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Dear Mr. Rundquist,

The attached Monthly Compliance Report for May 2014 is submitted for your review as part of ongoing reporting required by the California Energy Commission’s Conditions of Certification for the Mojave Solar Project. This monthly report has been added to the archival site on Box.com.

Please direct any question to me.

Sincerely,
William "Bill" Grisolia
Compliance Management
41234 Harper Lake Road
Hinkley, California 92347
(303) 885-2036 Cell

Attachment: Monthly Compliance Report
Mojave Solar Project
Monthly Compliance Report

May 2014 Reporting Period

Prepared for:
Mojave Solar LLC
13911 Park Avenue, Suite 206
Victorville, California  92392
Introduction

During construction of the Mojave Solar Project, monthly compliance reports are provided to the California Energy Commission (CEC) as required by Condition of Certification COMPLIANCE-6 of the License Decision, docket number 09-AFC-5C. This is the Monthly Compliance Report (MCR) for May 2014.

Construction activities in May included work on steam turbine generators (STG) and condensers, STG piping, balance of plant (BOP) piping, miscellaneous foundations in the Power Blocks (PB) and cooling tower piping. Heat Transfer Fluid filling activity took place in the both Alpha and Beta main headers.

Construction installation included cable trays, heat tracing cable, air compressor system, CO2 tank, PB auxiliary structure and construction, turbine lube oil system and turbine auxiliary piping, instrumentation and controls, pipe welding for ullage/overflow systems and expansion vessels, piping in the racks, solar field instrumentation, Water Treatment Plant (WTP) filters, motor control room in WTP, WTP rack, filter equipment, pipe utilities installation and welding, electrical equipment panels, fire protection systems, solar field and PB grounding, and steam generator, PB piping and BOP equipment insulation.

The following table provides a summary of all areas covered in this report.

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<th>Condition of Certification (COC) Topics</th>
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Appendix A
Air Quality Resources

Mojave Solar Project
Monthly Compliance Report
San Bernardino County, California

May 2014 Reporting Period
June 4, 2014

Dale Rundquist, CPM
California Energy Commission
Siting, Transmission & Environment Protection (STEP) Division
1516 Ninth Street (MS-2000)
Sacramento, CA 95814
drundqui@energy.state.ca.us

RE:  AQ-SC3, AQ-SC4, AQ-SC5, and WORKER SAFETY-8 Monitoring and Mitigation Activities at Mojave Solar Project (09-AFC-5C) for May 1 through May 31, 2014

Dear Mr. Rundquist:

This letter is to update you on the air quality construction monitoring occurring at the Mojave Solar Project (MSP) site during May 2014. Compliance with the WORKER SAFETY-8 condition was also monitored. Construction activities occurred May 1 through 31, 2014. Compliance monitoring was performed by Jose Manuel Bravo Romero of Abengoa; who is the full-time onsite Air Quality Construction Mitigation Manager (AQCMM). I, Christopher Waller of CH2M HILL, am the designated AQCMM delegate and visited the site on May 30, 2014, to ensure compliance with record keeping and conditional requirements.

Overview

Construction activities in May included heat transfer fluid (HTF) pipe insulation installation, HTF pipe testing, steam turbine generator (STG) assembly, fire protection system installation, water treatment plant (WTP) equipment and utilities installation, balance of plant (BOP) structure installation, Beta raw water line installation, heat trace installation, solar field and power block grouting, solar field grounding, and production well development. Construction was monitored for compliance with Conditions of Certification (COCs) AQ-SC3, AQ-SC4, AQ-SC5, and WORKER SAFETY-8. New equipment brought onsite during May was issued a tag in accordance with AQ-SC5a, and evaluated for compliance with AQ-SC5b through AQ-SC5d. A summary of the compliance with the Air Quality Construction Mitigation Plan (AQCMP) is provided in the following sections. Daily, weekly, and monthly observation logs and other site inspection forms are maintained onsite and available upon request.
Compliance Assessment

AQ-SC3 – Fugitive Dust Control

All of the AQ-SC3 COCs were in effect during May 2014. The following section summarizes each COC and describes the level of compliance.

- **AQ-SC3a: Soil stabilizers on main access roads and delivery areas**
  Soil stabilizers have been applied to finished access roads and delivery areas. Main roads in Beta have been paved.

- **AQ-SC3b: Watering of disturbed areas**
  Watering of actively disturbed areas was performed for all construction activities with the potential to create airborne dust plumes. When necessary, watering was intensified as directed by the onsite AQCMM and construction managers.

- **AQ-SC3c: Speed limits**
  The required speed limits have been enforced onsite.

- **AQ-SC3d: Speed limit signage**
  Speed limit signage has been posted and is clearly visible at all site entrances.

- **AQ-SC3e: Tire inspection and washing prior to exiting to paved roadway**
  Although tire washing stations have not been installed, all construction vehicles are inspected for dirt and other debris prior to exiting to paved public roadways.

- **AQ-SC3f: Tire washing station**
  As stated above, no tire washing stations have been installed. However, tires of construction vehicles are inspected for dirt and other debris prior to exiting to paved public roadways.

- **AQ-SC3g: Unpaved exit treatment**
  Rumble plates are installed at all site exits.

- **AQ-SC3h: Construction vehicles use approved entrances only**
  When traveling between sites, construction vehicles use approved entrances only.

- **AQ-SC3i: Run-off onto public roadways**
  Earthmoving activities have resulted in run-off being directed away from paved public roadways. In addition, fiber rolls have been placed where the potential for run-off onto public roadways exist. Watering has not resulted in run-off onto public roadways.

- **AQ-SC3j: Sweeping of paved roads within construction site**
  Sweeping of paved roads within the site is performed as necessary.

- **AQ-SC3k: Sweeping of public paved roadways with access to the MSP site**
  Sweeping of Harper Lake Road and Lockhart Road is performed as necessary.
• **AQ-SC3l: Stabilization of storage piles**
  
  Significant earthmoving activities performed during May 2014 included trenching for the Beta well #4 raw water line. Areas disturbed during trenching were sufficiently watered during all construction activities. Storage piles generated as a result of trenching activities will be used to backfill the trench after installation of the water line is complete. Additional storage piles exist to the east of the Alpha evaporation pond. These storage piles are watered frequently, and will be re-distributed at a later date. All other soil piles are temporary excavation spoils or grading excesses that are re-distributed prior to exceeding the 10-day limit for cover or treatment.

• **AQ-SC3m: Stabilization of transported solid bulk material**
  
  Transported solid bulk materials are sufficiently watered, and at least one foot of freeboard is provided during transportation.

• **AQ-SC3n: Wind control techniques**
  
  Wind fencing has been installed in Alpha East, Alpha West, and Beta along the eastern and western borders of each area.

**AQ-SC4 – Dust Plumes & WORKER SAFETY-8 – Site Worker Fugitive Dust Protection**

The following construction activities were performed during the May 1 to May 31, 2014 reporting period:

- HTF pipe insulation installation.
- HTF pipe testing
- STG assembly.
- STG insulation installation.
- Turbine and turbine auxiliary piping installation.
- Instrument and controls installation.
- Power block auxiliary structure construction and installation.
- Power block insulation installation.
- Solar field grounding.
- Power block and solar field grouting.
- BOP piping assembly.
- WTP rack, filter equipment, electrical equipment, and pipe utilities installation and welding.
- Motor control center (MCC) room in WTP installation.
- WTP chemical dosing and safety shower system installation.
- Beta raw water line trenching and installation.
- Rack equipment and insulation installation.
- Electrical, administration, and control building installation.
- Miscellaneous foundation construction.
- Cable tray and cable tray insulation installation.
- Heat trace installation.
- Isophase installation.
- Fire protection system installation.
- Production well development.
There were no high wind events (wind gusts of at least 25 mph) during May 2014. Therefore, there were no work stoppages due to inclement weather.

Soil stabilization has been implemented on finished haul roads and delivery areas. In addition, main roads in Beta and Harper Lake Road south of Lockhart Road have been paved. Unfinished areas and haul roads without soil stabilizers are watered daily to mitigate against the formation of fugitive dust. A truck washing station has not been installed. However, rumble plates are installed at all site entrances/exits, and the tires of construction vehicles are inspected for dirt and other debris and swept clean as needed prior to exiting the site onto paved roadways.

**AQ-SC5 – Diesel-Fueled Engine Control**

Attachment 1 to this letter contains a list of equipment operated onsite during May 2014. The list contains equipment information including manufacturer, model, California Air Resources Board (CARB) Equipment Identification Number (EIN), engine model year, engine horsepower, and U.S. Environmental Protection Agency (USEPA) certified tier level.

The following list summarizes each COC for AQ-SC5 and describes the level of compliance.

- **AQ-SC5a: Equipment Tags**
  A visible air quality tag with a unique number (AQ #) was issued and adhered to all equipment that arrived onsite between May 1 and May 31, 2014.

- **AQ-SC5b: USEPA Engine Tier Requirement**
  All construction equipment that arrived onsite between May 1 and May 31, 2014, had Tier 3 engines.

- **AQ-SC5c: Retrofit Control Termination**
  No equipment with retrofit control technology was brought onsite.

- **AQ-SC5d: Maintenance Records**
  Maintenance records for all vehicles are available upon request.

- **AQ-SC5e: “All diesel heavy construction equipment shall not idle for more than five minutes.”**
  Idle time was monitored by the activity managers and AQCMM. This condition was met during this reporting period.

- **AQ-SC5f: Electric motors**
  The use of construction equipment with electric motors was not feasible for current construction activities.
Please feel free to call (714) 435-6268 for questions, clarifications, or additional information.

Sincerely,

CH2M HILL

Christopher Waller
Staff Environmental Engineer
AQCMM Delegate
christopher.waller@ch2m.com

c: Jose Manuel Bravo Romero / Abengoa, AQCMM
   Christopher Waller / CH2M HILL, AQCMM Delegate
Attachment 1
Construction Equipment Mojave Solar Project
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## Construction Equipment for Mojave Solar Project – May 2014 Equipment Inventory

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## Construction Equipment for Mojave Solar Project – May 2014 Equipment Inventory

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### Construction Equipment for Mojave Solar Project – May 2014 Equipment Inventory

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## Construction Equipment for Mojave Solar Project – May 2014 Equipment Inventory

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## Construction Equipment for Mojave Solar Project – May 2014 Equipment Inventory

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Appendix B
Biological Resources

Mojave Solar Project
Monthly Compliance Report
San Bernardino County, California

May 2014 Reporting Period
Biological Resources
Monthly Monitoring Report
Conditions of Certification
BIO-2, BIO-3, BIO-4, BIO-5, BIO-7,
BIO-11, BIO-14, BIO-18

May 2014 Reporting Period

Prepared for:
Mojave Solar LLC
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Victorville, California 92392

Prepared by:

CH2M Hill
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Sacramento, California 95833

June 2014
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1 Agency Approval Status of Biological Staff
2 WEAP Summary and May Training Logs
3 Monthly Common Raven Monitoring Results
4 Observed Wildlife Species List
1 Introduction

Per the California Energy Commission’s (CEC) Abengoa Mojave Solar Project Commission Decision, CEC-800-2010-008-CMF, Docket Number 09-AFC-5C, this monthly compliance report (MCR) summarizes compliance with biological resource protection requirements during construction activities from May 1 through May 31, 2014, on the Mojave Solar Project (MSP) in San Bernardino County, California (see Figure 1, figures are at the end of this report).

This report does not repeat information provided in previous MCRs and assumes environmental compliance was met unless otherwise noted.

As provided in the CEC Final Decision, the following biological conditions of certification (COC) pertaining to monitoring activity covered by this MCR include, but are not limited to:

- BIO-2 Designated Biologist Duties
- BIO-3 Biological Monitor Selection, Qualifications and Duties
- BIO-4 Designated Biologist and Biological Monitor Authority
- BIO-5 Worker Environmental Awareness Program (WEAP)
- BIO-6 Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) Development and Compliance
- BIO-7 Impact Avoidance and Minimization Measures
- BIO-11 Desert Tortoise (Gopherus agassizii) Exclusion Fencing, Clearance Surveys, and Translocation Plan
- BIO-14 American Badger (Taxidea taxus) and Desert Kit Fox (Vulpes macrotis) Impact Avoidance and Minimization Measures
- BIO-18 Common Raven (Corvus corax) Monitoring, Management, and Control

This MCR is also being provided to California Department of Fish and Wildlife (CDFW) and United States Fish and Wildlife Service (USFWS).

1.1 Status of Biological Staff

Attachment 1 provides a summary table of the biological staff submitted for approval on this project and the status of their agency approvals. In May, no new biological monitors were submitted to the agencies for approval. Two CEC-approved biological monitors, Mark Bratton and Ed Morgan are pending USFWS approval as desert tortoise Authorized Biologists.
2 Ongoing Construction Monitoring

This section summarizes biological monitoring activities conducted by CH2M HILL throughout May 2014.

Please refer to sections “Desert Tortoise,” “Invasive Weed Species,” “Kit Fox and Other Mammals,” “Nesting Birds,” “Raven Monitoring, Management, and Control,” “Wildlife Injury and Mortalities,” and “Other Species” for specific information about wildlife and plants found by biological monitors in May.

The MSP requires that all onsite staff receive the WEAP training (via DVD) and a brochure prior to start of work. A total of 428 new staff went through WEAP training in May 2014. Attachment 2 provides an ongoing summary table of the project’s WEAP attendance and the hard copy sign-in training logs for May 2014.

On a typical construction day, one biological monitor or designated biologist:

- Monitors Harper Dry Lake Road at least every 3 hours during the desert tortoise active period (April through May). Due to desert tortoise observations on Harper Lake Road, biological staff monitored the road more often than every 3 hours during the morning and afternoons and when temperatures are optimal for tortoise movement;
- Monitors active construction areas, parking lots, laydown yards, and any areas of potential threat to vegetation, soils, or wildlife;
- Inspects desert tortoise exclusion fences and tortoise guards as required;
- Inspects potential entrapment areas (e.g., trenches);
- Monitors for formation of potential standing water;
- Inspects kit fox exclusion buffers and downloads motion-sensor cameras at shelter sites;
- Conducts raven observations and point-count surveys;
- Conducts bi-weekly breeding season raven nest search surveys (March through June);
- Receives reports of hazardous waste spills to the designated biologist;
- Inspects pipes greater than 3 inches in diameter that are less than 8 inches above the ground surface; and
- Performs other special biological-resources-related activities, as required.

2.1 Construction Activities

In May, construction activities occurred in all project sectors, with the highest concentration in the Alpha and Beta power block areas. In Alpha, ground disturbance included various foundations, bore holes, buildings, water connections, trenching for grounding, pressure testing and insulating heat transfer fluid (HTF) pipes, conduits, water lines, and cable installation. In Beta, ground disturbance included various foundations, bore holes, buildings, water connections, trenching for grounding, pressure testing and insulating HTF pipes, conduits, water lines, and cable installation. Additionally, systematic trash removal by sector continued during the month and maintenance of desert tortoise
guards and exclusion fences occurred on an as-needed basis. The construction schedule includes day and night shifts during the regular work week and limited shifts on weekends.

The new Beta well construction continued in May. Due to anticipated discharges, biological staff checked the wetland discharge pipe on a daily basis.

### 2.1.1 Desert Tortoise Exclusion Fence Repairs

In May, biological staff made comprehensive weekly inspections of the perimeter desert tortoise exclusion fence, which is more frequent than the monthly fence inspections required by BIO-11 and the Biological Opinion.

On May 1, biological staff notified construction staff of the need to modify the existing tortoise fence and guard at the Southern California Edison (SCE) gate, since the fencing there had not been replaced with the newer fencing materials.

On May 12, biological staff observed that the removal of the guard shack at the entrance of Beta East caused a breach in the external tortoise fencing. Construction staff were notified and the issue was resolved the same day.

Biological staff were notified in May that San Bernardino County Public Works would be repairing breaks in the tortoise fence along Harper Lake Road. As of May 31, the majority of the repairs had been completed.

### 2.2 Rain Events

One minor rain event occurred on May 21. All fences were inspected the next day and no breaches were observed. The evaporation ponds were not found to contain any water from the event.

### 2.3 Hazardous Material Spills

Several hazardous spills were reported at MSP in May, including diesel spills, gasoline spills, and HTF spills. Biological staff were notified and all spills were subsequently cleaned up.

On May 7, biological staff contacted the CEC seeking verification that the HTF neutralization process (wherein the contaminated soil is left in the open to be exposed to UV radiation and contaminants are allowed to evaporate) does not pose any potential risks to wildlife. On May 9, the CEC responded that the issue was considered during the Biological Assessment (BA), and that HTF neutralization poses no risk to wildlife assuming that it is implemented as stated in the BA.

The commissioning team continued using HTF for final pressure testing and filling of the Alpha and Beta pipes in May. Due to the hazardous nature of HTF and the environmental concern for prompt cleanup, biological staff worked with Abeinsa EPC (AEPC) to implement a reporting system that would comply with both the BIO-7 requirement that the designated biologist be immediately notified of hazardous materials spills, as well as other project-specific environmental cleanup requirements. The purpose of notifying biological staff immediately is to ensure that cleanup is timely and sufficient to minimize the risk to wildlife. Because drips of HTF were anticipated during the pressure testing phase, and
cleanup of hazardous materials is conducted immediately by trained personnel, biological staff agreed that nominal drips that result in approximately 2 pints of soil contamination (about one shovelful) could be reported at the end of the week. Once AEPC reports a spill and the area is opened for safe entry by general construction personnel, then biological staff systematically confirm that cleanup was conducted for each reported spill. AEPC staff will immediately notify biological staff of any hazardous material spill of HTF that is greater than pressure testing drips (approximately one shovelful of contaminated soil) or any other hazardous material.

During May, numerous HTF pressure testing drips were reported and assessed by biological staff. On May 29, a spill of approximately 28 gallons of HTF was reported in Beta East solar field. Contaminated soil was removed and biological staff were notified.

2.4 Non-compliance Notifications and Reports

Two formal non-compliance reports (NCRs) were issued to MSP in May.

NCR-6: Wildlife Entrapment

On May 1, NCR-6 was issued to MSP. On March 11, a Migratory Bird Treaty Act (MBTA)-protected species, northern flicker (*Colaptes auratus*), was found dead inside an HTF tunnel under Harper Lake Road after entering through an aboveground gate house. Biological staff requested several times throughout the month of April that MSP block the entrance of the tunnels. Biological staff provided construction personnel time to finish insulating the pipes before placing the exclusion netting in the gate house entrances; however, by the time the insulation had all been installed, exclusion netting had not been properly placed to prevent further wildlife entrapment.

Resolution

On May 1, MSP construction staff properly installed the exclusion netting in the gate houses; thereby, preventing the risk of further wildlife entrapment. On May 14, a formal resolution to NCR-6 was sent to the CEC.

NCR-7: Unauthorized Road use

On May 2, NCR-7 was issued to MSP. Initially, on February 15, MSP was issued NCR-4 for unauthorized road use. Abeinsa EPC responded with several measures to stop unauthorized road use by project personnel, including, but not limited to: erecting physical road blocks on the Beta perimeter roads; staffing a permanent security guard at the intersection of Santa Fe and Harper Lake roads; and deactivating the site badges of those individuals caught traveling on unauthorized roads.

However, on April 28 and May 1, several vehicles were observed using unauthorized roads to leave the project site. The resolution for NCR-4 proved inadequate as construction personnel were still being observed using unauthorized roads.

Resolution

MSP agreed to staff additional guards at the locations where unauthorized road use was occurring. On May 16, the CEC accepted the resolution provided that they are sent daily and weekly summary notifications of any observed or reported unauthorized road use. CEC
agreed to make a determination in June as to whether unauthorized road use has decreased, and will sign off on the resolution at that time.

2.5 **Compliance Concerns**

Biological staff managed several other biological compliance issues. They are described below.

2.5.1 **Trash**

Since the beginning of the year, trash disposal and control at MSP has improved; however, trash compliance does not yet meet permit requirements.

Despite improvements to trash disposal, some of the smaller AEPC subcontractors were still out of compliance on trash management in May. Biological staff engaged these contractors in the field regarding ongoing food waste issues such as attracting wildlife by using unapproved containers, overflowing containers, etc. Repeat offenders, and refusals to comply with guidance from biological staff, were referred to AEPC Health and Safety who resolved the issue. AEPC also prepared notices for buggies stating that loose trash in the bed is against workplace rules and it needed to be removed. Daily removal of trash from site has proven unattainable because no waste management service is available to AEPC to provide daily service. Consequently, AEPC replaced small waste bins with larger bins that are less likely to overflow between service intervals. Biological staff are of the opinion that the issue is being slowly resolved.

2.5.2 **Offsite Parking**

Temporary and long-term offsite parking was observed by biological staff in May. MSP staff were observed temporarily parking offsite along Lockhart Road to load and unload shipments, stage construction vehicles, or speak on the phone. Both biological and AEPC staff engaged the operators of the vehicles and instructed them to conduct construction business within the desert tortoise guards or to inspect underneath their vehicles for desert tortoise prior to moving them. In cases of long-term storage when the operator was not present, biological staff deferred to AEPC who placed a notice on the vehicle of the violation.

2.5.3 **Area of Critical Environmental Concern (ACEC) Use**

On May 13, biological staff observed MSP staff using the ACEC picnic area located offsite. Since the ACEC picnic area is located outside the project perimeter, biological staff again requested that no one use these areas. On May 14, MSP staff sent out notification that the ACEC picnic areas were off limits.
2.6 Desert Tortoise

In May, no construction activities required desert tortoise clearance surveys.

No desert tortoises were observed on the project site in May; however, one desert tortoise was observed by biological staff on Lockhart Road. On May 29, an adult male desert tortoise was found by MSP staff on Lockhart Road and the USFWS Authorized Biologist (AB) was notified immediately. The tortoise was found approximately halfway between the Beta West fence and the house located closest to this fence (Figure 2). MSP staff observed the tortoise walking in the road and monitored its safety until the AB arrived. The individual had no signs of disease or trauma and appeared healthy. The individual did not void its bladder during the interaction. Approximate midline carapace length (MCL) was 260 mm. The USFWS AB relocated this individual away from the road and nearby houses.

Photograph 1. Adult male tortoise observed on Lockhart Road May 29.
### 2.7 Invasive Weeds

One target invasive weed, London rocket (*Sisymbrium irio*), was observed in May. This species is included in the California Invasive Plant Council (Cal-IPC) “high” or “moderate” dispersal or establishment rating and in the project’s *Tamarisk Eradication, Monitoring and Reporting Program* (Tamarisk Plan). Two other weed species, Russian thistle (*Salsola tragus*) and fivehook bassia (*Bassia hyssopifolia*) were also observed onsite. Both of these species have only one of the Cal-IPC dispersal or establishment rating as “high” or “moderate.” Although these two species are not required to be removed per the Tamarisk Plan, the site must be devoid of vegetation during operations. Therefore, they will ultimately need to be removed.

In May, AEPC manually removed invasive weeds throughout the site. Because London rocket is establishing throughout the solar fields, roads, and fence lines, AEPC is preparing in June to apply herbicide, or burn where appropriate, to control this species.

