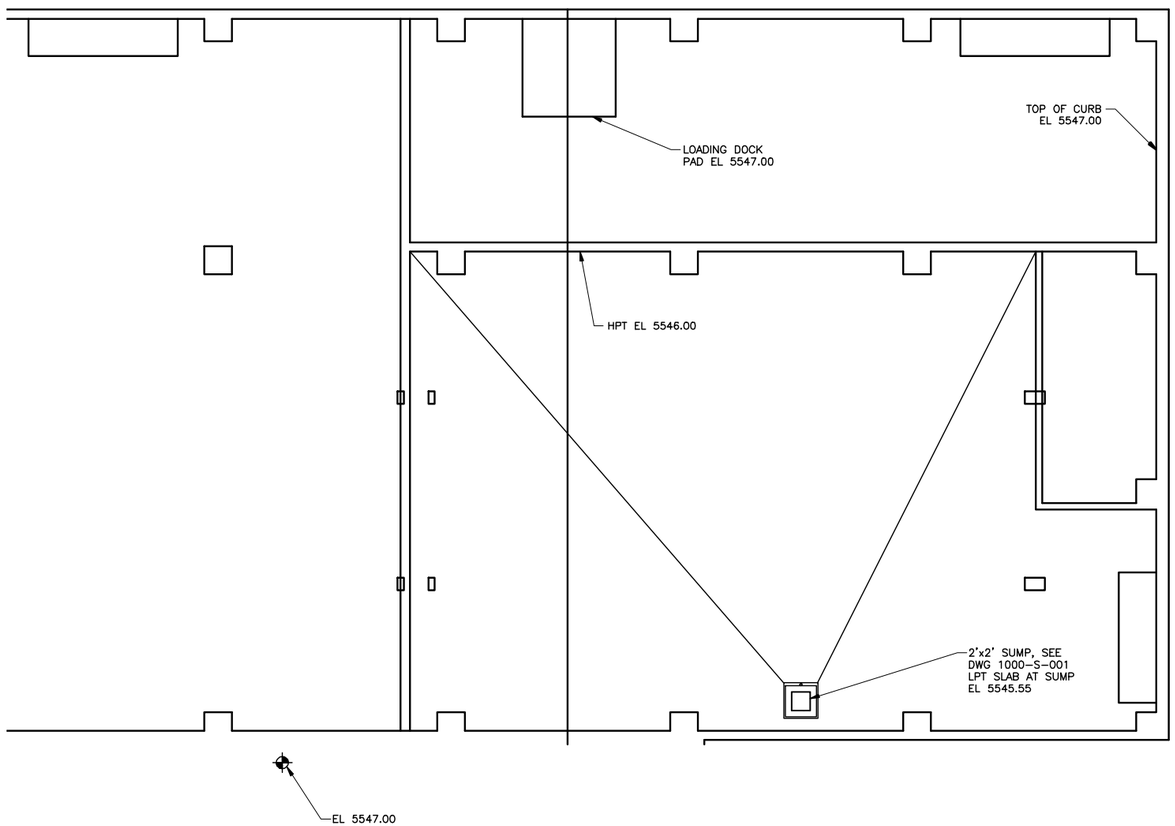
ENERGY FUELS RESOURCES CORP.

Title: Concrete Inspection Form
Area 700 Precipitation and Packaging Building

Dwg.No.: PM 10000-07

Pg. 1 of 1

Drawing No. PM 10000-08 1/1



Concrete Inspection Log

Item No.	Description	Date	Insp. By:

NOTES	LEGEND	DEPARTMENT	APPROVED BY	DATE	DEPARTMENT COMMENTS / REVISION DESCRIPTION
		DRAWN BY: BLN		09/14/10	

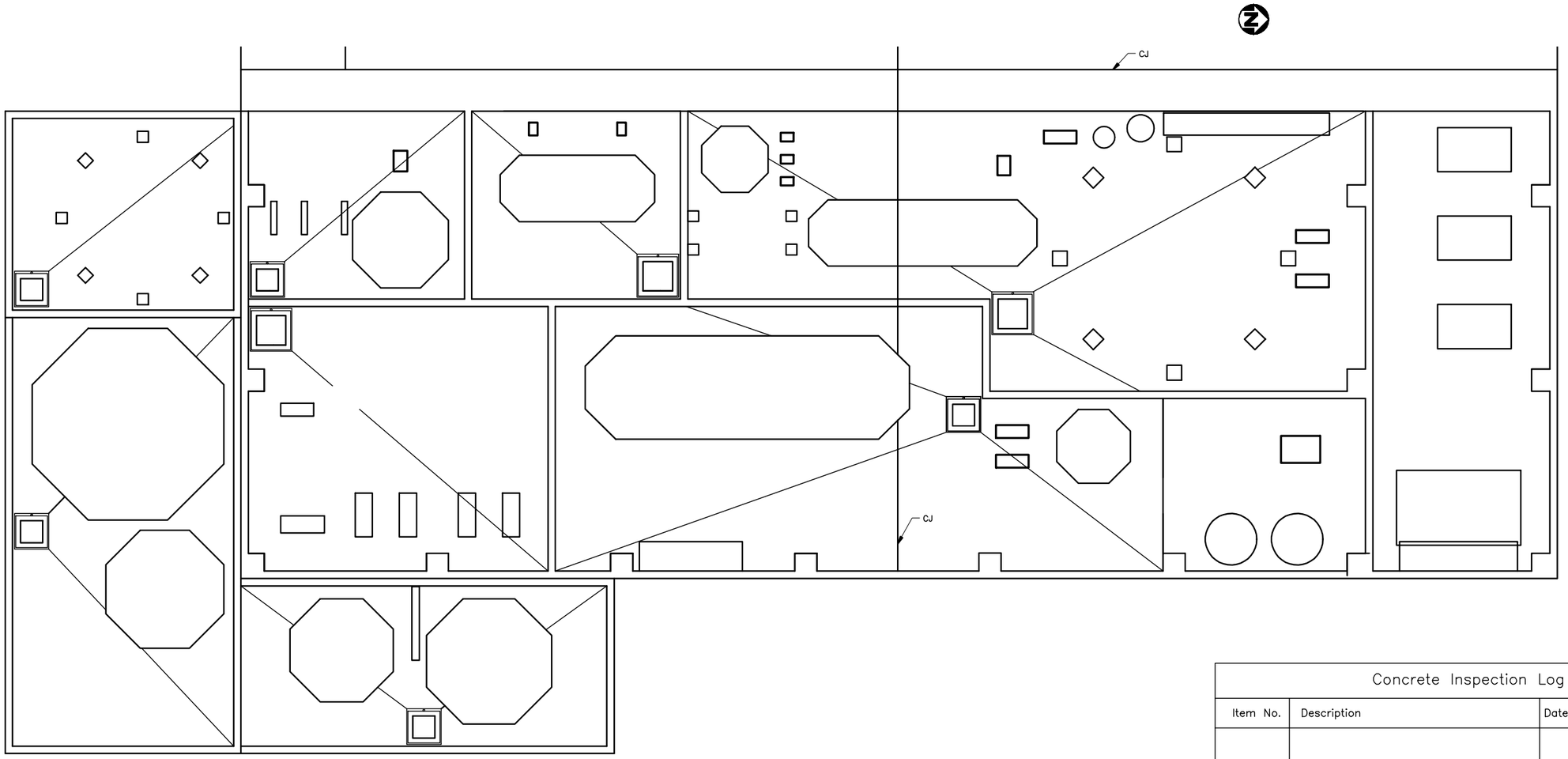
Scale 1/16"=1'-0"

ENERGY FUELS RESOURCES CORP.

Title: Concrete Inspection Form
Area 800 Precipitation and Packaging Building

Dwg.No.: PM 10000-08 Pg. 1 of 1

Drawing No. PM 10000-09 1/1



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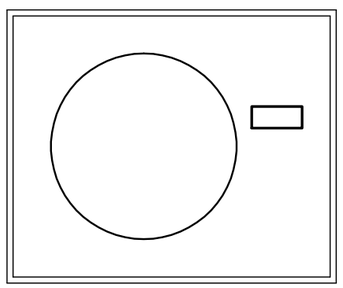
Scale 1/16"= 1'-0"

ENERGY FUELS RESOURCES CORP.