### 2.8 Kit Fox and Other Mammals

As of the end of May, there were six active kit fox shelter sites, DKF #3, 4, 5, 6, 7, and 8 (Figure 2). DKF #3 through #7 are located within a single exclusion buffer in the Alpha West solar field. DKF #8 was newly discovered in May.

Motion sensor cameras recorded consistent activity by two adult kit foxes and their pups at DKF #3 until May 13. On May 22, it was reported to biological staff that the kit foxes had moved under several conex storage boxes in a laydown yard approximately 500 meters north of the existing buffer area. Construction staff removed all of their materials from the area and a new buffer was erected around DKF #8. Kit fox activity is now concentrated at DKF #8, with occasional visits to the other shelter sites being recorded on motion sensor cameras. Due to the location of DKF #8 in a heavily trafficked area, MSP staff were advised to follow site rules concerning the storage of materials in order to avoid use of these materials by wildlife.

DKF #3 through #8 were continuously active throughout May by two adult kit foxes and their pups. The pups’ activity level increased throughout the month, and as of May 31, they are often making exploratory trips away from the shelter site as observed by MSP and biological staff during the day.

In May, there were also numerous observations of kit fox by construction personnel throughout the site (Figure 2). The most common sighting was passing through the Alpha West and Alpha East security gates in the early morning. Additionally, signs of kit fox activity (including tracks and scat) were found throughout the site.

Biological staff inspected the integrity of the exclusion buffers and downloaded the motion-sensor camera on a daily basis.

On May 15, 16, 19, 20, 21, 22, 23, 24, 28, 29, and 30, biological staff monitored construction crews working within the 250-foot exclusion buffers. Prior to working within the buffer, construction crews signed a protocol verifying their understanding of correct procedure within the exclusion buffer. Additionally, all construction crews were verbally briefed before entering the buffer. Due to the presence of pups, the biological staff limited
construction crews to walking within the buffer and limited driving to less than 5 mph when driving within the exclusion area. Prior to working within the buffer, biological staff checked the motion sensor camera to confirm whether the kit fox were within the shelter site. Depending on the type of construction activity, biological monitors also closed the adjacent solar field perimeter road to ensure that the kit fox would have a clear escape path if they exited the shelter sites.

2.9 Nesting Birds

In May, biological monitors continued to look for potential bird nesting behavior in the Alpha and Beta cooling towers by MBTA-protected birds. No MBTA species were observed nesting in the cooling towers. Biological staff observed use of the area by house sparrows (*Passer domesticus*), which is not an MBTA-protected species.

Biological staff will continue to monitor the bird deterrents installed in the cooling towers. AEPC has agreed to notify biological staff 2 weeks in advance of pumping any water through the cooling towers.

2.10 Raven Monitoring, Management, and Control

Common raven monitoring activities continued on the MSP site per BIO-18 and as outlined in the *Common Raven Monitoring, Management and Control Plan* (Raven Plan). The May Monthly Common Raven Monitoring Results provides information on monitoring activities, survey methods, maps, incidental raven observations, point count survey results, breeding season raven nest search surveys, and datasheets (Attachment 3).

2.11 Wildlife Injuries and Mortalities

2.11.1 Migratory Bird Treaty Act Protected Species

In May, one injured MBTA-protected species was observed at MSP.

On May 1, an injured mourning dove (*Zenaida macroura*) was reported in Alpha power block. The individual appeared sick, was lethargic, emaciated, covered in feces, and showed evidence of ecto-parasites. The dove was transferred to a licensed rehabilitation center who assumed care of the bird.

MSP was issued a 6-month USFWS *Migratory Bird Special Purpose Utility Salvage Permit – Solar* (SPUT permit) that authorizes project staff to collect, transport, and possess carcasses of species protected by the MBTA. The current MSP SPUT permit expires July 3, 2014.

2.12 Other Species

In May, one black-tailed jack rabbit (*Lepus californicus*) and one gopher snake (*Pituophis catenifer*) were found dead on Harper Lake Road. All remains were buried offsite by the biological staff.
On May 8, a rock dove (*Columbia livia*) was observed in the TAB parking lot by MSP staff. MSP staff reported that the dove appeared uninjured, but that they were concerned about it being at risk of harm while in a heavily trafficked area. Biological staff relocated the dove to the ACEC.

A list of wildlife species observed in May is included in Attachment 4. No sensitive species were observed at MSP.
FIGURE 1
Regional Map
Abengoa Mojave Solar Project
San Bernardino County, California
Attachment 1
Agency Approval Status of Biological Staff
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Legend:
CEC = California Energy Commission  
AB = Authorized Biologist  
CDFW = California Department Fish and Wildlife  
Alt-DB = Alternate Designated Biologist  
USFWS = United States Fish & Wildlife Service  
DB = Designated Biologist  
BM = Biological Monitor
Attachment 2
WEAP Summary and Training Logs
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*Attendance is based on training sign-in sheets
Certification of Completion  
Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)

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Biological Trainer: ______________ Signature: ______________ Date: 4/1/13

Cultural Trainer: ______________ Signature: ______________ Date: __/__/__

Paleo Trainer: ______________ Signature: ______________ Date: __/__/__
Certification of Completion  
Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)

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Cultural Trainer: __________ Signature: __________ Date: __/__/  
Paleo Trainer: __________ Signature: __________ Date: __/__/
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Biological Trainer: __________________ Signature: __________________ Date: 05/18

Cultural Trainer: __________________ Signature: __________________ Date: __/__/__

Paleo Trainer: __________________ Signature: __________________ Date: __/__/__
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Biological Trainer: __________________ Signature: __________________ Date: 05/10/21

Cultural Trainer: __________________ Signature: __________________ Date: __/__/__

Paleo Trainer: __________________ Signature: __________________ Date: __/__/__
# Certification of Completion

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Certification of Completion
Worker Environmental Awareness Program
Mojave Solar Project (09-AFC-5)

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Biological Trainer: Gerardo Arellano  Signature: Date: 1/1/2013
Cultural Trainer: Michael Casey  Signature: Date: 5/9/2013
Paleo Trainer: Signature: Date: 1/1/2013
Certification of Completion  
Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)

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Biological Trainer: Signature: Date: 1/1

Cultura Trainer: Signature: Date: 5/1/13

Paleo Trainer: Signature: Date: 1/1

GUILLERMO SANCHEZ AGOSTA MANAGEMNT/AG 1

CURTIS COOMBS ENGINEER/AGE
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Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)  

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Paleo Trainer: ______________ Signature: ______________ Date: 1/1/
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Biological Trainer: ___________________ Signature: ___________________ Date: 5/10/13

Cultural Trainer: ___________________ Signature: ___________________ Date: 1/1

Paleo Trainer: ___________________ Signature: ___________________ Date: 1/1

Specialist

Cara Corsatti Pa
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Worker Environmental Awareness Program  
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Cultural Trainer: ___________ Signature: ___________ Date: __/__/__

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Biological Trainer: __________________ Signature: ______________ Date: 5/14/13
Cultural Trainer: __________________ Signature: ______________ Date: __/__/__
Paleo Trainer: ________________ Signature: ______________ Date: __/__/__
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Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)  

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<td>Juan Vogel</td>
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<td>CIVIL ENGINEER / ENR</td>
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<td>Victor Gut</td>
<td>LINEMAN / HOTLINE</td>
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<td>Wireman / Hotline</td>
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<td>R. G. Montes</td>
<td>LAKER / MILCO</td>
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<td>Michael Smith</td>
<td>GROUNDMEN / HOTLINE</td>
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Biological Trainer: ______________  Signature: ______________  Date: 5/15/13  
Cultural Trainer: ______________  Signature: ______________  Date: __/__/  
Paleo Trainer: ______________  Signature: ______________  Date: __/__/
Certification of Completion  
Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)

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Biological Trainer: ______________ Signature: ______________ Date: 5/16/18

Cultural Trainer: ______________ Signature: ______________ Date: __/__/___

Paleo Trainer: ______________ Signature: ______________ Date: __/__/___
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Mojave Solar Project (09-AFC-5)

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<td>Labor</td>
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<td>Robert Mcinnis</td>
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Biological Trainer: [Signature]  
Date: 05/17/13

Cultural Trainer: [Signature]  
Date: __/__/__

Paleo Trainer: [Signature]  
Date: __/__/__
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<td>Mike Amagona</td>
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<td>William Stamp</td>
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Biological Trainer: __________________ Signature: __________________ Date: 5/21/13

Cultural Trainer: __________________ Signature: __________________ Date: __/__/__

Paleo Trainer: __________________ Signature: __________________ Date: __/__/__
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<td>JOHNNY TORRES</td>
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Biological Trainer: ___________ Signature: ___________ Date: 5/20/13

Cultural Trainer: ___________ Signature: ___________ Date: __/__/__

Paleo Trainer: ___________ Signature: ___________ Date: __/__/__
# Certification of Completion

**Worker Environmental Awareness Program**  
**Mojave Solar Project (09-AFC-5)**

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<td>1.</td>
<td>Eric Huesca</td>
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Biological Trainer: _______ Signature: __________ Date: 5/22/13

Cultural Trainer: _______ Signature: __________ Date: 1/1/

Paleo Trainer: _______ Signature: __________ Date: 1/1/
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Mojave Solar Project (09-AFC-5)

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<td>1.</td>
<td>Eric Bush</td>
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Biological Trainer: ______________ Signature: ______________ Date: 12/31/17

Cultural Trainer: ______________ Signature: ______________ Date: __/__/__

Paleo Trainer: ______________ Signature: ______________ Date: __/__/__
Certification of Completion  
Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)

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Biological Trainer: _______________ Signature: _______________ Date: 5/24/13

Cultural Trainer: _______________ Signature: _______________ Date: ___/___/___

Paleo Trainer: _______________ Signature: _______________ Date: ___/___/___
This is to acknowledge these individuals have completed a mandatory California Energy Commission-approved Worker Environmental Awareness Program (WEAP). The WEAP includes pertinent information on biological, cultural, and paleontological resources for all personnel (that is, construction supervisors, crews, and plant operators) working on site or at related facilities. By signing below, the participant indicates that he/she understands and shall abide by the guidelines set forth in the program materials. Include this completed form in the Monthly Compliance Report.

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Biological Trainer: __________________ Signature: __________________ Date: 12/6/13
Cultural Trainer: __________________ Signature: __________________ Date: 1/1/13
Paleo Trainer: __________________ Signature: __________________ Date: 1/10/13
Certification of Completion
Worker Environmental Awareness Program
Mojave Solar Project (09-AFC-5)

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<td>Americ inc</td>
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Biological Trainer: ______________ Signature: ______________ Date: 5/29/13

Cultural Trainer: ______________ Signature: ______________ Date: __/__/__

Paleo Trainer: ______________ Signature: ______________ Date: __/__/__
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Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)  
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Biological Trainer: __________________ Signature: __________________ Date: 5/30/13  
Cultural Trainer: __________________ Signature: __________________ Date: ___/___  
Paleo Trainer: __________________ Signature: __________________ Date: ___/___
Certification of Completion  
Worker Environmental Awareness Program  
Mojave Solar Project (09-AFC-5)

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</table>

Biological Trainer: __________________ Signature: ______________ Date: __/__/13

Cultural Trainer: ________________ Signature: ______________ Date: __/__/__

Paleo Trainer: ________________ Signature: ______________ Date: __/__/__
Attachment 3
Monthly Common Raven Monitoring Results
Monthly Common Raven Monitoring Results for Abengoa Mojave Solar Project
San Bernardino County, California

Monthly Compliance Report
May 2014

Prepared by:

CH2MHILL®

2485 Natomas Park Drive
Sacramento, California 95833

June 2014
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1.0 Introduction

The Abengoa Mojave Solar Project (MSP) is required to provide a monthly report on common ravens (Corvus corax) to the California Energy Commission (CEC), United States Fish and Wildlife Service (USFWS), and California Department of Fish and Wildlife (CDFW). The CEC Final Decision includes Condition of Certification (COC) BIO-18 stating that the project owner shall implement control measures to manage its construction site and related facilities in a manner to control raven populations and to mitigate cumulative and indirect impacts to desert tortoise associated with regional increase in raven numbers. In accordance with BIO-18, the CEC approved the Common Raven Monitoring, Management, and Control Plan (Raven Plan) on March 26, 2012. Refer to BIO-18 and the Raven Plan for monitoring and survey protocol description.

2.0 Construction Monitoring Activities

The following section summarizes biological monitoring activities conducted by CH2M HILL throughout May 2014.

On a typical weekday, one biological monitor or designated biologist:

- Monitors Harper Dry Lake Road at least every 3 hours during the desert tortoise active period (April through May). Due to desert tortoise observations on Harper Lake Road, biological staff monitored the road more often than every 3 hours during the cool morning and afternoon to evenings;
- Monitors active construction areas, parking lots, laydown yards, and any areas of potential threat to vegetation, soils, or wildlife;
- Inspects desert tortoise exclusion fences and tortoise guards as required;
- Inspects potential entrapment areas, e.g., trenches;
- Monitors for formation of potential standing water;
- Inspects kit fox exclusion buffers and downloads motion-sensor cameras at shelter sites;
- Conducts raven observations and bi-weekly point counts;
- Conducts bi-weekly breeding season raven nest search surveys (March through June);
- Reports hazardous waste spills to the designated biologist;
- Inspects pipes greater than 3 inches in diameter that are less than 8 inches above the ground surface; and
- Performs other special biological activities as required.

3.0 Methods

The designated biologist ensures that the biological monitors are trained to implement the Raven Plan in both raven monitoring and management measures. Biological staff also conduct 10-minute stationary point count surveys at seven locations (Supplement 1). The purpose of the point counts is to record raven observations including date, time, location,
number of individuals, age, behavior, distance from the station location, and any other pertinent notes (e.g., nesting behavior). This information is recorded on a hard copy datasheet. Point count surveys are conducted with a minimum of 1 week in between.

Point count surveys were positioned to monitor project-specific activities and features that have potential to attract or subsidize ravens. The Raven Plan defines six “conditions of concern” as:

1. Availability of water from evaporation ponds;
2. Potential creation of new perching/roosting/nesting sites for ravens;
3. Temporary water ponding potential from dust suppression associated with construction, operation, and maintenance;
4. Raven food sources from soil disturbance (rodents, insects, etc.) and road kill associated with construction activity;
5. Human food and waste management; and
6. Landscaping that could provide foraging, perching, and available water opportunities.

During daily monitoring activities, biological staff records incidental observations of ravens interacting with MSP. This includes any raven observation within site boundaries, flying overhead, or adjacent to the site. These observations are recorded in field notebooks and include date, general site location, global positioning system (GPS) location, number of individuals, and activity. The GPS information is also presented on a map.

The incidental observations are also used to identify potential problem areas. Problem areas are those requiring management actions. If a problem area is identified, the surveys will be increased to a weekly basis until the issue is resolved. Habitual perching sites will be identified and actions taken to discourage use. If hazing techniques are employed to discourage raven use, biologists will record information on date, time, location, habitat, number of individuals, and response to hazing. Potential or active raven nests will be documented and removed according to Raven Plan specifications. Biological staff will report on whether control measures are working and provide further recommendations in the biological monthly compliance report.

4.0 Results

Incidental Observations

In May, ravens were observed foraging on food waste in the power block and parking areas, and were also observed drinking from pooled water underneath water refueling stations. Construction staff were notified of these problem areas and biological staff continue to monitor the situation.

During biological monitoring, 72 ravens were incidentally observed during 46 separate observations (Table 1). Because ravens are indistinguishable from one another, multiple sightings of individual birds likely occur. Therefore, the number of observations does not reflect the number of individual birds onsite. Common ravens were observed throughout the site (Supplement 2). The most common raven behavior observed was flying overhead. Many ravens were observed around the Beta evaporation ponds, access roads and power
block, as well as the Alpha West staging area. Due to biologists staffing the kit fox exclusion buffer in Alpha West, a disproportionately high number of ravens was observed flying overhead in Alpha West. This area is not considered a problem area. Ravens were also observed perched on fences and various transmission line poles, but were not using a habitual perch location.

Table 1
May 2014 Incidental Raven Observations

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Number Observed</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/1/14</td>
<td>Beta West</td>
<td>3</td>
<td>Flying</td>
</tr>
<tr>
<td>5/2/14</td>
<td>Beta West</td>
<td>2</td>
<td>Flying</td>
</tr>
<tr>
<td>5/4/14</td>
<td>Alpha East</td>
<td>1</td>
<td>Flying</td>
</tr>
<tr>
<td>5/4/14</td>
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<td>1</td>
<td>Flying</td>
</tr>
<tr>
<td>5/6/14</td>
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<td>Flying</td>
</tr>
<tr>
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<td>Beta East</td>
<td>1</td>
<td>Flying</td>
</tr>
<tr>
<td>5/6/14</td>
<td>Alpha West</td>
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<td>Flying</td>
</tr>
<tr>
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<td>Drinking</td>
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<tr>
<td>5/9/14</td>
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<td>Flying</td>
</tr>
<tr>
<td>5/9/14</td>
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<td>Perched</td>
</tr>
<tr>
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<tr>
<td>5/16/14</td>
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**Table 1**  
**May 2014 Incidental Raven Observations**

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Number Observed</th>
<th>Activity</th>
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</thead>
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**Point Count Surveys**

In May, two biweekly point count surveys were conducted in accordance with the Raven Plan protocol. Point count surveys were conducted on May 8 and May 29, 2014. On May 8, three ravens were observed at Station 5 and one at Station 6. On May 29, one raven was observed at Station 7. Point count observations did not document any nesting.
behavior or problem areas. The Common Raven Fixed Point Observation Data Sheets are provided in Supplement 3.

Table 2 provides a summary of point count observations.

<table>
<thead>
<tr>
<th>Date: Time</th>
<th>Station</th>
<th>Number of Ravens Observed</th>
<th>Location Description</th>
<th>Activity Observed</th>
</tr>
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<td>5/8/2014: 12:04</td>
<td>#5</td>
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<td>5/8/2014: 12:22</td>
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<td><strong>Total Observed 5/8/14</strong></td>
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<td>5/29/2014: 11:27</td>
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<td>Beta East</td>
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<td><strong>Total Observed 5/29/2014</strong></td>
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</table>

**Nest Monitoring**

In accordance with the Raven Plan, biweekly breeding season raven nest surveys were conducted in May. No raven nests were identified onsite.
Monthly Common Raven Monitoring Results
May 2014

Supplement 1—Common Raven Point Count Stations
Monthly Common Raven Monitoring Results
May 2014

Supplement 2—Incidental Common Raven Observations
Monthly Common Raven Monitoring Results
May 2014

Supplement 3—Point Count Data Sheets
<table>
<thead>
<tr>
<th>Obs.</th>
<th>Time</th>
<th>See</th>
<th>Age</th>
<th># of Wroc</th>
<th>Activity (circle one: WA PE FL OT X others)</th>
<th>Flight Dir (°)</th>
<th>Horizontal Distance (m)</th>
<th>Habitat Type/Feather Structure</th>
<th>Aod</th>
<th>Vis</th>
<th>Notes</th>
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</tr>
</tbody>
</table>

Activity Codes: WA-walking on ground, PE-pitched above ground, FL-flying, OT-other (please specify)
Habitat Codes: CBS-Crescent Bush Scrub, SD/S3-Sand Dunes/Sand Shales, DP-Desert Pavement, OT-other (please specify, provide details of project structure/facility)

OBS. # (Time)  ADDITIONAL NOTES
## Common Raven Fixed Point Observation Data Sheet

**Date (mm/dd/yy):** 5/14/14  
**Observer (init.):** RV  
**Start Time:** 11:38  
**End Time:** 11:48

<table>
<thead>
<tr>
<th>Visibility:</th>
<th>Clear or Min.</th>
<th>Max. (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Direction from (circle one):</td>
<td>Calm</td>
<td>NE</td>
</tr>
<tr>
<td>Speed: (kmh)</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Precipitation (circle one):</td>
<td>Light rain</td>
<td>Rain</td>
</tr>
<tr>
<td>Temp: (°F)</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Obs. #</th>
<th>Time</th>
<th>Sex</th>
<th>Age</th>
<th># of birds</th>
<th>Activity (circle one: X others)</th>
<th>Flight Dir. (º)</th>
<th>Horizontal Distance (m)</th>
<th>Habitat Type/Feature Structure</th>
<th>Aud</th>
<th>Vis</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td></td>
<td>WA PE</td>
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</tbody>
</table>

**Activity Codes:** WA-walking on ground, PE-perched above ground, FL-flying, OT-other (please specify)

**Habitat Codes:** CBS-Crassote Bush Scrub, SDSS-Sand Dunes/Sand Sheets, DP-Desert Pavement, OT-other (please specify, provide details of project structure/facility)

**Additional Notes:**
## Mojave Solar

### Common Raven Fixed Point Observation Data Sheet

<table>
<thead>
<tr>
<th>Observations</th>
<th>Time</th>
<th>Sex</th>
<th>Age</th>
<th>No.</th>
<th>Activity (circle 1)</th>
<th>Flight</th>
<th>Horizontal Distance (m)</th>
<th>Habitat Type/Percent Structure</th>
<th>Audit</th>
<th>Notes</th>
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**Habitat Codes**: CBS-Crescenta Bush Scrub, SDSS-Sand Dunes/Sand Shells, DP-Desert Pavement, OT-other (please specify, provide details of project structure/habitat)

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Habitat Codes: CBS = Creosote Bush Scrub, SDOSS = Sand Dunes Sand Shads, DP = Desert Pavement, OT = other (please specify, provide details of Project structure/facility)
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Cloud Cover: S ½

Precipitation (circle one): None, light rain, rain, snow, e/leet, hal, fog, other

Temp: 90°F

Start Time: 12:36
End Time: 12:46

Visibility: Clear or Min Max (m)

Wind Direction from (circle one): Calm, NE, E, SE, S, SW, NW, Variable

Speed (Kmph), High (Kmph)
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### Mojave Solar

**Common Raven Fixed Point Observation Data Sheet**

- **Date (mm/dd/yy):** 04/19/14
- **Observer (init):** JRV
- **Start Time:** 11:10
- **End Time:** 11:20
- **Obs Pl:** 6

**Visibility:**
- **Min:**
- **Max:**

**Wind Direction from:**
- **N:**
- **NE:**
- **E:**
- **SE:**
- **S:**
- **SW:**
- **W:**
- **NW:**
- **Variable:**

**Visibility (circle one):**
- **Low**
- **High**

**Precipitation (circle one):**
- **Light rain**
- **Rain**
- **Snow**
- **Sleet**
- **Hail**
- **Fog**
- **Other**

**Temperature:**
- **C:**
- **F:**

**Cloud Cover:**
- **Sh:**

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<td>WA PE</td>
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</tbody>
</table>

**Activity Codes:**
- WA: Walking on ground
- PE: Perched above ground
- FL: Flying
- OT: Other (please specify)

**Habitat Codes:**
- OBSS: Cresso Bush Scrub
- SDSS: Sand Dunes/Sand Sheets
- DDP: Desert Pavement
- OT: Other (please specify, provide details of object structure/facility)

---

**OBS. # (Time):**

**ADDITIONAL NOTES:**
<table>
<thead>
<tr>
<th>Obs #</th>
<th>Time</th>
<th>Sex</th>
<th>Age</th>
<th># of birds</th>
<th>Activity (circle 1, X others)</th>
<th>Horizontal Distance (m)</th>
<th>Habitat Type/ Forest Structure</th>
<th>Alt?</th>
<th>Val?</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>12:27</td>
<td>A</td>
<td>1</td>
<td>1</td>
<td>WA</td>
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<td>SITE</td>
<td>N</td>
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<td>WA</td>
<td>FL OT</td>
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</tr>
</tbody>
</table>

Activity Codes: WA-walking on ground, PE-perched above ground, FL-flying, OT-other (please specify)
Habitat Codes: CB-Crossob Bush Scrub, DMD-Duneal Sand Sheets, DP-Desert Pavement, OT-other (please specify, provide details of Project structural/ability)
Attachment 4
Observed Wildlife Species List
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Whiptail</td>
<td>Aspidoscelis tigris</td>
<td>/ /</td>
</tr>
<tr>
<td>Red Racer</td>
<td>Coluber flagellum piceus</td>
<td>/ /</td>
</tr>
<tr>
<td>Gopher Snake</td>
<td>Pituophis catenifer</td>
<td>/ /</td>
</tr>
<tr>
<td>Desert Spiny Lizard</td>
<td>Sceloporus magister</td>
<td>/ /</td>
</tr>
<tr>
<td>Side-blotched Lizard</td>
<td>Uta stansburiana</td>
<td>/ /</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spotted Sandpiper</td>
<td>Actitis macularius</td>
<td>/ /</td>
</tr>
<tr>
<td>Red-winged Blackbird</td>
<td>Agelaius phoeniceus</td>
<td>/ /</td>
</tr>
<tr>
<td>House Finch</td>
<td>Carpodacus mexicanus</td>
<td>/ /</td>
</tr>
<tr>
<td>Killdeer</td>
<td>Charadrius vociferus</td>
<td>/ /</td>
</tr>
<tr>
<td>Rock Dove</td>
<td>Columba livia</td>
<td>/ /</td>
</tr>
<tr>
<td>Common Raven</td>
<td>Corvus corax</td>
<td>/ /</td>
</tr>
<tr>
<td>Snowy Egret</td>
<td>Egretta thula</td>
<td>/ /</td>
</tr>
<tr>
<td>American Kestrel</td>
<td>Falco sparverius</td>
<td>/ /</td>
</tr>
<tr>
<td>Greater Roadrunner</td>
<td>Geococcyx californianus</td>
<td>/ /</td>
</tr>
<tr>
<td>House Sparrow</td>
<td>Passer domesticus</td>
<td>/ /</td>
</tr>
<tr>
<td>Western Meadowlark</td>
<td>Sturnella neglecta</td>
<td>/ /</td>
</tr>
<tr>
<td>European Starling</td>
<td>Sturnus vulgaris</td>
<td>/ /</td>
</tr>
<tr>
<td>Mourning Dove</td>
<td>Zenaida macroura</td>
<td>/ /</td>
</tr>
<tr>
<td>Mammals</td>
<td>Common Name</td>
<td>Scientific Name</td>
</tr>
<tr>
<td>---------------------------------</td>
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<td>--------------------------</td>
</tr>
<tr>
<td>White-tailed Antelope Squirrel</td>
<td>Ammospermophilus leucurus</td>
<td></td>
</tr>
<tr>
<td>Black-tailed Jackrabbit</td>
<td>Lepus californicus</td>
<td></td>
</tr>
<tr>
<td>Desert Kit Fox</td>
<td>Vulpes macrotis</td>
<td></td>
</tr>
</tbody>
</table>

**Status Codes:**

**Federal:**

FE = Federally listed endangered: species in danger of extinction throughout a significant portion of its range

FT = Federally listed, threatened: species likely to become endangered within the foreseeable future

**State:**

SE = State listed as endangered

ST = State listed as threatened

CSC = California Species of Special Concern Species of concern to CDFW because of declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.

CCR = protected by the California Code of Regulations

WL = Watch List

CDF-S = California Department of Forestry Sensitive
Appendix C
Cultural Resources

Mojave Solar Project
Monthly Compliance Report
San Bernardino County, California

May 2014 Reporting Period
June 4, 2014

Dale Rundquist
Compliance Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Subject: Abengoa Mojave Solar Project (09-AFC-5C)
Monthly Compliance Report CUL-1 and CUL-6

Dear Mr. Rundquist:

CH2M HILL is assisting Abengoa Solar LLC (Abengoa) in complying with California Energy Commission (CEC) Conditions of Certification, specifically CUL-1 and CUL-6, for cultural resource monitoring, as set forth in the Commission Decision for the Mojave Solar Project (MSP). This report covers the cultural resources monitoring conducted from May 1, 2014, through May 31, 2014, by CH2M HILL.

**Personnel Active in Cultural Monitoring This Period**

The Cultural Resources Monitors (CRMs) included: Sonia Sifuentes and Jesse Shelmire. The Native American Monitors (NAMs) included: Tommy Herrera, Rebecca Brierty, Vanessa Brierty, Joseph Lente, and Leona Gilvin. Additionally, Cultural Resource Specialist (CRS), Gloriella Cardenas, was periodically onsite.

**Monitoring and Associated Activities This Period**

Ground-disturbing activities subject to cultural resource monitoring occurred in various locations of the MSP. In Alpha East, electrical conduit, Verizon communication installations, fiber optic cable trenching, multimedia filter crossings, and transformer foundations were monitored. In Alpha West, cabinet foundations were monitored. In Beta East, cabinet foundations, raw water line trenching, transformer foundations, and fiber optic cable trenching required monitoring.

**Cultural Resources Discoveries This Period**

None.
Anticipated Changes in the Next Period

Monitoring will continue for various foundations, electrical trenching, drainages, water line trenching, and other activities. Cultural monitoring crews will remain onsite to continue monitoring and to respond to discoveries if they occur.

Comments, Issues or Concerns

During the reporting period, one non-compliant event occurred resulting in a non-compliance report (NCR) being issued.

**NCR No. 10**

On Tuesday May 13, 2014, cultural monitors were scheduled to monitor a trench for fiber optic installations from 7:00 a.m. to 10:00 a.m. with the subcontractor Abacus; the activity did not take place and was rescheduled.

On Wednesday May 14, 2014, cultural monitors arrived at 7:00 a.m. to the location of where the fiber optics trenching was to take place, to find the excavation had been started, the day before at 12:00 p.m. This excavation occurred during an unscheduled time, monitors were not notified; therefore, they were not present for the trenching. The unmonitored trench excavation measured 5 feet in length, 2 feet in width and 2 feet in depth and was located in Alpha East, in the solar field, between mirror rows H-126 and H-127. Soils were examined to assess for impacts to cultural resources; none were noted as a result of this non-compliance event.

Because conducting ground disturbance of native sediments without cultural monitoring is a non-compliance issue per CUL-6, an NCR was issued.

**NCR No. 10 Resolution**

The recommendations were as follows:

1. Because this is the third infraction with the subcontractor (see Cultural NCR No. 1 and 8), upon receipt of this NCR the parties involved should undergo an immediate review of procedures for ground-disturbing operations and be placed on suspension from work for a minimum of 5 working days. The subcontractor shall be placed on a probationary status for the remainder of the contract. Termination of work/contract should occur upon another infraction by these parties.

2. A general requirement should be provided by the Project Owner that no excavations whatsoever are to occur without a cultural resources monitor present, or without a specific clearance from the CRS directly.

3. Construction is recommended to realign their work to be in compliance with the Conditions of Certification, existing plans, and SHPO stipulations regarding Determination of No Adverse Effects, specifically, the specifications listed in the Modification in the Mojave Solar Plant Construction Cultural Monitoring Requirements, dated April 9, 2013.
On May 15, 2014, at the request of cultural stakeholders, a call was held in order to
discuss non-compliance issues and construction, specifically, NCR No. 10. This meeting
resulted in concurrence by the CEC and the Department of Energy (DOE), of the
recommended resolutions.

On May 16, 2014, a document was provided by the contractor stating completion of the
resolutions. However, the documented resolutions differed from those recommended by
the CRS and approved by the CEC and DOE.

On May 19, 2014, additional documentation was requested to provide support that the
resolutions found in the NCR No. 10 were adhered to.

On May 28, 2014, a request by the contractor was sent to the CEC to rescind NCR No. 10.
The NCR No. 10 Resolution report and contractor documentation are included in an
attachment to this letter.

Sincerely,

CH2M HILL

Gloriella Cardenas, M.A., RPA
Cultural Resources Specialist

Attachment: NCR No. 10 Resolution Report
Attachment
NCR No. 10 Resolution Report
The recommendations were as follows:

1. Because this is the third infraction with the sub-contractor (see Cultural NCR No. 1 and 8), upon receipt of this NCR, the parties involved should undergo an immediate review of procedures for ground disturbing operations and be placed on suspension from work for a minimum of five working days. The subcontractor shall be placed on a probationary status for the remainder of the contract. Termination of work/contract should occur upon another infraction by these parties.

2. A general requirement should be provided by the Project Owner that no excavations whatsoever are to occur without a cultural resources monitor present, or without a specific clearance from the CRS directly.

3. Construction is recommended to realign their work to be in compliance with the Conditions of Certification, existing plans, and SHPO stipulations regarding Determination of No Adverse Effects, specifically, the specifications listed in the Modification in the Mojave Solar Plant Construction Cultural Monitoring Requirements, dated April 9, 2013.

On May 16, 2014 the contractor provided documentation that resolutions were met. However, the resolutions the contractor implemented differed from those addressed by the CRS. The contractor’s resolutions are found below.

AEPC will implement the following actions:

1. Activity managers, supervisors, and coordinators underwent a review of procedures for ground disturbance. Abacus, the subcontractor involved in the infraction committed on 05/13/2013, has been put on probationary status for the remainder of their contract and communicated via a Non-Conformity from AEPC of their 5 day suspension upon their third infraction (see attached sign-in sheet and email confirming the submittal of the NCR).

2. As per CRS’s email, AEPC will provide daily monitoring schedule maps to all monitors, via CRS, effective immediately. Deliverable to stakeholders will still be sent out daily to reflect the quantity of monitors requested the next day.

3. Activity managers, supervisors, and coordinators have undergone a review of the COC and SHPO for Mojave Solar Project in regards to cultural compliance. Attached is sign-in-sheet acknowledging review by 05/16/2013, official deadline.

These resolutions were found to be inadequate and additional documentation was requested on May 19, 2014 by the CRS. As of June 4, 2014, the NCR No. 10 resolutions have not been completed.
**Customer Non Conformity Report**

<table>
<thead>
<tr>
<th>Project: Mojave Solar Project</th>
<th>Reference: CUL-6 NCR 10</th>
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</thead>
<tbody>
<tr>
<td>Date: 05/15/2014</td>
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<tr>
<td>Affected Area: Construction</td>
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**Description of the problem:**
On Tuesday May 13, 2014, cultural monitors were scheduled to monitor a trench for fiber optic installations between the hours of 7:00 am to 10:00 am with the sub-contractor Abacus. This excavation did not take place during this scheduled time period. On Wednesday May 14, 2014, cultural monitors were rescheduled to monitor the fiber optics trenching. The cultural monitors arrived at 7:00 am to the location to find the excavation had already taken place, the day before starting at 12:00 pm. The non-monitored trench measured 5 ft in length, 2 ft in width and 2 ft in depth and was located in Alpha East, in the solar field, between mirror rows H-126 and H-127. Soils were examined to assess for impacts to cultural resources; none were noted as a result of this non-compliance event. Because conducting ground disturbance of native sediments without cultural monitoring is a non-compliance issue per CUL-6, this NCR was issued. Additionally, this is the sub-contractor’s third non-compliance incident regarding excavating without cultural monitors present for ground disturbing activities.

<table>
<thead>
<tr>
<th>Requires preventive action:</th>
<th>No □ Yes ☑ (IA Opening)</th>
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<table>
<thead>
<tr>
<th>IRP No:</th>
<th>Date: 5/15/14</th>
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<tbody>
<tr>
<td>IRP Evaluator:</td>
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</tbody>
</table>

Preventative measures to prevent any future infraction of CUL-6.

**Root Cause:**
Unfulfilled Procedure - Potential impacts could have included destruction of buried cultural deposits.

<table>
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<tr>
<th>Corrective Action:</th>
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<tbody>
<tr>
<td>IRP Coordinator: Steven Pochmara</td>
<td>Date: 5/15/2014</td>
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</tbody>
</table>
Comment:
AEPC will implement the following actions:

a. Activity managers, supervisors, and coordinators underwent a review of procedures for ground disturbance. Abacus, the subcontractor involved in the infraction committed on 05/13/2013, has been put on probationary status for the remainder of their contract and communicated via a Non-Conformity from AEPC of their 5 day suspension upon their third infraction (see attached sign-in sheet and email confirming the submittal of the NCR).

b. As per CRS’s email, AEPC will provide daily monitoring schedule maps to all monitors, via CRS, effective immediately. Deliverable to stakeholders will still be sent out daily to reflect the quantity of monitors requested the next day.

c. Activity managers, supervisors, and coordinators have undergone a review of the COC and SHPO for Mojave Solar Project in regards to cultural compliance. Attached is sign-in-sheet acknowledging review by 05/16/2013, official deadline.

Attachments:
- WEAP Training Sign-In Sheet – 5/16/14

NCR Coordinator:
Steven Pochmara
Position: Permitting Manager
Signature of Coordinator:

NCR Evaluator:
Nicolas Gallo Massa
Position: Project Sub-Director
Signature of Evaluator:

NCR Supervisor:
Efrain Perez
Position: Quality Manager
Signature of Supervisor:
Hello, Trey.

The Abacus crew involved in the violation reported will be trained next Monday in the morning. Quality will provide you the training record signed by all of them.

Abacus also received a warning, because there were previous violations. Safety is aware of this violation, too. They are waiting for the sworn statements.

Any question or comment, please let me know.

Regards,

Christian Oziel Bojorquez - Quality Engineer

---

**ABENGOA SOLAR**

**Holmes Bassette**

05/16/2014 12:11 PM

---

**ABENGOA EPC**

**Christian, Please revise the resolution...**

05/16/2014 12:11:33 PM
Christian,

Please revise the resolution proposal to clarify that the Abacus crew involved in the violation will be placed on probation. As it is currently written, it could be interpreted that Abacus as a whole will be placed on probation.

Upon receipt of the revision, the resolution will be forwarded for consideration and acceptance.

Thank you and kind Regards,

Holmes Bassette - (Trey)
Director of Permitting

ABENGOA SOLAR
Abengoa Solar Inc.
Abengoa Solar Inc.
11500 W.13th Avenue, Lakewood, CO 80215
Phone: 636-519-3640 (x86250) Cell: 720-289-5542
Holmes.Bassette@solar.abengoa.com

Eco-Tip: Printing e-mails is usually a waste.
Appendix D
Paleontological Resources

Mojave Solar Project
Monthly Compliance Report
San Bernardino County, California

May 2014 Reporting Period
June 5, 2014

RE: PAL-5, Summary of Paleontological Monitoring and Mitigation Activities at the Mojave Solar Project (MSP) for the period of May 2014

Dear Mr. Rundquist:

This letter is to confirm SWCA Environmental Consultants paleontological monitoring and mitigation activities at the MSP site during the period of May 1 through May 31, 2014. As of February 28, 2014, major ground-disturbing activities for the MSP have been completed and SWCA’s monitoring services are no longer required onsite. No paleontological monitoring occurred during the above-referenced period.

It has been a pleasure working with you on this project. If you have any questions please do not hesitate to contact me at 626 240 0587 ext 6605 or at ccorsetti@swca.com.

Respectfully,

Cara Corsetti, M.S.
Principal
Paleontological Resources Specialist, MSP
Appendix E
Worker Safety

Mojave Solar Project
Monthly Compliance Report
San Bernardino County, California

May 2014 Reporting Period
Monthly Safety Inspection Report
Larry Davis, Mojave Solar Project Safety Manager
May, 2014

Record of all employees trained for the month
Worked 5,052,100 hours project to date with 67 recordable incidents. 8,684 new employee orientations completed to date. 5,645 visitor safety orientations completed to date. 316 new employee orientations were completed in the month of May.

Summary report of safety management actions and safety-related incidents that occurred:

- Light level measurements continue to be taken on night shift to ensure compliance for OSHA standards.
- Outfitting cool down tents in Alpha and Beta with tables and benches.
- Master Chemical List has been updated for all subcontractors on site.
- Solutia VP-1 deliveries continue in both Alpha and Beta to the Overflow tanks.
- H&S is conducting a complete audit of all H&S incidents and injuries including follow up corrective actions.
  - Zurich Reporting Officer added.
  - Incident Investigation Team (IIT) created.

Safety management actions included WEAP and new employee orientation training, safety committee meetings and training classes for Confined Space, HTF Awareness, AWP, LOTO/70E, and HIPP/Off Angle Focus training. H&S continues with monthly subcontractor audits. Weekly inspection with Bureau Veritas revealed no major safety issues and all other issues corrected right away. Worker Safety-2, Emergency Response Plan, and HTF Spill Procedure have been approved by the CEC. Santa Fe/Pipe Line/BNSF right of way Rd update: Violators detected during the month of May had their site access badges deactivated and site access denied.

Recordable incidents in previous months (Updates on bold)

August 2013 open case
- Case #3 8/15/13. Milco. Worker fell while unloading HTF flex pipe resulting in a bruised tailbone. First Aid case reclassified as Lost Time on January 8, 2014.

October 2013 open cases
- Case #4: 10/16/2013. HLC. Left shoulder strain. Recordable reclassified as Lost Time.
- 10/16/2013. E.W. Corp. Physical Altercation Case. This non-occupational case is currently under worker compensation court review.

November 2013 open cases pending closure by Zurich
- Case #1: 11/19/2013. HLC. Worker suffered right clavicle dislocation resulting in RTW modified Duty. Retrained in safe work practices. Classified as recordable.

December 2013 open cases
- Case #1: 12/18/2013. Murray. Worker was unloading material from a flatbed trailer lost his footing and fell backwards to the ground and landed on left hip and leg area. Classified as Lost Time.

**Report of accidents and injuries that occurred during the month of May:**

**Three RWDC's** were incurred in the month of May 2014.

**Case #1: 5/13/2014 – Abacus, Corneal abrasion/conjunctivitis right eye; Classified as RWDC**
- Employee retrained on proper selection and use of goggles for windy/dusty hazard conditions.

**Case #2: 5/22/2014 – Abacus, Left knee strain; Classified as RWDC**
- Employee retrained on ergonomics (body position motion) and walking/working surfaces.

**Case #3: 5/30/2014 – Abacus, Lower back strain/muscle spasm; Classified as RWDC**
- Employee retrained on body positioning, stretch and flex.

**No report of any continuing or unresolved situations and incidents that may pose danger to life or health.**

Currently we have an average of **1,283** employees on site daily. Landing Zone prepared for emergency evacuation cleared at all times.

Construction has worked **5,052,100** hours with **67** recordable cases.  
Total Recordable Incident Rate, (TRIR), for Project in the month of May is **1.73%**  
Total Recordable Incident Rate, (TRIR), for year to date is **2.75%**  
Total Recordable Incident Rate, (TRIR), for Project to date is **2.65%**  
Total Lost Work day cases- **14**, Lost Work days total – **1,010**
# Safety Conditions Check List

**Internal by Work Site**

## Mojave Solar Project

### Activities performed:

- **Safety Inspection Report**
- **Record periodically (monthly)**
- **May, 2014**

### Safety & Risk Management Program Administration & Record Keeping

<table>
<thead>
<tr>
<th>A</th>
<th>Question</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is there a Safety Manual, 29 CFR Sub Part 1926 and HAZCOM Manuals available on-site?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are there Weekly Safety meetings (Toolbox Talks) conducted and documented?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Is the Weekly Job Safety Inspection conducted and documented?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are the Federal &amp; State Labor Notices posted in a conspicuous location?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are the Emergency phone numbers &amp; Doctors list posted conspicuously?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Are the Company vehicle operators authorized per company policy?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Are the New employee orientations documented for all new subcontractor employees?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Are the PM follow up letters to subcontractors re: Serious Violations on file?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Is the approved safety plan including the emergency action plan on site?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Is the Safety Plan updated to reflect any/all scope changes?</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### Ladders & Stairways - OSHA Subpart X

<table>
<thead>
<tr>
<th>B</th>
<th>Question</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are the ladders inspected for defects?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are extension ladders extending 3 ft. above landing?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are extension ladders pitched at 1 ft. out from vertical for every 4 ft. of height?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are straight ladders secured in place?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are the straight ladders equipped with safety feet?</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### Dates and Times:

- **Date:** 5.21.14
- **Time:** 11:45 am

### Inspected by:
- **Larry Davis**
  - **Title:** Safety Manager

### Accompanied by:
- **Raivo Neggo**
  - **Title:** BV Safety

**Project Name & Number:** Mojave Solar Project - 4A6007
<table>
<thead>
<tr>
<th></th>
<th>Fall Protection - OSHA Subpart M</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are the floor/roof deck openings protected with properly secured and marked covers or guardrails?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are the wall openings/open-sided floors protected with fall protection/prevention systems?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are the workers exposed to falls of 6’ or more provided with and required to use personal fall arrest systems (PFAS) when not protected by guardrails?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are the exposed rebar in work areas properly protected - capped, etc.? Both vertical and horizontal?</td>
<td>2</td>
<td>Abacus missing rebar caps Corrected at time of discovery</td>
</tr>
<tr>
<td>5</td>
<td>Are specialty trades, i.e., roofers, ironworkers, etc., working under fall protection plans prepared by them and approved by controlling contractor?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Are the PFAS - Harnesses, Lanyards, Anchorage Points, Lifelines and Retractables inspected?</td>
<td>1</td>
<td>ARB harness not inspected Corrected at time of discovery</td>
</tr>
<tr>
<td>7</td>
<td>Are the anchorage Points 5K per person?</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Demolition – OSHA Subpart T</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is the Engineering Survey completed and documented?</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Is the work area “Identified &amp; Protected”, i.e., electricity, gas, water, sprinkler system?</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Scaffolds and Aerial Lifts – OSHA Subpart L</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is there a competent Person, designated in writing, assigned to supervise operations and conduct documented daily inspections and on-site full time?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are the working surfaces 6’ or higher equipped with guardrails?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are the working surfaces clear of debris, slip, trip and fall hazards?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are the plumbs, tied in as necessary, safe footing, base plates, mudsills assembled and erected properly -? Are they equipped with all pins and bracing? Is a complete platform?</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
## Safety Conditions Check List