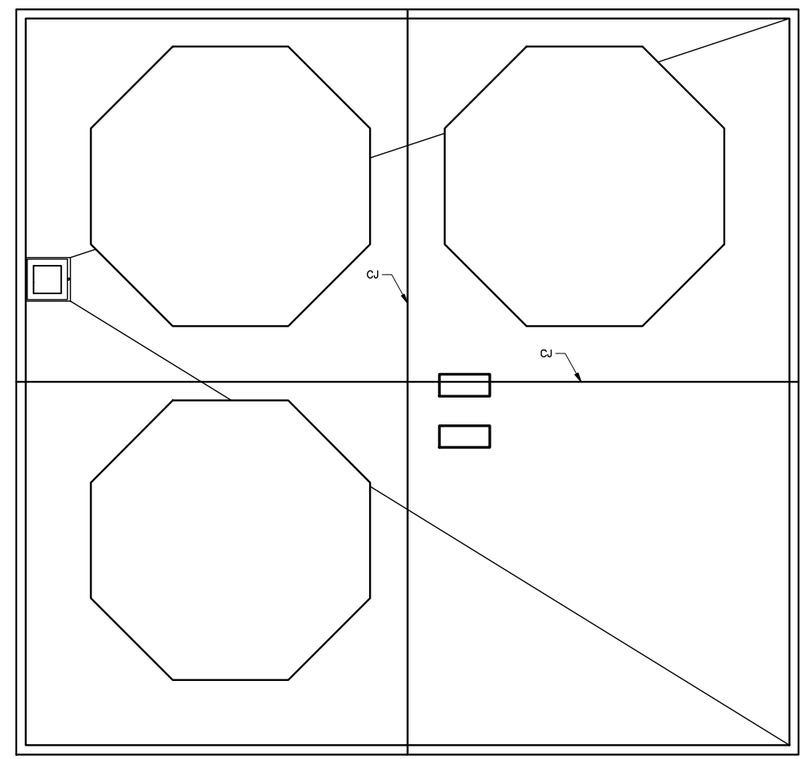
Title: Concrete Insp. Form
Area 800 Precipitation and Thickening Area

Dwg.No.: PM 10000-09 Pg. 1 of 1

Drawing No. PM 10000-10 1/1



Kerosene Storage



Sulfuric Acid Storage Area

Concrete Inspection Log			
Item No.	Description	Date	Insp. By:

NOTES	LEGEND	DEPARTMENT	APPROVED BY	DATE	DEPARTMENT COMMENTS / REVISION DESCRIPTION
		DRAWN BY: BLN		09/14/10	

Scale 1/16"=1'-0"

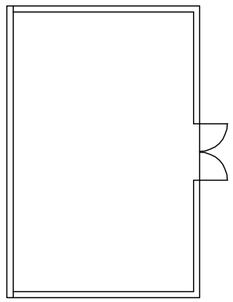
ENERGY FUELS RESOURCES CORP.

Title: Concrete Inspection Form Area 600 Sulfuric Acid Storage and Kerosene Storage

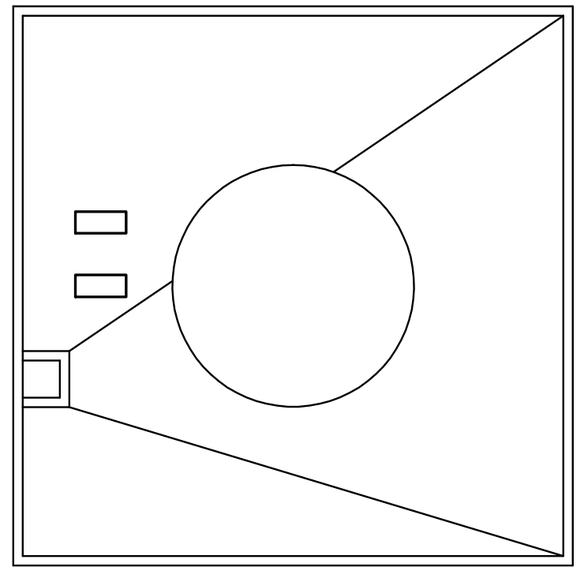
Dwg.No.: PM 10000-10

Pg. 1 of 1

Drawing No. PM 10000-11 1/1



Standby
Generator



Diesel Storage Tank
Containment Area

Concrete Inspection Log			
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Scale 1/16"=1'-0"

ENERGY FUELS
RESOURCES CORP.

Title Concrete Inspection Form
Area 900 Diesel Storage
and Standby Generator Set

Dwg.No.: PM 10000-11

Pg. 1 of 1