### Internal by Work Site

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Is there a safe means of access to platform provided?</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Are the wheels locked on rolling units when platform occupied?</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Are the scaffolds at least 10 ft. from energized power lines?</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Are the workers tied off in articulating boom lift?</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Is the aerial lift on level surface?</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Has safety been notified in advance of erecting a suspended scaffold?</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Is there a competent Scaffold Person inspected and signed-off on scaffold prior to each shift daily?</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Is a Tagging system used?</td>
<td>3</td>
</tr>
</tbody>
</table>

### F Excavations & Trenches – OSHA Subpart P

<table>
<thead>
<tr>
<th></th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is there a competent Person, designated in writing, assigned to supervise operations and conduct documented daily inspections and on site full time?</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Are all excavations and trenches 5 ft. or greater in depth equipped with Protective Systems (shoring/shielding or sloped/benched)?</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Are the ladders or other means of quick exit within 25 ft. of lateral travel for workers?</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Is the Spoil pile at least 3 ft. from edge of excavation or trench?</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Are the Underground utilities located &amp; marked before excavation starts? (Verify ticket/maps/plans)</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Are the barricades provided around all open excavations?</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Is the Equipment kept at proper distance from occupied excavations/trenches to minimize risk of cave-in or equipment falling in on workers?</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>IF 20’ OR DEEPER Has Safety been notified?</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>IF 20’ OR DEEPER, are the protective systems designed by a RPE?</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Are the Surface and subsurface encumbrances identified?</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Are the Water, atmospheric conditions, &amp; surcharge loads considered?</td>
<td>3</td>
</tr>
</tbody>
</table>

### G Motor Vehicles, Mechanized Equipment – OSHA Subpart

<table>
<thead>
<tr>
<th></th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are the Tractors, backhoes, other vehicles equipped with operable backup alarms?</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Are the Operators required wearing seat belts when provided on equipment?</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Is the Forklift/Lull operator certification documented and available on project?</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Is a High visible vest worn around earth moving equipment?</td>
<td>3</td>
</tr>
</tbody>
</table>

### H Electrical – OSHA Subpart K
**Safety Conditions Check List**

**Internal by Work Site**

<table>
<thead>
<tr>
<th><strong>Values</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Are the Ground fault circuit interrupters (GFCI) used with all temporary wiring, e.g., extension cords and power from welding machines?</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Is the GFCI in good appearance and in working order?</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Are All tools and equipment inspected for defects in cords and plugs?</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Are the Extension cords and ground pins are in good condition?</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Are the Sources of electricity, such as energized panel boxes, overhead lines, etc., properly marked, barricaded and protected? Inspected by a Qualified Person?</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Is there an adequate lockout/tag out/try out procedures in place to protect employees?</td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>Is the Temporary Lighting installed properly? (i.e. parking, construction trailer, &amp; site)</td>
</tr>
</tbody>
</table>

**I Personal Protective Equipment – OSHA Subpart E**

<table>
<thead>
<tr>
<th><strong>Values</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Is an adequate eye protection available and worn when required?</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Is a Hearing protection available and used when necessary?</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Are Hard hats available and worn at all times?</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Are Work boots with protective toes worn by all employees?</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Are All employees wearing shirts with sleeves?</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Is a Hand protection available and in use when required?</td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>Is there a Written respirator program available?</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td>Are they Using N95 respirators for “voluntary use”?</td>
</tr>
<tr>
<td><strong>9</strong></td>
<td>Are the PFAS inspected by employees prior to use?</td>
</tr>
</tbody>
</table>

**J Fire Prevention – OSHA Subpart F**

<table>
<thead>
<tr>
<th><strong>Values</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Are the flammable/combustible liquids stored away from ignition sources and identified by warning signs?</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Are the approved metal safety cans utilized for storing all liquid flammables?</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Are the fuel tanks surrounded by containment and 20’ from building?</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Are an adequate number of charged fire extinguishers available? With-in 75’?</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Are the Extinguishers properly located, protected, Inspected?</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Are the Flammable/combustible debris &amp; storage kept away from welding &amp; cutting?</td>
</tr>
</tbody>
</table>

**K Welding & Cutting - OSHA Subpart J**

<table>
<thead>
<tr>
<th><strong>Values</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Are welding leads in good condition?</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Is a Portable fire extinguisher located within 20’ of all welding operations?</td>
</tr>
</tbody>
</table>
### Safety Conditions Check List

#### Internal by Work Site

<table>
<thead>
<tr>
<th></th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Are Fire blankets available and used to cover combustible material located around welding operations?</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Are Hot Work Permits used when required?</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Is an Adequate use of fire curtains to enclose and shield welding operations?</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Are Hoses, torches, and gauges free from defects, dirt and hydrocarbons such as oil and grease?</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Are Regulators provided with flash arrestors?</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Are Welding / cutting helmets, eye protection, gloves, bibs, face shields available and properly used when necessary?</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Are the Stored oxygen and fuel cylinders separated by a minimum of 20 ft. with valve protection caps in place?</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Are All cylinders firmly secured in upright position?</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Are Cylinders secured to welding cart, valve closed and caps on when not in use?</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Are Empty and full cylinders separated and marked?</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Are Flammable gas cylinders and oxygen gas cylinders are separated 20’ apart?</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Tools – Hand & Powered – OSHA Subpart I

<table>
<thead>
<tr>
<th></th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are Tools and equipment in good condition?</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Is the Defective equipment tagged as such and removed from work area?</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Are Tools and equipment guards and handles in place and in good condition?</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Are the Powder actuated tool operators properly trained and documented?</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Confined Space Entry - OSHA 29CFR1910.146

<table>
<thead>
<tr>
<th></th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is a competent Person / Entry Supervisor designated in writing? On site full time?</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Is an Entry permit properly issued prior to work starting?</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Is the Air sampling equipment available and properly used? Calibrated?</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Are the Air samples show acceptable oxygen concentrations of (19.5% to 23.5%)?</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Are the Air samples show space is free of toxic/flammable/explosive gases?</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Is there a Trained attendant assigned to maintain constant contact with workers inside space?</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Is there Trained person assigned to recheck air quality frequently throughout the project?</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Is there an Emergency rescue plan and equipment in place?</td>
<td>3</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is there an Abeinsa EPC, Subcontractor MSDS’s available?</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Is there an Abeinsa EPC List of Hazardous Chemicals current?</td>
<td>3</td>
</tr>
</tbody>
</table>
## Safety Conditions Check List

### Internal by Work Site

<table>
<thead>
<tr>
<th>O</th>
<th>Health and Safety - OSHA Subparts C &amp; D</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is illumination, task lighting adequate?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are sanitary facilities adequate and clean?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Is drinking water properly dispensed and community water containers cleaned and secured?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is First Aid kit stocked including latex gloves and Bloodborne clean-up kit?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are Eye wash stations available &amp; accessible?</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P</th>
<th>Housekeeping - OSHA Subparts C &amp; D</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are Suitable containers available for disposal of trash, debris and recyclables?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are Walkways, aisles, hallways and passageways clear of trash, debris, materials?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are Tools not in use stored in job boxes?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is the Equipment not in use stored properly?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are Pipes and other materials stored kept neatly?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Are Appropriate sub-contractors dumpsters available?</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q</th>
<th>Cranes and Hoists - OSHA Subpart N</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are Operator’s “daily inspections” available for review?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Is there an Annual Inspection and 3rd party crane inspection documented?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are the Swing radius barricaded?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Are the Hydraulic crane outriggers padded and on stable ground?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are the Power lines at safe distance? De-energized or protected? (Check clearance heights)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Are the Uniform signals properly used?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Are Cable and slings regularly inspected and in good condition? Red is dead!</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Are Operable safety catches provided on load hooks?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Is there a Proper rigging used for loads?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Are the Operator qualifications on site?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Is a competent training person involved with safe rigging practices?</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R</th>
<th>Abatement &amp; Remediation - OSHA Subparts D &amp; Z</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is the Personnel trained &amp; medically qualified including fit tests? Documentation on site?</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Are the three work zones delineated?</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
### Safety Conditions Check List

#### Internal by Work Site

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Are workers wearing the correct level of protection?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is on-going air monitoring documented?</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Are vision panels installed where practical?</td>
<td></td>
</tr>
</tbody>
</table>

#### Public Safety & General Liability – ANSI A.10-30-2001

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Values</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is an adequate placement of flashers, barricades, signs around excavations and equipment or materials located in foot/vehicle traffic areas?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Is Security in place? Is the Access control plan established?</td>
<td>3</td>
<td></td>
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<tr>
<td>3</td>
<td>Is the fencing erected around laydown/material storage areas?</td>
<td>3</td>
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<td>4</td>
<td>Is the Site lighting meets 5-foot candles?</td>
<td>3</td>
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<tr>
<td>5</td>
<td>Have All contractors submitted COI?</td>
<td>3</td>
<td></td>
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<tr>
<td>6</td>
<td>Are the way (Traffic signs) signs clear?</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Are the Off-site work hazards identified?</td>
<td>3</td>
<td></td>
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</tbody>
</table>

### Safety Deficiency Point Reduction

**Inspection Score: 388 /408 = 95.0 %**

**Comments:**

- PTD worked hours 5,052,100 hours with 67 recordable incidents.
- 8,684 New employee orientations completed to date.
- 5,645 Visitor safety orientations completed to date.
- 316 new employee orientations were completed in the month of May.

Weekly Safety Committee Meetings were held and the following trainings were offered: Combined AWP, Confined Space, LOTO & ARC Flash, HTF Awareness, HiPP/Off Angle Focus.
Appendix F
Engineering

Soil & Water
Waste
General Conditions
Civil
Structural
Mechanical
Electrical
Transmission System

Mojave Solar Project
Monthly Compliance Report
San Bernardino County, California

May 2014 Reporting Period
June 9, 2014
Mr. Dale Rundquist, CPM
California Energy Commission
1516 Ninth Street (MS-2000)
Sacramento, CA 95814
drundqui@energy.state.ca.us

Dear Mr. Rundquist,

As required by the California Energy Commission and more specifically by Condition of Certification COMPLIANCE5, attached please find an update to the following Compliances:

COMPLIANCE-2 [ASI + A/T]

The project owner shall maintain project files on-site or at an alternative site approved by the CPM for the life of the project, unless a lesser period of time is specified by the Conditions of Certification. The files shall contain copies of all “as-built” drawings, documents submitted as verification for Conditions, and other project-related documents. Energy Commission staff and delegate agencies shall, upon request to the project owner, be given unrestricted access to the files maintained pursuant to this Condition. 

**Hardcopy files of all “as-built” drawings and documents are available for review at the Abeinsa EPC Alpha east main site trailer.**

COMPLIANCE-6 [ASI + A/T]

The first Monthly Compliance Report is due one month following the Energy Commission business meeting date upon which the project was approved, unless otherwise agreed to by the CPM. The first Monthly Compliance Report shall include the AFC number and an initial list of dates for each of the events identified on the Key Events List found at the end of this section of the Decision.
The Key Events list has been included with current completed activity dates listed, please see attachment. The 2-month look ahead schedule has been included, please see attachment.

AIR QUALITY PERMIT

Air Quality permit amendment was submitted to MDAQMD on 10/19/2013. MDAQMD approved on 02/24/2014. MDAQMD submitted this approval to the CPM on 02/24/2014, MDAQMD submitted revised ATC to CPM on 03/14/2014. CPM provided revised conditions of certification on 03/21/2014. CPM staff review and public comment period took place on 04/22/2014, CEC approved air quality permit revision. CEC issued revised air quality permits on 04/28/2014.

AQ-12

Specifications for the Ullage Venting System resubmitted to CPM and MDAQMD on 05/28/2014, please see attachments.

AQ-26

Cooling Tower calculations and water sample test protocol submitted to CPM and MDAQMD on 05/23/2014, please see attachments. MDAQMD approved on 05/27/2014, please see attachment.

AQ-32

Hour meter for diesel fuel emergency backup generator submitted to CPM and MDAQMD on 05/20/2014, please see attachments.

AQ-43

Hour meter for diesel fuel emergency backup generator for fire pumps submitted to CPM and MDAQMD on 04/20/2014, please see attachments.

HAZ-1 [ASI and A/T]

The project owner shall not use any hazardous materials not listed in Appendix A (Hazardous Materials Proposed for Use at AMS During Operations), below, or in greater quantities or strengths than those identified by chemical name in Appendix A (Hazardous Materials Proposed for Use at AMS During Operations), below, unless approved in advance by the Compliance Project Manager (CPM). The project owner shall provide to the CPM, in the Annual Compliance Report, a list of hazardous materials contained at the facility. A revised chemical list was submitted to the CPM on 04/30/2014, CPM approved on 05/20/2014, please see attachment. HTF, Nitrogen, diesel fuel and gasoline were delivered during the month. The HTF, Beck Oil and Nitrogen delivery spreadsheets for May 2014 are included, as well as this month’s Beck Oil delivery tickets, please see attachments.
HAZ-2 [ASI and A/T]

At least 60 days prior to receiving any hazardous material on the site for commissioning or operations, the project owner shall provide a copy of a final Hazardous Materials Business Plan (HMBP), Spill Prevention, Control, and Countermeasure (SPCC) Plan, and a Process Safety Management (PSM) Plan to the CPM for approval.

The HMBP was submitted to the CPM and San Bernardino Fire Department on 07/23/2013. The CPM and SBCFD Haz Mat Division approved the HMBP on 08/01/2013 and 10/09/2013 respectively. The SPCC and PSM plans were submitted to the CPM on 10/29/2013, and SBCFD Haz Mat Division on 11/01/2013. The plans were approved by SBC Haz Mat Division as they stated that their only requirement is to have a copy of the SPCC on file at the site should a representative visit. The SPCC was approved by CPM on 11/25/2013. The PSM plan was returned with comments on 12/09/2013. Revised PSM plan, PHA, LOPA and O&M Manuals were resubmitted to the CPM on 01/29/2014, CEC approved on 02/10/2014. The HTF End Loop Testing procedure was submitted to the CPM on 01/17/2014, CPM approved on 01/27/2014. SBCFD provided comments to the SPCC on 02/13/2014. Comments were addressed and submitted to CPM on 02/28/2014, please see attachment. CPM comments for the PSM plan were addressed and submitted to CPM on 01/27/2014. CPM approved PSM plan on 02/10/2014, please see attachment. HMBP was resubmitted on 03/26/2014 to include the hydrogen and CO2 for the turbine cooling system, CEC approved on 04/16/2014, please see attachments.

WASTE-2 [ASI and A/T]

Project owner shall keep a copy of the identification number on file at the project site and provide documentation of the hazardous waste generation notification and receipt of the number to the CPM after receipt of the number. Waste generator number issued by California EPA on September 28, 2012. CEC reviewed and approved submittal on November 27, 2012. The application for the USEPA hazardous waste generation notification number was submitted on July 9, 2013. EPA approval issued on 10/02/2013.
WASTE-10 [ASI and A/T]

The project owner shall document all releases and spills of HTF as described in Condition of Certification WASTE-9 and as required in the Soil & Water Resources section of this Decision. Cleanup and temporary staging of HTF-contaminated soils shall be conducted in accordance with the approved Operation Waste Management Plan required in Condition of Certification of WASTE-6. The project owner shall sample HTF-contaminated soil in accordance with the United States Environmental Protection Agency’s (USEPA) current version of “Test Methods for Evaluating Solid Waste” (SW-846). Samples shall be analyzed in accordance with USEPA Method 1625B or other method to be reviewed and approved by DTSC and the CPM. Within 28 days of an HTF spill the project owner shall provide the results of the analyses and their assessment of whether the HTF-contaminated soil is considered hazardous or non-hazardous to DTSC and the CPM. If DTSC and the CPM determine the HTF-contaminated soil is considered hazardous it shall be disposed of in accordance with California Health and Safety Code (HSC) Section 25203 and procedures outlined in the approved Operation Waste Management Plan required in Condition of Certification WASTE-9 and reported to the CPM in accordance with Condition of Certification WASTE-12. If DTSC and the CPM determine the HTF-contaminated soil is considered nonhazardous it shall be retained in the land farm and treated on-site in accordance with the Waste Discharge Requirements contained in the Soil & Water Resources section of this Decision. The HTF contaminated soil samples have been submitted to a testing lab. Lab results submitted to the CPM on 04/25/2014 and to DTSC on 05/09/2014, please see attachments. CPM approved on 05/22/2014 and DTSC on 05/09/2014, please see attachments. HTF Spill Reports and summary are attached.

WORKER SAFETY-2

At least 30 days prior to the start of commissioning, the project owner shall submit to the SBCFD the final Operations Fire Prevention Plan and Emergency Action for review and the final Project Operations and Maintenance Safety and Health Program to the CPM for approval. Health & Safety, Fire Prevention and Emergency Response plans for operations submitted to SBCFD and CPM on 02/14/2014, please see attachments. SBCFD issued comments on 02/26/2014, comments addressed and resubmitted to CPM on 02/26/2014. CPM issued comments on 03/03/2014, package resubmitted on 03/05/2014, please see attachment. CPM approved package on 03/10/2014, please see attachment. CPM clarified its approval of this compliance on 03/25/2014.
Provide an analysis on the effectiveness of the drainage, erosion, and sediment control measures and the results of monitoring and maintenance activities. Please see the attached Construction Site Stormwater Runoff Control Inspection forms. No rain events occurred on site for the month. All site BMP’s functioned accordingly and there was no runoff from the site. The contractor reports as of May 31, 2014 that 0 lf (24,730 lf total for project) of straw rolls and 0 lf (16,219 lf total for project) of new swale have been installed for this month, maintenance required for this month included repair of 25 lf on the north side of Beta east. The existing fiber rolls and swales continued being monitored, maintained, and replaced as needed. The contractor reported that no maintenance of fiber rolls/swales was required for the month. The QSP reports that no sand build-up is prevalent on the straw waddles. These BMP’s were effective in preventing sediment run off from the site. There are five concrete washout stations (3 in Alpha and 2 in Beta). Additionally, the steel rumble strips remain in place at the Alpha east main entrance (north), Alpha east (south) entrance, Alpha west entrance, and on Lockhart Road adjacent to the TAB main entrance. They were effective in preventing dirt and mud from being tracked from the site onto Harper Lake Road and Lockhart Road as well as an effective deterrent against the spreading of noxious weeds. The steel beams are continuously maintained to prevent clogging. Street sweeping of the construction entrances and Harper Lake Road and Lockhart Road is occurring on an as needed basis as a means of good housekeeping; it has improved and will continue to be the main activity to keep the streets free of dirt and mud, especially when high winds and storm events occur. Soil stabilizer wasn’t used for this month on traffic areas as daily watering was an effective means for dust control. Project site areas for the month that have been stabilized are 0 acres for Alpha East (279.50 acres total), 0 acres in Alpha West (369 acres total), 0 acres in Beta East (502 acres total), and 0 acres in Beta West (102.50 acres total). No sand build-up was reported in the retention basins between collectors. Trash collection was taken care of daily, as AEPC has 12 full time workers dedicated to trash duty. Due to the increase in on site contractors trash has escalated and became a major concern. Notification to the subcontractors to clean up their own trash, especially any accumulating in the trenches, pipes and power block areas has reduced the problem. Sand removal along tortoise fences was done daily. Since the new crews have been on site and new trash policies have been followed, the site has shown vast improvement and is caught up with handling the influx of new workers. Please see attachments, which include the weekly Construction Site Stormwater Runoff Control Inspection forms signed by the project QSP and the Bureau Veritas site inspector.

The project owner shall comply with the Waste Discharge Requirements (WDRs) established in Soil and Water Resources Appendices C, D, and E for the construction and operation of the surface impoundments (evaporation ponds), land treatment units, and storm water management system. These requirements relate to discharges, or potential discharges, of waste that could affect the quality of waters of the state, and were developed in consultation with staff of the State Water Resources Control Board and/or the applicable California Regional Water Quality Control Board (hereafter “Water Boards”). It is the
Commission’s intent that these requirements be enforceable by both the Commission and the Water Boards. In furtherance of that objective, the Commission hereby delegates the enforcement of these requirements, and associated monitoring, inspection and annual fee collection authority, to the Water Boards. Accordingly, the Commission and the Water Board shall confer with each other and coordinate, as needed, in the enforcement of the requirements. The project owner shall pay the annual waste discharge permit fee associated with this facility to the Water Boards. In addition, the Water Boards may "prescribe" these requirements as waste discharge requirements pursuant to Water Code Section 13263 solely for the purposes of enforcement, monitoring, inspection, and the assessment of annual fees, consistent with Public Resources Code Section 25531, subdivision (c). No later than sixty (60) days prior to any wastewater or storm water discharge or use of land treatment units, the AMS project shall provide documentation to the CPM, with copies to the Lahontan RWQCB, demonstrating compliance with the WDRs established in Appendices C, D, and E. Any changes to the design, construction, or operation of the ponds, treatment units, or storm water system shall be requested in writing to the CPM, with copies to the Lahontan RWQCB, and approved by the CPM, in consultation with the Lahontan RWQCB, prior to initiation of any changes. The AMS project shall provide to the CPM, with copies to the Lahontan RWQCB, all monitoring reports required by the WDRs, and fully explain any violations, exceedances, enforcement actions, or corrective actions related to construction or operation of the ponds, treatment units, or storm water system. SWAT2-01-00, construction plans for the Evaporation ponds and LTU’s were submitted to the CEC, Lahontan and CBO on June 6, 2013 and approved by all agencies on June 11, 2013. SWAT2-02-00, a modification to the LTU plans was submitted to the CEC and Lahontan on August 5, 2013, and an approval was issued on August 8, 2013. SWAT2-04-00 for a change in verification was requested by the CEC but AEPC suggested that any change will be covered by the closure compliances, COMPLIANCE-12, -13 and -14. The CEC responded on September 12, 2013 that they were in agreement. SWAT2-03-00, for the monitoring well system was submitted to the CEC and Lahontan the week of 10/28. Abeinsa EPC engineering staff is still coordinating with the CEC and Lahontan on the final design. Abeinsa EPC submitted a well plan for CEC review on 11/27/2013. CEC provided comments to the well plan on 12/17/2013. Revised well plan submitted to the CEC on 12/23/2013, CPM approved on 01/14/2014.

SOIL&WATER-4

Well abandonment status for remaining abandonments submitted to CPM on 09.06.12. As of 09.06.12, the CEC has approved all well abandonments with the exception of wells 11 and 14 (stuck pump wells). They require a wildlife survey in the area of the two wells to ensure that their habitats won’t be disrupted with the use of explosives for the stuck pump wells. As of 10.13.2012, the well contractor was able to remove the pump from Well #11 by conventional means. However, Well #2 has now been determined as having a stuck pump and needing explosives to remove. The abandonment package was revised and resubmitted to the CEC on 10.22.2012. CEC has approved the use of explosives on Wells #2 and #14 as of October 31, 2012. As of March 5, 2013, the remaining wells to be abandoned are: Ryken and Wetlands. Wells #2 and #14 (by explosives) and 8, 10, 19, were abandoned during January 2013 but their well completion reports were finalized this month, please see attachments. Ryken and Wetlands wells were approved to be abandoned by SBC on May 7, 2013. Final abandonment was completed on May 17, 2013 and well completion reports were submitted to the CEC for approval. ASI and Abeinsa EPC have agreed on a new location of the Beta #4. An exhibit indicating final production well
locations (including Beta #4) was provided to CPM on 11/27/2013. CPM responded asking for the well design by well contractor that will show a sealed upper layer which prevents any infiltration of the perched layer into the lower aquifer. Well contractor submitted a permit to SBC on 12/07/2013 but decision was made to go with a different contractor. New contractor submitted a permit for the Beta #4 well on 01/14/2014, SBC approved on 01/31/2014 based on the condition that Beta #1 be retrofitted as a monitoring well and the Beta #2 conductor casing be destroyed. The CPM further approved the use of Beta #1 for construction water while Beta #3 construction was completed. CPM approved the Beta #4 permit on 02/04/2014. A request to extend the discharge permit for well test water to the BLM marsh was submitted to CPM on 02/10/2014, CPM approved on 02/12/2014. Beta #4 continued to be developed during the month, please see attached Beta #4 water usage. Beta #4 well completion report submitted to CPM on 05/22/2014, please see attachment.

SOIL&WATER-5

Beginning six (6) months after the start of construction, the project owner shall prepare a semi-annual summary report of the amount of water used for construction purposes. The summary shall include the monthly range and monthly average of daily water usage in gallons per day.

For May 2014, 3,114,401 gallons were pumped from Beta #3. Also taken from the overall total was a monthly amount of 204,000 gallons (May) by SBC for off-site road maintenance. The running total of water usage for construction/testing purposes from January 1, 2014 to May 31, 2014 is 19,501,251 gallons. To date, there have been 114 working days for 2014 which equates to 171,064 gal/day. This equates to 3,900,250 gal/month, please see attachments.

SOIL&WATER-6

The project owner shall do all of the following:
1. At least sixty (60) days prior to project construction, the project owner shall submit to the CPM, for review and approval, a comprehensive plan (Groundwater Level Monitoring and Reporting Plan) presenting all the data and information required in Item A above. The project owner shall submit to the both the CPM all calculations and assumptions made in development of the plan.
2. During project construction, the project owner shall submit to the CPM quarterly reports presenting all the data and information required in Item B above. The project owner shall submit to the CPM all calculations and assumptions made in development of the report data and interpretations.
3. No later than sixty (60) days after commencing project operation, the project owner shall provide to the CPM, for review and approval, documentation showing that any mitigation to private well owners during project construction was satisfied, based on the requirements of the property owner as determined by the CPM.
4. During project operation, the project owner shall submit to CPM, applicable quarterly, semi-annual, and annual reports presenting all the data and information required in Item C above. The project owner shall submit to the CPM all calculations and assumptions made in development of report data and interpretations, calculations, and assumptions used in development of any reports.
5. The project owner shall provide mitigation as described in Item D above, if the
CPM’s inspection of the monitoring information confirms project-induced changes to water levels and water level trends relative to measured preproject water levels, and well yield has been lowered by project pumping. The type and extent of mitigation shall be determined by the amount of water level decline and site-specific well construction and water use characteristics. The mitigation of impacts will be determined as set forth in Item D above.

6. No later than 30 days after CPM approval of the well drawdown analysis, the project owner shall submit to the CPM for review and approval all documentation and calculations describing necessary compensation for energy costs associated with additional lift requirements.

7. The project owner shall submit to the CPM all calculations, along with any letters signed by the well owners indicating agreement with the calculations, and the name and phone numbers of those well owners that do not agree with the calculations.

8. If mitigation includes monetary compensation, the project owner shall provide documentation to the CPM that compensation payments have been made by March 31 of each year of project operation or, if a lump-sum payment is made, payment shall be made by March 31 of the following year. Within 30 days after compensation is paid, the project owner shall submit to the CPM a compliance report describing compensation for increased energy costs necessary to comply with the provisions of this condition.

9. After the first 5-year operational and monitoring period, and every subsequent 5-year period, the project owner shall submit a 5-year monitoring report to the CPM for review and approval. This report shall contain all monitoring data collected and provide a summary of the findings and a recommendation about whether the frequency of water level measurements should be revised or eliminated.

10. During the life of the project, the project owner shall provide to the CPM all monitoring reports, complaints, studies, and other relevant data within 10 days of being received by the project owner.

Fourth quarter water quality report submitted to CPM on 03/28/2014  CPM provided comments, report resubmitted on 04/25/2014.

SOIL&WATER-9

Prior to the start of construction of the sanitary waste system, the project owner shall submit to the County of San Bernardino for review and comment, and to the CPM for review and approval, plans for the construction and operation of the project’s proposed sanitary waste septic system and leach field. These plans shall comply with the requirements set forth in County of San Bernardino Code Title 3, Division 3, Chapter 8 Waste Management, Article 5, Liquid Waste Disposal and Title 6, Division 3, Chapter 3, and the Uniform Plumbing Code. Project construction shall not proceed until the CPM has approved the plans. The project owner shall remain in compliance with the San Bernardino County code requirements for the life of the project.

The septic plans were submitted to CEC on 04/03/2012 for review and approval. CEC approved on 04/23/2012. Plans were resubmitted to SBC on 12/16/2013 to include the addition of the sanitary lift station, comments received regarding the addition and reason for the sanitary lift station, package resubmitted to SBC on 02/19/2014, SBC approved on 02/20/2014. Plans were submitted to CPM on 02/28/2014, CPM approved on 04/23/2014.
SOIL&WATER-10

The project owner shall obtain a permit to operate a nontransient, non-community water system with the County of San Bernardino at least sixty (60) days prior to commencement of construction at the site. The project owner shall supply updates annually for all monitoring requirements and submittals to County of San Bernardino related to the permit, and proof of annual renewal of the operating permit. To date, potable water system is not installed, thus no monitoring requirements are in effect.

Alpha #1 well permit issued by San Bernardino County on 01/10/2012.
Alpha #2 well permit issued by San Bernardino County on 01/10/2012.
Beta #3 well permit issued by San Bernardino County on 06/04/2012.

Non-transient, non-community water system submitted to SBC on 05/05/2014, please see attachment.

GEN-2

Provide schedule updates in the monthly compliance report.

All engineering disciplines have submitted updated master drawing/spec lists. In addition, the latest construction schedule has been provided. Please see attached copies.

CIVIL-1

At least 15 days (or project owner and CBO approved alternative time frame) prior to the start of site grading the project owner shall submit the documents described above to the CBO for design review and approval. In the next monthly compliance report following the CBO’s approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.

STRUC-1

Submit to the CPM, in the next monthly compliance report, a copy of a statement from the CBO that the proposed structural plans, specifications, and calculations have been approved and comply with the requirements set forth in applicable engineering LORS.

Struc-1-45.03: Alpha & Beta Water Treatment Building Motor Control Center Room Raised Floor Structural plans submitted to CBO on 04/15/2014, CBO approval on 05/21/2014, please see attachment.

Struc-1-45.03x1: Alpha & Beta Water Treatment Building Motor Control Center Room Raised Floor plans submitted to CBO on 05/23/2014, CBO approval on 05/29/2014, please see attachment.
Struc-1-77.00: Alpha & Beta Miscellaneous Stair Foundation plans submitted to CBO on 04/25/2014, CBO approved on 05/01/2014, please see attachment.
Struc-1-77.01: Alpha & Beta Miscellaneous Stairs Structure plans submitted to CBO on 04/25/2014, CBO approved on 05/01/2014, please see attachment.
Struc-1-78.00: Alpha & Beta Outdoor SP Transformer Foundation plans submitted to CBO on 04/29/2014, CBO approved on 05/06/2014, please see attachment.

MECH-1

Send the CPM a copy of the transmittal letter.

Mech-1-16.02: Alpha & Beta Expansion Vessel Fire Protection plans submitted to CBO on 08/22/2013, CBO approved on 05/08/2014, please see attachment.
Mech-1-48.00: Alpha & Beta Service testing of water treatment and utility lines submitted to CBO on 04/28/2014, CBO approved on 05/05/2014, please see attachment.

ECN-1

Send the CPM a copy of the transmittal letter in the next monthly compliance report.

ELEC-1

Send the CPM a copy of the transmittal letter in the next monthly compliance report.

Elec-1-14.01x3: One-Line Diagram Panels 22 submitted to CBO on 05/13/2014, CBO approved on 05/20/2014, please see attachment.
Elec-1-14.01x4: One-Line Diagram Panels 26 submitted to CBO on 05/13/2014, CBO approved on 05/20/2014, please see attachment.
Elec-1-14.01x5: One-Line Diagram Panels 27 submitted to CBO on 05/13/2014, CBO approved on 05/20/2014, please see attachment.
Elec-1-14.01x6: One-Line Diagram Panels Misc submitted to CBO on 05/13/2014, CBO approved on 05/20/2014, please see attachment.
Elec-1-25.00x2: One-Line Diagram 5kV Distribution system submitted to CBO on 04/29/2014, CBO approved on 05/06/2014, please see attachment.
Elec-1-29.00x2: Alpha & Beta Electrical Layout for Bldgs 22, 26 & 27 submitted to CBO on 05/05/2014, CBO approved on 05/13/2014, please see attachment.
Elec-1-31.00x1: Alpha & Beta One-Line Diagram Bldg 10 submitted to CBO on 04/30/2014, CBO approved on 05/06/2014, please see attachment.
Elec-1-42.07: Alpha & Beta Temporary Power for Air Compressor submitted to CBO on 05/09/2014, CBO approved on 05/21/2014, please see attachment.
Elec-1-47.00: Alpha & Beta Electrical plans for the Heat Trace Cables submitted to CBO on 04/08/2014, CBO approved on 05/13/2014, please see attachment.
Elec-1-49.00: Alpha & Beta Temporary Power for Admin Bldgs Sewer Liftstation submitted to CBO on 05/09/2014, CBO approved on 05/14/2014, please see attachment.
TRANS-5 [A/T]

The project owner shall not allow hazardous materials deliveries during non-daylight periods (during both construction and operation) to enhance safety at the rail crossing. A record of hazardous materials deliveries shall be provided to the CPM as required in HAZ-3. Please see attached Beck Oil delivery lists and HTF delivery list.

TSE-1

Provide schedule updates in the MCR. Please see attached Electrical Master List.

TSE-4

At least 30 days (or a lesser number of days mutually agreed to by the project owner and the CBO) prior to the start of each increment of construction, the project owner shall submit to the CBO for review and approval the final design plans, specifications and calculations for equipment and systems of the power plant switchyard, outlet line and termination, including a copy of the signed and stamped statement from the responsible electrical engineer attesting to compliance with the applicable LORS, and send the CPM a copy of the transmittal letter in the next Monthly Compliance Report. The following activities shall be reported in the Monthly Compliance Report:

A. Receipt or delay of major electrical equipment; Please see attached list of receipt of major electrical equipment.
B. Testing or energization of major electrical equipment; Please see attachments for electrical tests to date.
C. The number of electrical drawings approved, submitted for approval, and still to be submitted. Please see attached Electrical Master List.

TSE-5

At least 60 days prior to the start of construction of transmission facilities (or a lesser number of days mutually agreed to by the project owner and CBO), the project owner shall submit to the CBO for approval:

A. Design drawings, specifications and calculations conforming with CPUC General Order 95 or NESC, Title 8, Articles 35, 36 and 37 of the “High Voltage Electric Safety Orders”, NEC, applicable interconnection standards and related industry standards, for the poles/towers, foundations, anchor bolts, conductors, grounding systems and major switchyard equipment.

B. For each element of the transmission facilities identified above, the submittal package to the CBO shall contain the design criteria, a discussion of the calculation method(s), a sample calculation based on “worst case conditions” and a statement signed and sealed by the registered engineer in responsible charge, or other acceptable alternative verification, that the transmission element(s) will conform with CPUC General Order 95 or NESC, Title 8, California Code of Regulations, Articles 35, 36 and 37 of the, “High Voltage Electric Safety Orders”, NEC, applicable interconnection standards, and
related industry standards.

C. Electrical one-line diagrams signed and sealed by the registered professional electrical engineer in responsible charge, a route map, and an engineering description of equipment and the configurations covered by requirements TSE-5 a) through f) above. 7 Worst case conditions for the foundations would include for instance, a dead-end or angle pole.

D. The Special Protection System (SPS) sequencing and timing if applicable shall be provided concurrently to the CPM.

E. A letter stating the mitigation measures or projects selected by the transmission owners for each reliability criteria violation are acceptable,

F. An Operational study report based on the expected or current COD from the California ISO and/or SCE, and

G. A copy of the executed LGIA signed by the California ISO and the project owner.

Submittal of project LGIA sent to CPM on 11/08/2013, CPM approved on 12/02/2013.

**TLSN-5**

The project owner shall ensure that all permanent metallic objects within the right-of-way of the project-related lines are grounded according to industry standards regardless of ownership.

At least 30 days before the lines are energized, the project owner shall transmit to the CPM a letter confirming compliance with this Condition.

Confirmation letter sent to the CPM on 11/06/2013, CPM approved on 11/07/2013.

**VIS-1**

*Revised Surface Treatment Package was submitted to CPM on 04/14/2014. CPM approved plans on 05/16/2014, please see attachments.*

**VIS-3**

*Permanent Lighting plans. Package was submitted to CPM on 05/05/2014. CPM approved plans on 05/05/2014, please see attachment.*

Should you have any questions or need any additional information, please do not hesitate to contact me.

Sincerely,

[Signature]
Steven Pochmara

ABEINSA EPC

13911 Park Avenue, Suite 208
Victorville, CA 92392
Cell: (480) 287-1419
# KEY EVENTS LIST

**PROJECT:** MOJAVE SOLAR PROJECT  
**DOCKET #:** 09-AFC-5  
**COMPLIANCE PROJECT MANAGER:** DALE RUNDOQUIST

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LETTER OF TRANSMITTAL

Date: May 27, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-12
Description: Specifications for the ullage/expansion vent system.
Submittal No.: AQ-12-01-00
To: Mr. Chris Anderson
Mojave Desert Air Quality
Management District

WE ARE SENDING YOU

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Title</th>
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<tr>
<td>AQ-12 Cover Letter</td>
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<td>AQ-12 Technical Memorandum HTF Expansion System Basis</td>
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<td>6007-ESP-ATP-44-62-F206</td>
<td>Specification For Carbon Filters</td>
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<td>6007-ESP-ATP-44-62-V208</td>
<td>Specification For HTF Scrubbers</td>
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<td>6007-ESP-ATP-58-62-V200D</td>
<td>Data Sheet (2 of 2) HTF Expansion Vessels mv-205A, B, C.</td>
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THESE ARE TRANSMITTED as checked below:

☒ For Review

REMARKS

COPY TO: File
SIGNED BY: Vernon D. Leeming
Permitting Engineer
ABEINSA EPC
Cover Letter

Date: May 27, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-12
Description: Specifications for the ullage/expansion vent system.
Submittal No.: AQ-12-01-00

Mr. Chris Anderson
Mojave Desert Air Quality
Management District.
Permitting Department
14306 Park Ave
Victorville CA 92392
canderson@mdaqmd.ca.gov

Dear Mr. Anderson,

In compliance with AQ-12 we are submitting the Specifications for the ullage/expansion vent system of the Mojave Solar Project for your review.

For your convenience, we are including the Compliance language below:

AQ-12 The ullage/expansion system nitrogen venting shall be carried out only through vents which have vapor condensing coolers which shall be maintained at or below 120 degrees Fahrenheit. District permit numbers C012015 and C012016.

Verification: The project owner shall provide the District and CPM manufacturer design specifications showing compliance with this condition at least 30 days prior to the installation of the ullage/expansion vent system. The project owner shall have active temperature gauges that can be inspected to show compliance with this condition.

Should you have any questions or comments, please don’t hesitate to contact me.

COPY TO: ___________________________ SIGNED BY: ___________________________

Vernon D. Leeming
Permitting Engineer
ABEINSA EPC
HTF Expansion System Basis

The heat transfer fluid (HTF) will be Therminol VP-1, produced by Solutia, Inc., which is comprised of diphenyl oxide (73 - 73.5%) and biphenyl (26.5 - 27%). This material in gaseous form represents VOCs. As the HTF is normally cycled from 422 °F to 740 °F every day, there will be some degradation of the HTF. This degradation will result in primarily benzene and phenol with smaller concentrations of toluene and naphthalene. These degradation products will affect the thermal efficiency of the HTF and increase vapor pressure. Benzene is classified as a hazardous air pollutant (HAP) and the plant’s ullage system design basis is to limit the amount of benzene released to the atmosphere, as well as limit the overall VOC emissions. Both benzene and VOC emissions are expected to be below the allowable threshold as currently permitted.

Based on Solutia’s simulations and lab/field tests, daily degraded low boilers are calculated to be approximately 128.6 lbs/day per plant (257.1 lbs/day for both plants).

The Mojave project has two identical Alpha and Beta plants. The numbers on the following flow diagram are representative of a single plant and the total project site is expected to have twice the numbers listed on the diagram. The HTF system of each plant will consist of 4 vertical ASME-rated expansion vessels, one horizontal ASME rated condensate receiver vessel, one ullage condenser, two ullage scrubbing units, two sets of activated carbon filters, and two vertical HTF overflow tanks.

These expansion vessels and the condensate receiver vessels will be sized such that during normal operation, the expansion of the HTF will: first, allow the nitrogen / vapor space pressure to increase from 8 bara to 12 bara nominally; and second, vent the volume of vapor space equivalent to the remaining expansion of the HTF to operating temperature, through the ullage system. However, after filling all pipes initially at ambient temperature (with high density – lower specific volume), the expansion of the HTF from the ambient temperature to the daily operating temperatures will push the HTF that is not needed in the system during daily operation into two overflow tanks that will be kept cooler (at about 150 °F) and blanketed with 2-15 inches Water Column (in. WC) of nitrogen.

During daytime operation, when the HTF is heated and expands, the expanded volume will move into the expansion vessels and the nitrogen will be compressed until the pressure reaches 12 bara, upon which any additional volume expansion will push the equivalent volume of vapor space through the ullage system. This additional volume being vented will be condensed in a nitrogen ullage condenser, stored in the pressurized, horizontal condensate receiver vessel, and pumped back into the system. At night, when the HTF cools and contracts, the HTF will move back into the system piping and allow the vapor
Types of Venting

There are two types of venting from the HTF system:

- the venting of nitrogen due to HTF overflow tank breathing
- the daily venting of vapor space due to HTF expansion into the expansion vessels.

Overflow Tank Venting: As indicated above, during most normal operation, there will be no exchange of HTF or nitrogen between the expansion vessels and the overflow tanks. However, during the winter months when the HTF temperature drops below the normal daily range, some of the HTF in the overflow tanks may need to be transferred into the expansion vessels to maintain the minimum expansion tank’s level. During these conditions, the overflow tank levels may fall and rise, thus requiring nitrogen space venting.

The worst case would be if the HTF system became very cold (limited to 120 °F) after a few days of no sun, in which case all the HTF from the overflow tanks would be pumped back into the system. The next time the system is brought back to normal operation, all of the HTF that was pumped out of the overflow tanks would return to the overflow tanks. Under that condition, the total amount of nitrogen vented is calculated to be 24,731 cu ft total for both plants.

The overflow tanks have vent scrubbers on their stacks before feeding into the carbon filters. Nitrogen and HTF mixture to be released passes through these scrubbers where it is cooled to 117 °F by the cooled liquid HTF stream flowing countercurrent. This overflow tank vent scrubber will condense most of the HTF vapor vented from the overflow tanks before reaching the carbon filters. The overflow tanks have a design temperature of 350 °F, but the worst case vapor space temperature has been calculated to be around 250 °F. The overflow tanks are designed to be maintained at 150 °F to minimize HTF venting but at the same time be sufficiently higher than the heat tracing (electric heating) initiation temperature of 120 °F. The HTF overflow tank has a liquid HTF cooler to maintain this tank’s temperature at 150 °F.
Expansion Vessel Venting: As the HTF expands and contracts daily into and out of the expansion vessels, the LB’s along with some vaporous HTF will be released into the vapor space. To help this separation of LB’s into the vapor space, a side stream of HTF will also be sprayed to the top of the expansion vessels continuously. As the expansion vessels fill up with HTF, the nitrogen space is compressed until the pressure reaches 12 bara, upon which the vent valve opens and allows any further expansion to force the vapor space through the ullage system. The nitrogen + vapors will be pushed through the nitrogen ullage condenser, where most of the HTF and low boiler degradation products will be condensed and collected in the low boiler condensate receiver vessel. The nitrogen and other non-condensable constituents will pass through the expansion vessel vent scrubber where the 117 °F, countercurrent liquid HTF flow will bring even more HTF and low boilers into the liquid phase. The nitrogen, degradation products, and vaporous HTF remaining in the vapor phase at the exit of the scrubber will enter the carbon filters for further cleaning before venting to the atmosphere.

Low Boilers Removal Scheme: The HTF system is sized to minimize the nitrogen venting due to HTF expansion. On a daily basis, the low boilers and some HTF will be vented from the expansion vessels. Since the vessels are first allowed to pressurize from 8 bara to 12 bara, the amount of nitrogen being vented is reduced and is equivalent to the volume of four expansion vessels from the 27% level to the 72% level (normal operating level), or 45% of the total volume of the four expansion vessels. This vented nitrogen at 12 bar (174 psia) will include small amounts of HTF and HTF degraded by-products, the LB’s.

An ASPEN simulation predicted that it is better to condense the low boilers under pressure than to expand the mixture and cool it. The expansion vessel’s vent stream is cooled to 120 °F at 174 psia through a water-cooled nitrogen ullage condenser. The non-condensable vapors and nitrogen remaining in the vent stream will be passed through the rest of the ullage system for further cleaning before venting to the atmosphere. The condensed HTF along with low boilers will be sent to the low boiler condensate receiver vessel for temporary storage. The condensate stored in the receiver vessel will be pumped back into the main system.

Release Control Efficiency: Expected VOC emissions, per plant, from nitrogen venting are thus 0.47 lb/day HTF with a maximum of 27% or 0.13 lb/day comprised of biphenyl; 1.68 lbs/day of benzene, toluene, and phenol; and 0.02 lb/day high boilers, primarily dibenzofuran. Of this 1.68 lbs/day low boiler venting, 1.39 lbs/day of this is Benzene, which is within the present permit level of 1.9 lbs/day for this HAP venting. The Title V threshold for hazardous air pollutants is 10 tons/year for any individual HAP. So the HTF and benzene release, as calculated, is much less than the maximum allowable level.

Based on the calculations submitted, this control reduces the potential mass of HTF released, per plant, from 4921 lbs/day to 0.47 lbs/day resulting in an overall VOC control efficiency of about 99.99%. These results are outlined on the attached Process Flow Block Diagram.

Based on the above design considerations and system control efficiency, the project is not anticipating the need for any additional add-on VOC controls.

Emissions Summary
Therefore, the HTF overflow and expansion venting system will result in VOC (HTF plus low boiler and high boiler compounds) emissions on the order of 9.45 lbs/hr, 4.33 lbs/day (based on 40 minutes/day of expansion vessel venting and 20 minutes/day of overflow tank venting), 1,581 lbs/year, or 0.791 tpy for the entire facility. VOC emissions for a single power block would be approximately 4.73 lbs/hr, 2.17 lbs/day (based on 40 minutes/day of expansion vessel venting and 20 minutes/day of overflow tank venting), 791 lbs/yr, or 0.395 tpy. The VOC emissions is broken down by component in the table shown on the next page and the values for the HTF overflow and expansion venting emissions represents the emissions for a single power block. The most stringent permitted value is for the Benzene emissions, which is permitted at an HAP emission level of 1.9 lbs/day. With 95% efficient carbon filters, the Benzene emissions will be 3.06 lbs/hr, 1.39 lbs/day, 506.79 lbs/yr, or 0.253 tpy per power block.

HTF VOC fugitive emissions from valves, flanges, pumps, seals, etc., will be 1.34 lbs/hr, 21.33 lbs/day, 7,784 lbs/year, or 3.89 tpy, based on the data and assumptions in the VOC Component Count and Emissions spreadsheet attached at the end of this report.

The following table includes a breakdown of emissions on a component basis for both the HTF overflow and expansion venting emissions and HTF fugitive emissions and the values listed in the table represent values for a single power block:

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<th>Compound</th>
<th>HTF Overflow and Expansion Venting Emissions</th>
<th>HTF Fugitive Emissions</th>
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<td>lbs/hr Maximum</td>
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<td>Diphenyl ether</td>
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<td>Biphenyl</td>
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Waste hauling (total load-out emissions for the 250 MW facility), when needed (initially it is not expected to be needed for several years) will be approximately 0.0013 lbs/hr, 0.0013 lbs/day, 0.0157 lbs/yr, or 7.84E-6 tpy. These emissions are based on the following data and assumptions:

a) 12 facility load-outs per year (1 per month) maximum.

b) 2 hours per load-out (1 hour at each power block). The actual load-out pumping or transfer time will be less than an hour, but an hour was used as the basic emission period.

c) VOC emissions loss rate is ~0.0013 lbs/hr (based upon the haul truck evacuated vapor space volume and VOC concentration in the vapor per facility load-out).
## HTF System Component Count and Fugitive Emissions Estimate

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Notes:
1. The component counts listed above are the actual number of each component purchased as of 04/05/2013, with a 10% margin.
2. The Emission Factor (EF) values listed above and guidance for light liquid vs. heavy liquid operating hours came from the following source: CEC, Supplemental Staff Assessment - Part B, Abengoa Mojave Solar, May 2010, 09-AFC-5, CEC-700-2010-003-SUPB.
### ABENER TEYMA MOJAVE

**Specification For Carbon Filters**

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| Dated : | |
|---------| |
| 11/28/12| |

**Instructions:**

1. Initialing (By/Chk’d/App’d) required on cover sheet only. All other title block information must be included on all pages.

2. Revisions are identified in the body of the Specification.

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<th>Date</th>
<th>By</th>
<th>Chk’d</th>
<th>App’d</th>
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EC-94 (Rev. 05/2011)
1. **Project Summary**

1.1 The project consists of two, 140 MW, parabolic trough solar power plants, referred to as Alpha Plant and Beta Plant. The plants will be built on adjacent sites in an unincorporated area of San Bernardino County near Hinkley, California. The plant sites are located approximately six miles north of highway CA-58 on Harper Lake Road, approximately 20 miles west of Barstow.

1.2 The Vendor shall furnish carbon filters for each plant site meeting the requirements set forth in this specification. This specification covers the minimum requirements for the performance, design, materials, fabrication, testing and delivery of the filters.

2. **General**

2.1 The attachments identified in this document are considered to be part of this specification. Attached specifications shall be met and followed by the Vendor in full. All drawings and documents included in this package are considered “Contract Documents”.

2.2 **Definitions**

a. “Vendor” shall mean “Condorchem Envitech” for which this specification is intended.

b. “Engineer”, “Purchaser” or “Customer” shall mean the “Abener Teyma Mojave General Partnership”.

c. “Owner” shall mean “Mojave Solar LLC”.

d. “Construction Manager” or “Construction Superintendent” shall mean “Abener Teyma Mojave General Partnership”.

2.3 The imperative language of this specification is directed to the Vendor, unless specifically noted otherwise. All directives such as “provide”, “perform”, “test”, etc., are addressed solely to Vendor, whether or not the word “Vendor” is specifically mentioned. Work by Others will be specifically identified.
3. **Function**

The carbon filters will be used to minimize the emission of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) to the atmosphere. The VOC emissions will be Heat Transfer Fluid (HTF) vapors (di-phenyl ether and biphenyl) and its degradation products including, benzene, toluene, and phenol in nitrogen vented from the HTF Overflow Tanks and the HTF Expansion Vessels.

4. **Operation**

The HTF vapors and nitrogen will be displaced from the HTF Overflow Tanks and HTF Expansion Vessels due to thermal expansion of the HTF as it is warmed to operating temperatures each day. The HTF system will be vented as needed to control the maximum system pressure. The HTF Overflow Tank vent gases will pass through a HTF Scrubber prior to entering the filter. The HTF expansion vessel vent gases will pass through an ullage cooler, condensate receiver and a HTF Scrubber prior to entering the filter. The HTF Overflow Tanks will vent for approximately 20 minutes per day, when required. The HTF Expansion Vessel will vent approximately 40 minutes each day. The venting from the overflow tanks and the expansion vessels will be sequential and not simultaneous.

5. **Location**

5.1 The filters shall be installed outdoors. For proposal purposes, assume the filters will be on a concrete foundation at grade.

5.2 Electrical Area Classification - The filters will be installed in an area that is classified as a Class I Division 2 location per NEC 500.5 (Classification of Locations).

5.3 The equipment shall be designed to meet all design and climatic conditions set forth in this specification. Refer to specification 6007-ESP-ATP-00-60-G100 Project Design Criteria, for site specific information.
6. **Schedule**

The vendor shall propose the best available delivery. Vendor’s schedule shall comply with the Abener Teyma project schedule.

7. **Scope**

7.1 Vendor shall design, fabricate, assemble, inspect, test, pack and ship the carbon filters as specified herein.

7.2 Vendor shall furnish four sets of carbon filters; one set for the Alpha plant and one set for the Beta plant. The general arrangement will be two vessels installed in parallel, one for low pressure stream (Overflow Tanks) and one for high pressure stream (Expansion Vessels) per plant.

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<tr>
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<th>Tag Number</th>
<th>Plant Site</th>
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<td>Carbon Filter</td>
<td>B-MF-206 D</td>
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7.3 The vendor will provide the following:

a. Filter vessels
b. Vessel nozzles
c. Manways
d. Piping, valves, and distribution manifolds within the vessels
e. Supports for internal components
f. Vessel support legs and seismic restraints
g. Anchor bolt design
h. Grounding lugs

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### Specification For Carbon Filters

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1. Filter media, (1st fill)
2. Start up and commissioning spare parts (Quote as a separate line item.)
3. Spare parts for one year of operation (Quote as a separate line item.)
4. Other items as specified on the Equipment Data Sheets

**m. Rupture Disk Alarm for PSV**

**n. Inlet ductwork for 2 vessels with 2 wafer valves**

**o. Outlet ductwork for 2 vessels with 2 wafer valves**

**p. Two test ports for each carbon filter sets (inlet and outlet)**

**q. Four vessel support legs**

**r. Lifting Lugs**

**s. Spiral Wound Gaskets**

**t. 4 load cells complete with high speed digital weight indicator and mounting accessories**

**u. Pressure/vacuum safety valve (Rupture disk and spare for startup)**

**v. Ladder and inspection platform**

**w. Pressure transmitters for inlet and outlet for each filter sets**

**x. Junction boxes**

**y. Flanges**

#### 7.4 Vendor Data

The Vendor shall furnish the Vendor Submittal Data for the Carbon Filters as specified here-in. Refer to specification 6007-ESP-ATP-44-62-F206V for additional Vendor Data Requirements.

#### 7.5 Work By Others

The following is out of the scope of this specification:

a. Receiving, unloading, storage and handling of the filters on site
b. Installation of the filters
c. Foundations
d. Furnishing and installation of anchor bolts
e. Piping prior to the inlet flange of the filters and after the outlet flange of the filters
f. Interconnecting piping between the filter vessels

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g. Supply of any required utilities to the filters.

8. Performance

8.1 The vendor supplied equipment shall meet the performance requirements defined in this specification and under the column marked “Abener Teyma Requirement” on the Data Sheets; included herein.

8.2 The vendor shall provide with his quotation guaranteed final vent values for Benzene and Toluene at the design flow rate.

8.3 The vendor shall provide with his quotation the “expected” final vent values for all the gas constituents at the design flow rate.

8.4 Vendor shall have sole responsibility for meeting the performance requirements. Vendor shall provide all equipment, appurtenances, and accessories required in order to meet this performance.

8.5 The vendor shall determine the optimal filter design including; vessel arrangement, vessel dimensions, filter media, media depth, and gas distribution system to meet these requirements.

8.6 The filters (including any auxiliaries) shall be designed and constructed for a minimum service life of 30 years.

8.7 The vendor shall provide with his quotation the expected life of the filter media.

9. Codes and Standards

9.1 At a minimum all applicable portions of the codes and standards listed below shall be followed.

a. AISI – American Iron and Steel Institute
b. ANSI – American National Standards Institute
c. ASME – American Society of Mechanical Engineers
d. ASTM – American Society of Testing Materials

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e. AWS – American Welding Society
f. CAL/OSHA – California Occupational Safety and Health Administration
g. CBC – California Building Standards Code (2010)
h. EPA – Environmental Protection Agency
i. NEC – National Electric Code
j. NFPA – National Fire Protection Association
k. OSHA – Occupational Safety and Health Act
l. SSPC – The Society for Protective Coatings

9.2 Vendor shall meet all federal, state, and local laws and regulations.

9.3 Should there be any conflict between applicable codes, standards, specifications noted herein or vendor’s recommendations and those of the locality of the project, the more stringent code shall apply.

10. Design

10.1 General

10.1.1 The vendor shall design the filters to meet the operating conditions and performance requirements set forth in this specification. Any conflicts between the specification, the data sheets and the appropriate codes and standards shall be referred to Abener Teyma for resolution.

10.2 Vessels

10.2.1 The carbon filters, being low pressure vessels, may be non-code vessels and do not require an ASME code stamp.

10.2.2 Vessels shall be designed to withstand internal or external pressure and mechanical loads induced by vessel dead load, process, contents, earthquake, wind and other specified loadings. Wind and earthquake loads shall be in accordance with the Project Design Criteria described in Specification 6007-ESP-ATP-00-60-G001. Load
combinations must be appropriately considered. Structural / seismic design calculations are required.

10.2.3 All vessels shall have physical dimensions within the allowable limits for shipping, and shall be completely shop fabricated and tested prior to shipping.

10.2.4 Vendor shall furnish the vessels complete as shown on data sheets and as noted herein and shall include all necessary nozzles, blind flanges, studs, nuts, bolts, clips, support brackets, lifting lugs, davits, and gaskets.

10.2.5 The design shall be such to avoid any corrosion of vessel equipment.

10.2.6 The design shall be such to avoid any contamination of the vessel contents once the vessel is put into service.

10.2.7 The layout of weld seams shall be such that it will allow full access for inspection. Circumferential seams shall not be located within a distance of 1-1/2" of any external compression ring, internal ring, support ring, etc. Nozzles and manholes shall not intersect any weld seams, unless approved by Abener Teyma.

10.2.8 Pressure and Vacuum Relief

(1) The vendor shall furnish and install pressure and vacuum relief to protect the vessel from damage due to over pressurization or vacuum.

10.2.9 Nozzles

(1) Vendor to indicate on project drawings the maximum allowable loads on nozzles. Minimum design of nozzles shall be in accordance with specification 6007-ESP-ATP-00-60-G130, Required Allowable Nozzle Loads.

(2) Vendor shall extend nozzles 6 inches beyond the exterior surface of the vessel unless otherwise specified.
(3) All nozzles shall be flush at the interior surface of the vessel wall, unless otherwise specified.

(4) Nozzle sizes and locations shall be coordinated with Abener engineering prior to fabrication. Abener will review locations and sizes on the submittal drawings.

(5) Vendor shall provide sample ports

10.2.10 Manways

(1) Two (2) manways shall be provided in each vessel for accessing and ventilating the filter interior.

(2) Manways shall be located to provide easy access for maintenance and cleaning of the filter.

(3) Manway covers shall be equipped with hinges or davits and handles to aid in removing and replacing the covers.

10.2.11 Lifting Lugs

(1) Vessels shall include lifting lugs and tailing lugs, designed by vendor, for use in loading, unloading, and field erection of vessel. Empty weight shall be marked on the vessel by using lettering no less than 6 inches high.

10.2.12 Anchor Bolts

(1) Anchor bolts shall be furnished by Abener Teyma as sized and selected by the Vendor. Vendor shall specify bolt material, size, and quantities and provide drawings and loading diagrams for structural design.
10.2.13 Ground Lugs

1. Each filter shall include two stainless steel grounding lugs. Grounding lugs shall be a minimum of 3” wide x 3 “tall x ½” thick plates, and shall be made of 304 grade stainless steel. The grounding lugs shall be drilled to match “Burndy Qiklug” type “QA28-2N” which utilizes NEMA bolt spacing. Grounding lugs shall be welded to the vessel support lugs. The lugs shall be oriented so that the holes in the lug are on the vertical centerline.

10.2.14 Vessel Internals

1. The filter shall be designed to prevent channeling and provide a uniform gas velocity across the filter cross section.

2. The gas velocity through the filter shall not cause the carbon media to be fluidized.

3. The maximum pressure drop from the inlet to outlet of the filter set shall not exceed the value listed in the equipment data sheet.

4. The vendor shall design the filters to allow for complete removal and re-filling of the filter media.

5. The vendor shall state the maximum allowable gas flow and inlet pressure to the filters.

6. The vendor shall provide the operator a means of determining the remaining media life.

10.3 Media

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10.3.1 The filter media should be coal based pellet and depth of media shall be by the vendor.

10.3.2 The Vendor shall provide the 1st fill of media for the filters.

10.3.3 The vendor shall provide instructions and on-site supervision of the first media fill and the first media replacement.

10.4 Materials of Construction

10.4.1 All materials shall be new and free from defects.

10.4.2 Materials of construction shall be per the attached data sheet. Where materials of construction are not specified, Vendor shall propose materials for each item as appropriate for the service conditions.

10.4.3 All materials purchased by Vendor shall meet nationally recognized standards unless otherwise approved by Abener Teyma.

10.4.4 All vessel materials shall be compatible with the vessel contents and in accordance with all applicable welding procedures.

10.4.5 Copies of mill test reports for materials shall be provided to Abener Teyma by Vendor.

10.4.6 Asbestos or material containing asbestos shall not be used in the construction or manufacture of the equipment.

10.5 Insulation and Heat Tracing

10.5.1 The filters vessels will not be insulated or heat traced.

10.6 Painting

10.6.1 Vessel exteriors shall be painted per manufactures standard.
10.7 Nameplate

10.7.1 Permanent stainless steel nameplates shall be fixed to each vessel including, but is not limited to, the following information:

1. Customers Equipment Number
2. Customers Equipment Name
3. Customers PO number
4. Nominal Diameter
5. Nominal Overall Length
6. Empty Weight
7. Internal Capacity
8. Design Specific Gravity
9. Material of Construction

10.7.2 The location of the tag shall be determined during drawing review.

11. Submittals

11.1 Vendor shall provide engineering drawings and calculations for approval prior to the start of fabrication.

11.2 Refer to and comply with specification 6007-ESP-ANC-44-62-F206V, Vendor Data Requirements – Carbon Filters.

11.3 Approval of Vendor’s drawings and calculations is limited to verifying general compliance with specifications and design drawings, and does not imply verification of dimensions, quantities, or calculations. Vendor is not relieved from responsibility for accurate dimensioning, equipment sizing, fabrication to required tolerances, and fabrication fit-up.
11.4 U. S. customary units shall be used on all drawings and calculations.

11.5 Drawings:

11.5.1 A general arrangement drawing shall be furnished for each vessel. The general arrangement drawing shall include:

1. Overall dimensions of the vessel,
2. Size and location and orientation of all nozzles and connections,
3. Size and locations of manways,
4. Anchor bolt layout,
5. Required clearances for media replacement and other maintenance access,
6. Vessel data:
   i. Empty weight, shipping weight, operating weight, flooded weight
   ii. Shell dimensions
   iii. Shell thickness
   iv. Head style and dimensions
   v. Head thickness (nominal)
   vi. Head volume
   vii. Total volume
   viii. Maximum and minimum allowable working pressures
   ix. Materials of construction
7. Location of the vessel nameplate and the actual data to be inscribed on the name plate.

11.5.2 Vendor shall provide all drawings that are issued for fabrication, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

11.6 Data and Calculations

11.6.1 Design calculations (including lifting attachments and support lugs) made by the Vendor shall be furnished prior to or along with submission of drawings for approval. When calculations are made using a computer, all input data, assumptions, computer program version used, and a summary of the results shall be furnished.
11.6.2 Vendor shall provide their structural calculation package, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

12. Fabrication

12.1 Any fabrication sub-contracted to others shall require written approval by Abener Teyma.

12.2 All plate and other material used in the execution of this work shall be new and clean stock, free from surface laminations and other physical imperfections.

12.3 The axis of any nozzle on the vessel shell shall be radial and perpendicular to the longitudinal axis of the vessel unless otherwise specified. The axis of any nozzle on the vessel head shall be parallel to the longitudinal axis of the vessel unless otherwise specified. The flange face shall be perpendicular to the nozzle axis. All welds protruding beyond the flange face shall be ground flush.

12.4 Flange bolt holes of shell nozzles shall straddle the axial center line.

12.5 Vendor shall prepare weld end nozzles end face in accordance with ASME B31.3 and ASME B16.25. Abener Teyma shall review each weld end nozzle face prior to protection for shipment. Vendor is to protect each weld end nozzle face against damage during handling and transporting.

12.6 All permanent attachments, stiffeners, clip angles, ring angles, etc., shall be joined to vessels by continuous welding, unless approved otherwise by Abener Teyma.

12.7 Remove all sharp edges and burrs.

12.8 All welds and surfaces shall be free of gouges, pits, cracks or other surface defects.

12.9 All welds and materials discovered to be non-compliant through inspection and/or testing shall be fully repaired at vendor’s cost.
12.10 Fabricated location and orientation of nozzles will be reviewed by Abener Teyma. If there are any discrepancies with project documents, the vendor will make corrections.

12.11 To prevent contamination of the vessel contents, Vendor shall mechanically clean the interior surface of the vessel to remove all weld spatter, scale, rust, filings, dirt, etc., as well as all foreign materials. Vendor shall not commence mechanical cleaning until after all testing has been completed.

13. Inspection

13.1 Abener Teyma (or an inspector on their behalf) reserves the right to inspect the equipment at any time during the course of fabrication. Abener Teyma retains the right to provide personnel to observe all fabrication work within the scope of the contracted work (including testing and inspection). Such individuals shall be afforded full and free access for these purposes, subject to safety and schedule constraints.

13.2 Inspector means Abener Teyma (or an inspector on their behalf).

13.3 Inspector shall have free access, at all reasonable times, to the areas where the work on equipment is being performed. Vendor shall notify Abener Teyma purchasing department in advance (minimum one week) of scheduled vessel testing to allow time for the Inspector to arrange to be at the test site before testing begins.

13.4 Mill and shop inspection shall not release the vendor from responsibility for replacing any defective material and for repairing any defective workmanship that may be discovered in the field.

13.5 Vendor shall submit letters of completion to Abener Teyma at least twenty days prior to the requested final inspection date. The equipment must be ready for inspection and the tests run prior to this final inspection request.
13.6 The cost of all tests due to code requirements or manufacturer’s test requirements shall be fully borne by vendor.

13.7 The carbon filter vessels shall be tested for leaks by filling with water.

13.8 A written certification of an acceptable water fill test shall be completed by vendor. The certification shall be forwarded to the individual indicated on the Abener Teyma purchase order.

14. **Shipping**

14.1 All parts shall be skidded, boxed, or otherwise suitably prepared for shipment to protect against damage while in transit.

14.2 Vendor shall refer to specification 6007-ESP-ATP-00-60-G121 for shipping and preparation requirements.

15. **Installation Information**

15.1 The Vendor shall specify with quote any detailed installation requirements.

15.2 The Vendor shall include in their quotation one set of any special tools and wrenches required for installation and maintenance.

16. **Startup, Training and Field Services**

The Vendor shall state all startup, training and field services included in bid, clearly identifying duration, number of people, and specific services provided. The Vendor shall quote any additional assistance on a per diem rate.

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17. **Qualifications**

The Vendor shall furnish equipment, designs, and materials that have been proven by successful operation for no less than five (5) years. Requests to use untried or unproven equipment, designs, or materials must be approved by the Purchaser in writing prior to incorporation into the purchase order.

18. **Warranty:**

All components of the purchased system shall be covered under warranty by the Vendor. The Vendor shall troubleshoot and repair any malfunctioning system element at no cost to the Purchaser during the warranty period. Reference commercial documentation for the warranty period and terms conditions.

19. **Guarantees:**

19.1 Vendor shall guarantee the minimum removal efficiency of Benzene and Toluene through a temperature range from 80°F up to 140°F at the design flow rates.

19.2 Vendor shall guarantee the maximum pressure drops through the filter set during expansion vessel venting and overflow tank venting.
20. Proposal Requirements

20.1 Vendor shall furnish a quote for the following equipment and services:

20.1.1 Design, materials, labor, fabrication, testing, inspection, and shipping of the equipment.

20.1.2 All parts and accessories required for complete functional Carbon Filters.

20.1.3 As a separate line item the vendor shall quote the cost of replacement carbon for a period of one year. Usage shall be based on venting of the expansion vessels and overflow tanks once per day as described in the data sheets below.

20.1.4 Submittal of data as required in the Vendor Data Requirements Specification, 6007-ESP-ATP-44-62-F206V.

20.1.5 Start-up, training and commissioning, clearly identifying duration, number of people, and specific services included in bid. The Vendor shall quote any additional assistance on a per diem rate.

20.1.6 Spare parts recommended for startup and commissioning, with quantities. Quote as a separate line item.

20.1.7 Recommended spare parts for two years of operation, with quantities. Quote as a separate line item.

20.1.8 The Vendor shall separately quote one set of any special tools and wrenches required for maintenance. Quote as a separate line item.

20.2 The Vendor’s base quotation shall consist of the equipment and services identified herein. Pricing for Purchaser identified options shall be submitted as separate line items. Vendor identified alternatives may be submitted if system improvements and/or cost savings can be realized. Vendor may propose alternate arrangements based on their experience.

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20.3 Vendor shall state their equipment Warranty in the proposal.

20.4 Vendor shall state their Performance Guarantee in the proposal.

20.5 Comments and exceptions to the specification shall be listed in a separate part of the proposal titled “Exceptions to the Specification”. All exceptions shall be listed in this section and shall reference the appropriate specification section. No other exceptions will be allowed. After the purchase order is awarded, the Vendor shall be responsible to satisfy all requirements of this specification except for the agreed upon exceptions. Any requirements that are not included with the Vendor’s equipment and are in the equipment specification shall be furnished and installed at the Vendor’s expense.

20.6 Vendor shall complete and return the Equipment Data Sheets with the proposal. Failure to submit these sheets will result in an incomplete proposal that may not be considered.

20.7 Vendor shall furnish dimensioned envelope drawings with the proposal. Drawing shall show the location of all connections, supports, estimated weights, and other pertinent data.

20.8 Vendor shall provide minimum clearances and access required for maintenance, service and operation of the filter and its components.

21. Attachments

6007-ESP-ATP-44-62-F206V  Vendor Data Requirements – Carbon Filters
6007-ESP-ATP-00-60-G100   Project Design Criteria
6007-ESP-ATP-00-60-G120   Equipment Modeling Vendor Data Requirements
6007-ESP-ATP-00-60-G121   Shipping and Preparation Requirements
6007-ESP-ATP-00-60-G130   Required Allowable Nozzle Loads
**ABENER TEYMA**
**MOJAVE**

<table>
<thead>
<tr>
<th>Specification For Carbon Filters</th>
<th>Job No.: 120010</th>
<th>Spec. No.: 6007-ESP-ATP-44-62-F206</th>
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<tbody>
<tr>
<td>Item No.: See Spec</td>
<td>No. Req’d.: See spec</td>
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<tr>
<td>Project: Mojave</td>
<td>Ref.: Issue: 1 Dated: 11/28/12</td>
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### Carbon Filters, MF-206

<table>
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<th>Data Sheets</th>
<th>Vendor:</th>
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<tbody>
<tr>
<td><strong>CARBON FILTERS MF-206C</strong></td>
<td><strong>ABENER / TEYMA REQUIREMENT</strong></td>
</tr>
</tbody>
</table>

**TYPE: EXPANSION**

Activated Carbon Bed

**DESIGN AND CONSTRUCTION**

<table>
<thead>
<tr>
<th>Vessel Design Code:</th>
<th>None</th>
</tr>
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<tbody>
<tr>
<td>Stamp:</td>
<td>Not Required</td>
</tr>
<tr>
<td>Operating Pressure:</td>
<td>≤75 to 0</td>
</tr>
<tr>
<td>in H2O</td>
<td>80 to 120</td>
</tr>
<tr>
<td>Operating Temperature:</td>
<td>84</td>
</tr>
<tr>
<td>°F</td>
<td>25 to 140</td>
</tr>
<tr>
<td>Design Pressure:</td>
<td>By vendor</td>
</tr>
<tr>
<td>in H2O</td>
<td>0.02 (STAINLESS STEEL)</td>
</tr>
<tr>
<td>Design Temperature:</td>
<td>75</td>
</tr>
<tr>
<td>°F</td>
<td>Length 108</td>
</tr>
<tr>
<td>Corrosion Allowance, in</td>
<td>128</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Filters per Plant Site</th>
<th>By vendor - (See note 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter Vessel Orientation</td>
<td>Horizontal</td>
</tr>
<tr>
<td>Vessel Dimensions</td>
<td>2 in parallel (for expansion)</td>
</tr>
</tbody>
</table>

**Inside Diameter, in.**

By vendor

**Shell Height, Seam to Seam, in.**

By vendor

**Overall Height, In.**

By vendor

**Head style / Flange height, in.**

By vendor / By vendor

**Shell Thickness, in.**

By vendor

**Head thickness, in.**

By vendor

**Head Volume, Ft³**

By vendor

**Vessel Volume, Ft³**

By vendor

**Vessel Support Legs, Qty.**

By vendor

<table>
<thead>
<tr>
<th>Nozzles / Manways</th>
<th>Size / Type / Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Inlet, in.</td>
<td>By vendor 8/150#</td>
</tr>
<tr>
<td>B - Outlet, in.</td>
<td>By vendor 8/150#</td>
</tr>
<tr>
<td>C - Media Fill, in</td>
<td>By vendor 20</td>
</tr>
<tr>
<td>D - Media Removal, in</td>
<td>By vendor 8</td>
</tr>
<tr>
<td>E - Pressure Relief, in</td>
<td>By vendor 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>JS</th>
<th>MZA</th>
<th>APF</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>11/27/2012</td>
<td>Issue for Purchase</td>
<td>JS</td>
<td>MZA</td>
<td>APF</td>
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<tr>
<td>1</td>
<td>11/13/2012</td>
<td>Re-issued for Bid</td>
<td>JS</td>
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<td>APF</td>
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<tr>
<td>0</td>
<td>3/29/2012</td>
<td>Issued for Bid</td>
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<td>APF</td>
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### Specification For Carbon Filters

**Job No.:** 120010  
**Spec. No.:** 6007-ESP-ATP-44-62-F206  
**Item No.:** See Spec  
**No. Req’d.:** See spec  
**Project:** Mojave  
**Ref.:** Issue: 1  
**Dated:** 11/28/12

<table>
<thead>
<tr>
<th>Data Sheets</th>
<th>Vendor:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CARBON FILTERS MF-206C</td>
<td>ABENER / TEYMA REQUIREMENT</td>
<td>VENDOR INFORMATION</td>
</tr>
<tr>
<td>F1 - Upper Manway, in</td>
<td>24*</td>
<td>20</td>
</tr>
<tr>
<td>F2 - Lower Manway, in</td>
<td>30*</td>
<td>NONE</td>
</tr>
</tbody>
</table>

**Materials of Construction**

- **Shell**: SA 182 /SS304  
- **Head**: SA 182 /SS304  
- **Internal Supports**: SA 182 /SS304  
- **Internal Piping**: SA 182 /SS304

**Media**

- **Media**: Activated Carbon  
- **Media Vendor**: By vendor  
- **Media Type / Designation**: Coal Pellet  
- **Depth, in**: By vendor  
- **Media life (mas flow rate/max concen.)**: By vendor  
- **Activated Carbon**: CONDORCHEM  
- **Pellet 4 mm**: 71  
- **242 days/62 days**

---

<table>
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EC-94 (Rev. 05/2011)
**Specification For Carbon Filters**

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</table>

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<th>Item No.:</th>
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<tbody>
<tr>
<td>See Spec</td>
<td>Mojave</td>
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<table>
<thead>
<tr>
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<th>Issue:</th>
<th>Dated:</th>
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<tbody>
<tr>
<td></td>
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<td>11/28/12</td>
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**Carbon Filters, MF-206**

### Data Sheets

<table>
<thead>
<tr>
<th>CARBON FILTERS</th>
<th>ABENER / TEYMA REQUIREMENT</th>
<th>VENDOR INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF-206C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TYPE: OVERFLOW

Activated Carbon Bed

---

### DESIGN AND CONSTRUCTION

- **Vessel Design Code:** None
- **Stamp:** Not Required
- **Operating Pressure:** in H₂O ≤29 to 1
- **Operating Temperature:** °F 80 to 120
- **Design Pressure:** in H₂O 84
- **Design Temperature:** °F 25 to 140
- **Corrosion Allowance:** By vendor

- **Number of Filters per Plant Site:** By Vendor - (See note 1)
- **Filter Vessel Orientation:** Horizontal
- **Vessel Dimensions:**
  - Inside Diameter, in.: By vendor
  - Shell Height, Seam to Seam, in.: By vendor
  - Overall Height, In.: By vendor
  - Head style / Flange height, in.: By vendor / By vendor
  - Shell Thickness, in.: By vendor
  - Head thickness, in.: By vendor
  - Head Volume, Ft³: By vendor
  - Vessel Volume, Ft³: By vendor
  - Vessel Support Legs, Qty.: By vendor

- **Nozzles / Manways**
  - **A - Inlet, in.** By vendor
  - **B - Outlet, in.** By vendor
  - **C - Media Fill, in** By vendor
  - **D - Media Removal, in** By vendor
  - **E - Pressure Relief, in** By vendor

  - **Size / Type / Class:** 3/150#

<table>
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<tr>
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<th>11/27/2012</th>
<th>Issue for Purchase</th>
<th>JS</th>
<th>MZA</th>
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<th>CARBON FILTERS MF-206C</th>
<th>ABENER / TEYMA REQUIREMENT</th>
<th>VENDOR INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F1 - Upper Manway, in</strong></td>
<td>24*</td>
<td>20</td>
</tr>
<tr>
<td><strong>F2 - Lower Manway, in</strong></td>
<td>30*</td>
<td>NONE</td>
</tr>
</tbody>
</table>

**Materials of Construction**

- **Shell**: SA 182 /SS304, SA 182 or similar (AISI304)
- **Head**: SA 182 /SS304, SA 182 or similar (AISI304)
- **Internal Supports**: SA 182 /SS304, SA 182 or similar (AISI304)
- **Internal Piping**: SA 182 /SS304, SA 182 or similar (AISI304)

**Media**

- **Media**: Activated Carbon, Activated Carbon
- **Media Vendor**: By vendor, CONDORCHEM
- **Media Type / Designation**: Coal Pellet, Pellet 4 mm
- **Depth, in**: By vendor, 51
- **Media life (mas flow rate/max concen .)**: By vendor, 63days/15 days

---

<table>
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<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
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EC-94 (Rev. 05/2011)
## ABENER TEYMA MOJAVE

### Specification For Carbon Filters

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<tr>
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</tr>
<tr>
<td>Ref.: Issue: 1</td>
<td>Dated : 11/28/12</td>
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</tbody>
</table>

Maximum Flow Rate Case

**Data Sheets**

<table>
<thead>
<tr>
<th>CARBON FILTERS MF-206</th>
<th>ABENER / TEYMA REQUIREMENT</th>
<th>VENDOR INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PERFORMANCE</strong></td>
<td><strong>Inlet Design</strong></td>
<td><strong>Outlet Design</strong></td>
</tr>
<tr>
<td><strong>Expansion Tank Venting</strong></td>
<td>92.89</td>
<td></td>
</tr>
<tr>
<td>Total Gas Flow Rate lb/min.</td>
<td>92.89</td>
<td></td>
</tr>
<tr>
<td>Flow Duration, min. /day</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Flow Composition, lb/min</td>
<td>By vendor</td>
<td></td>
</tr>
<tr>
<td>Diphenyl ether</td>
<td>0.0075</td>
<td>0.0075</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0027</td>
<td>0.0027</td>
</tr>
<tr>
<td>Benzene</td>
<td>≤1% of inlet</td>
<td>0.0908</td>
</tr>
<tr>
<td>Toluene</td>
<td>≤1% of inlet</td>
<td>0.0028</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0006</td>
<td>0.0006</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>92.78</td>
<td>92.78</td>
</tr>
<tr>
<td>High Boilers</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total Low Boilers</td>
<td>0.0942</td>
<td>0.0942</td>
</tr>
<tr>
<td>Total Non-N&lt;sub&gt;2&lt;/sub&gt;</td>
<td>0.1044</td>
<td>0.1044</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>10.15</td>
<td>10.15</td>
</tr>
<tr>
<td>Gas Flow, acfm: (See note 2)</td>
<td>1365.22</td>
<td>1365.22</td>
</tr>
<tr>
<td>Operating Temperature, °F</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, in H&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>≤75</td>
<td>1</td>
</tr>
<tr>
<td>Diff. Pressure @ design flow, in H&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>≤74</td>
<td>14.8</td>
</tr>
<tr>
<td>(Note 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed VOC Removal</td>
<td>99%</td>
<td>99%</td>
</tr>
</tbody>
</table>

### Notes:

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. (*) Expected/**(*)guaranteed

---

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>JS</th>
<th>MZA</th>
<th>APF</th>
</tr>
</thead>
<tbody>
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<td>Issue for Purchase</td>
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<td>11/13/2012</td>
<td>Re-issued for Bid</td>
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<tr>
<td>0</td>
<td>3/29/2012</td>
<td>Issued for Bid</td>
<td>WMP</td>
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EC-94 (Rev. 05/2011)
## Specification For Carbon Filters

|---------|-----------|----------|------------|---------|------|-------|-------|

### Data Sheets

#### CARBON FILTERS MF-206

#### ABENER / TEYMA REQUIREMENT

#### VENDOR INFORMATION

<table>
<thead>
<tr>
<th><strong>PERFORMANCE</strong></th>
<th><strong>Inlet Design</strong></th>
<th><strong>Outlet Design</strong></th>
<th><strong>Inlet Design</strong></th>
<th><strong>Outlet Design</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overflow Tank Venting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Gas Flow Rate lb/min.</td>
<td>14.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Duration, min. /day</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Composition, lb/min</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphenyl ether</td>
<td>0.0105</td>
<td></td>
<td>0.0105</td>
<td></td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0038</td>
<td></td>
<td>0.0038</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>0.1442</td>
<td>≤1% of inlet</td>
<td>0.1442</td>
<td>0.0014(*)</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.0045</td>
<td>≤1% of inlet</td>
<td>0.0045</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0010</td>
<td></td>
<td>0.0010</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>High Boilers</td>
<td>0.0001</td>
<td></td>
<td>0.0001</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Total Low Boilers</td>
<td>0.1497</td>
<td></td>
<td>0.1497</td>
<td>0.0015(*)</td>
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<tr>
<td>Total Non-N₂</td>
<td>0.1641</td>
<td></td>
<td>0.1641</td>
<td>0.0016(*)</td>
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<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>15.26</td>
<td>15.26</td>
<td>15.26</td>
<td>15.26</td>
</tr>
<tr>
<td>Gas Flow, acfm: (Note 1)</td>
<td>209.35</td>
<td></td>
<td>209.35</td>
<td>209.35</td>
</tr>
<tr>
<td>Operating Temperature, °F</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, in H₂O</td>
<td>≤29</td>
<td>1”</td>
<td>29-75</td>
<td>ATM</td>
</tr>
<tr>
<td>Diff. Pressure @ design flow, in H₂O</td>
<td>≤28</td>
<td>14.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Note 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed VOC Removal</td>
<td>99%</td>
<td></td>
<td>99%</td>
<td></td>
</tr>
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</table>

### Notes:

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. (*) Expected/***)guaranteed

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EC-94 (Rev. 05/2011)
Maximum Flow Rate Case

Operating Mode 1: Expansion Tank Venting  Duration: 40 minutes

From Expansion Vessels Scrubber

Expansion Tank Venting  lbg/min  lbs/day  tons/year
Diphenyl ether  0.0075  0.2984  0.0545
Biphenyl  0.0027  0.1075  0.0196
Benzene  0.0908  3.6310  0.6631
toluene  0.0028  0.1118  0.0204
Phenol  0.0006  0.0252  0.0046
Nitrogen  92.78  3711.37  677.78

Temp (F)  120
Pressure  75" H2O Max
Flow (acfm at 15psia)  1,365.22

By Vendor

From Overflow Tanks Scrubber

Overflow Tank Venting  lbs/min  lbs/day  tons/year
Diphenyl ether  0  0  0
Biphenyl  0  0  0
Benzene  0  0  0
toluene  0  0  0
Phenol  0  0  0
Nitrogen  0  0  0
Temp (F)  N/A
Pressure  29" H2O Max
Flow (acfm at 15psia)  0

Notes:
1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. Per vendor’s design.

<table>
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Maximum Flow Rate Case

Operating Mode 2: Overflow Tank Venting  Duration: 20 minutes

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Toluene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Temp (F)</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>75’ H2O Max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow (acfm at 15psia)</td>
<td>0</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>Overflow Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0.0105</td>
<td>0.2106</td>
<td>0.0385</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0038</td>
<td>0.0759</td>
<td>0.0139</td>
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<tr>
<td>Benzene</td>
<td>0.1442</td>
<td>2.8845</td>
<td>0.5268</td>
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<tr>
<td>Toluene</td>
<td>0.0045</td>
<td>0.0895</td>
<td>0.0164</td>
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<tr>
<td>Phenol</td>
<td>0.0010</td>
<td>0.0196</td>
<td>0.0036</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>14.09</td>
<td>281.78</td>
<td>51.46</td>
</tr>
<tr>
<td>Temp (F)</td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>29’ H2O Max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow (acfm at 15psia)</td>
<td>209.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. Per vendor’s design.
ABENER TEYMA
MOJAVE

<table>
<thead>
<tr>
<th>Specification For Carbon Filters</th>
<th>Job No.: 120010</th>
<th>Spec. No.: 6007-ESP-ATP-44-62-F206</th>
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<tr>
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Maximum Concentration Case

**Data Sheets**

**CARBON FILTERS**

**MF-206**

**ABENER / TEYMA REQUIREMENT**

**VENDOR INFORMATION**

**PERFORMANCE**

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gas Flow Rate lb/min</td>
<td>81.40</td>
<td>0.0056</td>
<td>0.0056</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Flow Duration, min. /day</td>
<td>40</td>
<td>By vendor</td>
<td>0.0020</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Flow Composition, lb/min</td>
<td></td>
<td>≤1% of inlet</td>
<td>0.3832</td>
<td>0.0038 (**)</td>
</tr>
<tr>
<td>Diphenyl ether</td>
<td>0.0056</td>
<td>By vendor</td>
<td>0.0037</td>
<td>≤1% of inlet</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0020</td>
<td>≤1% of inlet</td>
<td>0.0147</td>
<td>≤1% of inlet</td>
</tr>
<tr>
<td>Benzene</td>
<td>0.3832</td>
<td>By vendor</td>
<td>0.0147</td>
<td>By vendor</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.0037</td>
<td>≤1% of inlet</td>
<td>0.0147</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Phenol</td>
<td>80.99</td>
<td>By vendor</td>
<td>80.99</td>
<td>≤1% of inlet</td>
</tr>
<tr>
<td>Nitrogen</td>
<td></td>
<td>80.99</td>
<td>80.99</td>
<td>80.99</td>
</tr>
<tr>
<td>High Boilers</td>
<td>0.0003</td>
<td>By vendor</td>
<td>0.4015</td>
<td>0.0003</td>
</tr>
<tr>
<td>Total Low Boilers</td>
<td>0.4015</td>
<td>By vendor</td>
<td>0.4094</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Total Non-N₂</td>
<td>0.4094</td>
<td>By vendor</td>
<td>40.94</td>
<td>0.0040(*)</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>11.85</td>
<td>11.85</td>
<td>11.85</td>
<td>11.85</td>
</tr>
<tr>
<td>Gas Flow, acfm (See note 2)</td>
<td>1193.30</td>
<td>1193.30</td>
<td>1193.30</td>
<td>1193.30</td>
</tr>
<tr>
<td>Operating Temperature, °F</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, in H₂O</td>
<td>≤75</td>
<td>1</td>
<td>75-29</td>
<td>ATM</td>
</tr>
<tr>
<td>Diff. Pressure @ design flow, in H₂O (Note 3)</td>
<td>≤74</td>
<td>14.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed VOC Removal</td>
<td>99%</td>
<td>99%</td>
<td></td>
<td></td>
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</tbody>
</table>

**Notes:**

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. (*) Expected/**(*) guaranteed

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**No. Date Description**

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<th>Chk’d</th>
<th>App’d</th>
<th>App’d</th>
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EC-94 (Rev. 05/2011)
## Specification For Carbon Filters

<table>
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<th>Spec. No.:</th>
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### Maximum Concentration Case

**Data Sheets**

**CARBON FILTERS**

**MF-206**

#### PERFORMANCE

**Overflow Tank Venting**

<table>
<thead>
<tr>
<th></th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
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</thead>
<tbody>
<tr>
<td>Total Gas Flow Rate lb/min.</td>
<td>13.55</td>
<td></td>
<td>0.0084</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Flow Duration, min. /day</td>
<td>20</td>
<td></td>
<td>0.0030</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Flow Composition, lb/min</td>
<td></td>
<td></td>
<td>0.6815</td>
<td>0.0068(**)</td>
</tr>
<tr>
<td>Diphenyl ether</td>
<td>0.0084</td>
<td>By vendor</td>
<td>0.0084</td>
<td></td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0030</td>
<td>By vendor</td>
<td>0.0030</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>0.6815</td>
<td>≤1% of inlet</td>
<td>0.6815</td>
<td>0.0003(**)</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.0252</td>
<td>≤1% of inlet</td>
<td>0.0252</td>
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<tr>
<td>Phenol</td>
<td>0.0060</td>
<td>By vendor</td>
<td>0.0060</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>12.83</td>
<td>12.83</td>
<td>12.83</td>
<td>12.83</td>
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<td>High Boilers</td>
<td>0.0004</td>
<td>By vendor</td>
<td>0.0004</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Total Low Boilers</td>
<td>0.7127</td>
<td>By vendor</td>
<td>0.7127</td>
<td>0.0071(*)</td>
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<tr>
<td>Total Non-N₂</td>
<td>0.7245</td>
<td>By vendor</td>
<td>0.7245</td>
<td>0.0072(*)</td>
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<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>33.80</td>
<td>33.80</td>
<td>33.80</td>
<td>33.80</td>
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<tr>
<td>Gas Flow, acfm: (Note 1)</td>
<td>193.59</td>
<td>By vendor</td>
<td>19.59</td>
<td>193.59</td>
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<tr>
<td>Operating Temperature, °F</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, in H₂O</td>
<td>≤29</td>
<td>1&quot;</td>
<td>29-75</td>
<td>ATM</td>
</tr>
<tr>
<td>Diff. Pressure @ design flow, in H₂O (Note 3)</td>
<td>≤28</td>
<td></td>
<td>14.8</td>
<td></td>
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</table>

**Guaranteed VOC Removal**

|                  | 99% | 99% |

### Notes:

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. (*) Expected/(**)guaranteed

### Dates

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<th>No.</th>
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<tr>
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<td>Issued for Bid</td>
<td>WMP</td>
<td>MZA</td>
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EC-94 (Rev. 05/2011)
Maximum Concentration Case

**Operating Mode 1: Expansion Tank Venting**  Duration: 40 minutes

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0.0056</td>
<td>0.2248</td>
<td>0.0411</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0020</td>
<td>0.0810</td>
<td>0.0148</td>
</tr>
<tr>
<td>Benzene</td>
<td>0.3832</td>
<td>15.3285</td>
<td>0.7989</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.0147</td>
<td>0.5863</td>
<td>0.1071</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0037</td>
<td>0.1465</td>
<td>0.0268</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>80.99</td>
<td>3239.79</td>
<td>591.66</td>
</tr>
</tbody>
</table>

| Temp (F) | 120 |
| Pressure | 75" H2O Max |
| Flow (acfm at 15psia) | 1,193.30 |

<table>
<thead>
<tr>
<th>Overflow Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
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<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Toluene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

| Temp (F) | N/A |
| Pressure | 29" H2O Max |
| Flow (acfm at 15psia) | 0 |

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. Per vendor’s design.

---

**Job No.:** 120010  **Spec. No.:** 6007-ESP-ATP-44-62-F206  **Item No.:** See Spec  **No. Req’d.:** See spec  **Project:** Mojave

---

### Table:

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<td>MZA</td>
<td>APF</td>
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EC-94 (Rev. 05/2011)
Maximum Concentration Case

Operating Mode 2: Overflow Tank Venting  Duration: 20 minutes

<table>
<thead>
<tr>
<th></th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expansion Tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphenyl ether</td>
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<tr>
<td>Biphenyl</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Benzene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Toluene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen</td>
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</tr>
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<tr>
<td>Flow</td>
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</tbody>
</table>

By Vendor

Notes:
1. Vendor to provide size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. Per vendor’s design.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>JS</th>
<th>MZA</th>
<th>APF</th>
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EC-94 (Rev. 05/2011)
### Specification For Carbon Filters

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Instructions:

1. Initialing (By/Chk’d/App’d) required on cover sheet only. All other title block information must be included on all pages.

2. Revisions are identified in the body of the Specification.

<table>
<thead>
<tr>
<th>Rev. No.</th>
<th>Date</th>
<th>By</th>
<th>Chk’d</th>
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<th>Description of Revision Including Page Numbers</th>
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<td>13 Nov 2012</td>
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EC-94 (Rev. 05/2011)
1. **Project Summary**

1.1 The project consists of two, 140 MW, solar thermal powered electric generating plants, referred to as Alpha Plant and Beta Plant. The plants will be built on adjacent sites in an unincorporated area of San Bernardino County near Hinkley, California. The plant sites are located approximately six miles north of highway CA-58 on Harper Lake Road, approximately 20 miles west of Barstow.

1.2 The Vendor shall furnish two (2) HTF Overflow Tank Vent Scrubbers, one (1) per plant site, and two (2) HTF Expansion Tank Vent Scrubbers, one (1) per plant site, meeting the requirements set forth in this specification. This specification covers the minimum requirements for the performance, design, materials, fabrication, testing and delivery of the scrubbers.

2. **General**

2.1 The attachments identified in this document are considered to be part of this specification. Attached specifications shall be met and followed by the Vendor in full. All drawings and documents included in this package are considered “Contract Documents”.

2.2 Definitions

a. “Vendor” or “vendor” shall mean *The Clean Air Group, A Croll Reynolds Company, supplier of the* HTF Overflow Tank Vent Scrubber and HTF Expansion Tank Vent Scrubber for which this specification is intended.

b. “Engineer”, “Purchaser” or “Customer” shall mean the “Abener Teyma Mojave General Partnership”.

c. “Owner” shall mean “Mojave Solar LLC”.

d. “Construction Manager” or “Construction Superintendent” shall mean “Abener Teyma Mojave General Partnership”.

2.3 The imperative language of this specification is directed to the Vendor, unless specifically noted otherwise. All directives such as “provide”, “perform”, “test”, etc., are addressed solely to Vendor, whether or not the word “Vendor” is specifically mentioned. Work by Others will be specifically identified.
3. **Function**

   The HTF Overflow Tank Vent Scrubber and HTF Expansion Tank Vent Scrubber will be used to remove HTF vapors from the vent gases of the HTF Overflow Tanks and the HTF Low Boiler Condensate Receiver Vessel. The scrubbers will consist of a spray scrubbing tower using a cooled HTF liquid spray and a packing media to condense the HTF vapors including benzene, toluene, and phenol from the vent gases. The vent gases will enter at the bottom of the scrubber and pass upward through the packing media, spray and mist eliminators before being vented out of the scrubber to a carbon filter furnished by others.

4. **Operation**

   The scrubbers will operate intermittently, as required, during the day. The HTF vapors will be displaced at least once daily from the HTF Overflow Tank and the Expansion Vessels due to thermal expansion of the HTF as it is warmed to operating temperatures. The HTF system will be vented as needed to control the maximum system pressures. **The venting and condensing is expected to occur during morning start-up and operate for approximately 40 minutes.**

5. **Location**

   5.1 The scrubbers shall be installed outdoors. For proposal purposes, assume the vessel is attached to an open structure with the bottom nozzle 35 feet above grade.

   5.2 Electrical Area Classification - The scrubbers shall be installed in an area that is classified as a Class I Division 2 location per NEC 500.5 (Classification of Locations).

   5.3 The equipment shall meet all the design conditions including the seismic and climatic conditions in this specification. Refer to specification 6007-ESP-ATP-00-60-G100 Project Design Criteria, for site specific information.

6. **Schedule**

   Vendor’s schedule shall comply with the Abener Teyma schedule. The vendor shall propose the best available delivery.
7. **Performance**

7.1 The vendor supplied equipment shall meet the performance requirements defined in this specification and under the column marked “Abener Teyma Requirement” on the Data Sheets; included herein.

7.2 Over time the HTF will degrade and the quantity of low boilers; benzene, toluene, and phenol, in the HTF will increase. The HTF will be cleaned and/or replaced after seven years of operation. The included data sheets describe the concentrations of inlet gases and the allowable concentrations of the outlet gases for both the minimum and maximum concentrations.

7.3 Vendor shall have sole responsibility for meeting the performance requirements. Vendor shall provide all equipment, appurtenances, and accessories required in order to meet this performance.

7.4 The vendor shall determine the optimal scrubber design, including vessel dimensions, packing type and depth, spray nozzle quantity and type, and mist eliminator type and depth.

7.5 The scrubbers (including any auxiliaries) shall be designed and constructed for a minimum service life of 30 years.

8. **Scope**

8.1 Vendor shall furnish the design, submittal data, fabrication, assembly, inspection, testing, packing, and shipping of the scrubbers as specified herein.

8.2 Vendor shall furnish four (4) HTF Scrubbers.

<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Tag Number</th>
<th>Plant Site</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>HTF Overflow Vent Scrubber</td>
<td>A-MV-208</td>
<td>Alpha</td>
<td>1</td>
</tr>
<tr>
<td>HTF Expansion Tank Vent Scrubber</td>
<td>A-MV-209</td>
<td>Alpha</td>
<td>1</td>
</tr>
<tr>
<td>HTF Overflow Vent Scrubber</td>
<td>B-MV-208</td>
<td>Beta</td>
<td>1</td>
</tr>
<tr>
<td>HTF Expansion Tank Vent Scrubber</td>
<td>B-MV-209</td>
<td>Beta</td>
<td>1</td>
</tr>
</tbody>
</table>
8.3 The scrubbers shall include, but are not limited to, the following:
   a. Scrubber vessel
   b. Packing
   c. Spray nozzles
   d. Internal spray manifold
   e. Mist eliminators
   f. Supports for internal components
   g. Manways with davits
   h. Vessel nozzles per data sheet.
   i. Vessel support lugs / saddles and seismic restraints designed per CBC 2010
   j. Anchor bolt sizing and selection
   k. Insulation support rings and pins
   l. Start up and commissioning spare parts
   m. Spare parts for one year of operation.
   n. Other items as specified on the Equipment Data Sheets
   o. **Structural support steel for scrubbers designed per CBC 2010**

8.4 Vendor Data

The Vendor shall furnish the Vendor Submittal Data for the HTF Scrubbers as specified here-in. Refer to specification 6007-ESP-ATP-44-62-V208V for additional Vendor Data Requirements.

8.5 Work By Others

The following is out of the scope of this specification:
   a. Receiving, unloading, storage and handling of HTF Scrubbers on site.
   b. **(deleted)**
   c. Installation of the Scrubbers.
   d. Furnishing and installation of anchor bolts.
   e. Piping prior to the vessel inlet flanges or after the outlet flanges.
   f. Insulation.
9. **Codes and Standards**

9.1 At a minimum all applicable portions of the codes and standards listed below shall be followed.
   a. AISC - American Institute of Steel Construction
   b. AISI – American Iron and Steel Institute
   c. ANSI – American National Standards Institute
   d. ASME – American Society of Mechanical Engineers
   e. ASNT – American Society for Nondestructive Testing
   f. ASTM – American Society of Testing Materials
   g. AWS – American Welding Society
   h. CAL/OSHA – California Occupational Safety and Health Administration
   i. CBC – California Building Standards Code (2010)
   j. NEC – National Electric Code
   k. NFPA – National Fire Protection Association
   l. OSHA – Occupational Safety and Health Act
   m. SSPC – The Society for Protective Coatings

9.2 Vendor shall meet all federal, state, and local laws and regulations.

9.3 Should there be any conflict between applicable codes, standards, specifications noted herein or vendor’s recommendations and those of the locality of the project, the more stringent code shall apply.

10. **Design**

The vendor shall design the scrubbers to meet the operating conditions and performance requirements set forth in this specification. Any conflicts between the specification, the data sheets and the appropriate codes and standards shall be referred to Abener Teyma for resolution.

10.1 **Submittals**

10.1.1 Vendor shall provide engineering drawings and calculations for approval prior to the start of fabrication.

10.1.2 Refer to and comply with specification 6007-ESP-ATP-44-62-V208V, Vendor Data Requirements - HTF Scrubbers.
10.1.3 Approval of Vendor’s drawings and calculations is limited to verifying general compliance with specifications and design drawings, and does not imply verification of dimensions, quantities, or calculations. Vendor is not relieved from responsibility for accurate dimensioning, equipment sizing, fabrication to required tolerances, and fabrication fit-up.

10.1.4 U. S. customary units shall be used on all drawings and calculations.

10.1.5 Drawings:

(1) A general arrangement drawing shall be furnished for each vessel, and shall contain the data shown in the appropriate Data Sheet. The location of the vessel marking or nameplate, the size and orientation of all nozzles and connections, and the anchor bolt layout shall also be shown on this drawing.

(2) A separate outline drawing for each vessel shall be furnished with appropriate markings to cross-reference each component (shell plates, heads, nozzles, flanges, forgings, skirt plates, etc.) to the applicable mill test certificates for the steels used in the construction.

(3) Vendor shall provide all drawings that are issued for fabrication, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

(4) Fabrication drawings shall show weld details and shall reference applicable welding procedures. The drawings shall also include impact test requirements, showing (as applicable):
   a. Component
   b. Thickness for impact purposes
   c. Material specification
   d. Critical Exposure Temperature
   e. Minimum Design Metal Temperature
   f. Appropriate Charpy impact requirements (average/minimum values)
10.1.6 Data and Calculations

(1) Design calculations (including lifting attachments and support lugs) made by the Vendor shall be furnished prior to or along with submission of drawings for approval. When calculations are made using a computer, all input data, assumptions, computer program version used, and a summary of the results shall be furnished.

(2) Vendor shall provide their structural calculation package, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

10.2 Vessels

10.2.1 The HTF Expansion Tank Vent Scrubbers shall be designed, manufactured, tested and stamped by the manufacturer in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII Division 1.

10.2.2 The HTF Overflow Tank Vent Scrubbers shall be designed and manufactured by the manufacturer in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII Division 1. However, the HTF Overflow Tank Vent Scrubbers, being low pressure vessels, shall not require an ASME code stamp.

10.2.3 Vessels shall be designed to withstand internal or external pressure and mechanical loads induced by vessel dead load, process, contents, earthquake, wind and other specified loadings. Wind and earthquake loads shall be in accordance with the Project Design Criteria described in Specification 6007-ESP-ATP-00-60-G001. Load combinations must be appropriately considered. Record design calculations are required.

10.2.4 The minimum insulation design load shall be for 3” thickness on heads and shell using 8 lb. / ft² mineral wool insulation with aluminum jacket.

10.2.5 All vessels, with physical dimensions within the allowable limits for shipping, shall be completely shop fabricated and tested before shipment.

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EC-94 (Rev. 05/2011)
10.2.6 Vendor shall furnish the vessels complete as shown on data sheets and as noted herein and shall include all necessary nozzles, blind flanges, studs, nuts, bolts, clips, support brackets, lifting lugs, davits, and gaskets.

10.2.7 Vessels shall include lifting lugs and tailing lugs, designed by vendor, for use in loading, unloading, and field erection of vessel. Empty weight shall be marked on the vessel by using lettering no less than 6 inches high.

10.2.8 Anchor bolts shall be furnished by Abener Teyma as specified by Vendor. Vendor shall specify bolt material, size, and quantities and provide drawings and loading diagrams for structural design.

10.2.9 Vendor shall extend nozzles a minimum 8 inches outside surface of the vessel. **Vendor shall check the projection to ensure that every nozzle is outside of the insulation by at least 5 inches.**

10.2.10 Each vessel shall include four stainless steel grounding lugs. Grounding lugs shall be a minimum of 3” wide x 3 “tall x ½” thick plates, and shall be made of 304 grade stainless steel. The grounding lugs shall be drilled to match “Burndy Qiklug” type “QA28-2N” which utilizes NEMA bolt spacing. Grounding lugs shall be welded to the vessel support lugs. The lugs shall be oriented so that the holes in the lug are on the vertical centerline.

10.2.11 Materials of construction shall be per the attached data sheet. Where materials of construction are not specified, Vendor shall propose materials for each item as appropriate for the service conditions.

10.2.12 All materials purchased by Vendor shall meet nationally recognized standards unless otherwise approved by Abener Teyma.

10.2.13 All materials shall be compatible with the vessel contents and in accordance with all applicable welding procedures.

10.2.14 Copies of mill test reports for materials shall be provided to Abener Teyma by Vendor.

10.2.15 The design shall be such to avoid any corrosion of vessel equipment.
10.2.16 The design shall be such to avoid any contamination of the vessel contents once the vessel is put into service.

10.2.17 The layout of weld seams shall be such that it will allow full access for inspection. Circumferential seams shall not be located within a distance of 1-1/2” of any external compression ring, internal ring, support ring, etc. Nozzles and manholes shall not intersect any weld seams, unless approved by Abener Teyma.

10.2.18 Vendor shall provide corrosion allowances as specified by the data sheets.

10.2.19 The minimum required thickness of plate and other structural members shall be that which is necessary to satisfy tension and compression strength requirements for the specified design conditions, plus the corrosion allowance.

10.2.20 All nozzles shall be flush with the inside surface of the vessel wall, unless otherwise specified.

10.2.21 Nozzle flanges and manway flanges shall be the material as indicated on the Data Sheets.

10.2.22 Internal bolting is not allowed unless required for maintenance purposes. Nuts and bolts shall use safety wire, cotter pins or other mechanical methods to prevent bolts from loosening due to vibration.

10.2.23 Vendor to indicate on project drawings the maximum allowable loads on nozzles. Nozzles shall be designed for a minimum of the loads as indicated below.

<table>
<thead>
<tr>
<th>Nozzle Size (NPS)</th>
<th>Sum Force (pounds)</th>
<th>Sum Moments (foot pounds)</th>
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<tr>
<td>3 and smaller</td>
<td>750</td>
<td>1500</td>
</tr>
<tr>
<td>4</td>
<td>1400</td>
<td>2500</td>
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<td>3700</td>
<td>16000</td>
</tr>
<tr>
<td>12</td>
<td>4600</td>
<td>25000</td>
</tr>
</tbody>
</table>

Example: NPS-3 nozzle would be subjected to simultaneous loads of $F_{axial}=428$ lbs, $F_{circumferential}=428$ lbs, $F_{radial}=428$ lbs, and $M_{axial}=855$ ft-lbs, $M_{circumferential}=855$ ft-lbs, $M_{radial}=855$ ft-lbs.
10.2.24 Manways

(1) Manways shall be provided for accessing and ventilating the scrubber interior.

(2) Manways shall be located to provide easy access for maintenance and cleaning of the scrubber including cleaning or replacement of the packing, spray nozzles and mist eliminators.

(3) Manway covers shall be equipped with davits and handles to aid in removing and replacing the covers.

10.2.25 Each vessel shall include insulation support rings. Rings shall be provided at the top and bottom tangents. Additional rings shall be provided as required at no more than 10 foot spacing. Rings shall extend 2 inches beyond the shell outside diameter. Rings shall be segmented and detachable for shipment. Attachment brackets shall be continuously welded to the vessel.

10.2.26 Each vessel shall include insulation support pins welded to the bottom head. Insulation will be 3” thick mineral wool. Pins are to be #10 gauge (3.6mm) weld pins 3-1/2” long on 12” centers. The companion 2-1/2” square speed clips shall be shipped with the vessel. The pins shall be carbon steel.

10.2.27 Any instrumentation provided by the vendor must comply with the attached specification, 6007-ESP-ATP-00-30-M100 (Electrical and Instrument Systems On Packaged Mechanical Equipment)

10.3 Vessel Internals

10.3.1 The Vendor shall design the scrubber packing, mist eliminators and spray nozzles to allow for removal through nozzles F1 & F2 for cleaning and maintenance.

10.3.2 The selection of type, size, and depth of packing shall be by the vendor.

10.3.3 The scrubber and packing design shall prevent channeling and provide a uniform gas velocity across the scrubber cross section.
10.3.4 The maximum pressure drop from the inlet to outlet of the scrubber shall not exceed the value listed in the equipment data sheet. **Vendor to provide the maximum pressure drop across all elements of the scrubber, from inlet to outlet.**

10.3.5 The selection of type, size, and quantity of the spray nozzles shall be by the vendor.

10.3.6 The maximum total flow and inlet pressure of the HTF to the spray nozzles shall be as indicated on the data sheet.

10.3.7 The selection of type, size, and depth of the mist eliminator shall be by the vendor. The mist eliminator shall coalesce and remove entrained HTF droplets from the gas stream to prevent carry over to the carbon filters.

10.4 **Insulation and Heat Tracing**

10.4.1 Piping and vessel insulation will be mineral wool bats furnished and installed by others.

10.4.2 Aluminum insulation jacketing will be furnished and installed by others.

10.4.3 Vessels and associated piping will be electrically heat traced by others.

10.5 **Painting**

10.5.1 Vessel exteriors shall be **(deleted)** painted according to the attached specification, 6007-ESP-ATP-00-60-N102 (Two Coat System for High Temperature Non-Primed Carbon Steel) to prevent rust and corrosion during shipping and installation.

10.5.2 Painting vessel interiors is not required. See section 11.17 of this spec.

11. **Fabrication**

11.1 Any fabrication sub-contracted to others shall require written approval by Abener Teyma.

11.2 All vessels must meet the latest edition of the ASME Boiler and Pressure Vessel Code for shop practices, welding, and stress relieving.
11.3 Vessels requiring a Code Stamp must meet the latest edition of the ASME Boiler and Pressure Vessel Code for radiographing, and testing.

11.4 All plate and other material used in the execution of this work shall be new and clean stock, free from surface laminations and other physical imperfections.

11.5 All materials shall be identified throughout fabrication. Material certification shall be provided on request by the Abener Teyma inspector. Material certification test reports shall become a permanent record of the documentation package.

11.6 Machined surfaces which are warped or distorted due to welding, etc., shall be re-machined after these operations are finished, with minimum thickness maintained as specified. Machine surfaces shall be finished to the smoothness limit indicated on the design drawings.

11.7 The axis of any shell nozzle shall be radial and perpendicular to the longitudinal axis of the vessel. Flange face shall be perpendicular to the nozzle axis. All welds protruding beyond the flange face shall be ground flush.

11.8 Flange bolt holes of shell nozzles shall straddle the axial center line.

11.9 Vendor shall prepare the weld end nozzles end face in accordance with ASME B31.3 and ASME B16.25, to match the piping as indicated in the piping specification referenced in this specification. Abener Teyma shall review each weld end nozzle face prior to purging and protection for shipment. Vendor is to protect each weld end nozzle face against damage during handling and transporting.

11.10 All permanent attachments, stiffeners, clip angles, ring angles, etc., shall be joined to vessels by continuous welding, unless approved otherwise by Abener Teyma.

11.11 Remove all sharp edges and burrs.

11.12 All welds and surfaces exposed to vessel contents, its vapor or condensate shall be free of gouges, pits, cracks or other surface defects.

11.13 All welds and materials discovered to be non-compliant through inspection and/or testing shall be fully repaired at vendor’s cost.
11.14 Fabricated location and orientation of nozzles will be reviewed by Abener Teyma. If there are any discrepancies with project documents, the Vendor will make corrections.

11.15 Vendor shall notify Abener Teyma regarding any necessary repair work and have written approval before proceeding.

11.16 Vendor shall provide whatever additional treatment, such as preheat and/or post weld heating, as required for the material being used. Shop drawings must identify such treatments.

11.16.1 For any required heat treatment, Vendor shall provide written procedures for Abener Teyma review.

11.16.2 At completion, Vendor shall provide a Product Certification for PWHT, including a copy of time / temperature chart records.

11.17 To prevent contamination of the vessel contents, Vendor shall mechanically clean the interior surface of the vessel to remove all weld spatter, scale, rust, filings, dirt, etc., as well as all foreign materials.

11.17.1 Mechanical cleaning shall meet all requirements of NACE No. 3 (Commercial Blast Cleaning).

11.17.2 Vendor shall not commence mechanical cleaning until after all testing has been completed.

11.17.3 Vendor shall not commence mechanical cleaning until instructed by Abener Teyma to do so.

11.17.4 At the completion of mechanical cleaning, Vendor shall purge and seal the vessel with an inert gas to a minimum 2 psig.

   (1) Warning signs shall be placed by Vendor on the vessel and manway clearly indicating the vessel has an inert gas seal that must be purged before entry.

   (2) Method for sealing weld end nozzles shall minimize damage to weld end prep, and minimize any required weld end prep at the job site.
12. Inspection

12.1 Abener Teyma (or an inspector on their behalf) reserves the right to inspect the equipment at any time during the course of fabrication. Abener Teyma retains the right to provide personnel to observe all fabrication work within the scope of the contracted work (including testing and inspection). Such individuals shall be afforded full and free access for these purposes, subject to safety and schedule constraints.

12.2 Inspector means Abener Teyma (or an inspector on their behalf).

12.3 Inspector shall have free access, at all reasonable times, to the areas where the work on equipment is being performed. Vendor shall notify Abener Teyma purchasing department in advance (minimum one week) of scheduled vessel testing to allow time for the Inspector to arrange to be at the test site before testing begins.

12.4 Mill and shop inspection shall not release the Vendor from responsibility for replacing any defective material and for repairing any defective workmanship that may be discovered in the field.

12.5 Vendor’s currently qualified welders and procedures under ASME Sec. IX, must be submitted to Inspector for approval. Additional qualifications necessary are to be at vendor’s expense.

12.6 All vessels shall be inspected and tested according to the applicable code as listed in the vessel data sheets.

12.7 For any required radiographic examination, a certified copy of a written report confirming that the work was inspected as set forth herein shall be provided when specified. Refer to 6007-ESP-ATP-44-62-V208V Vendor Data Requirements. The report shall include the following:

(3) Sealing with inert gas shall include a pressure gauge that proves purge gas in the vessel. Pressure gauge is to stay with sealed vessel. Pressure gauge is to be protected from damage during shipment. Pressure gauge is to include shut off valve.

(4) Apply water-soluble rust inhibitor during hydrotest, according to specification 6007-ESP-ATP-00-61-PS010.
a. A summary of inspection of radiographs.
   b. Identification of unacceptable radiographs and a statement of the action taken to rectify unsatisfactory welds.

12.8 Tell-tale holes shall be used to pneumatically test all welded attachments prior to hydrostatic testing. Tell-tale holes shall not be plugged during hydrostatic testing of the vessel.

12.9 Vendor shall submit letters of completion to Abener Teyma at least twenty days prior to the requested final inspection date. The equipment must be ready for inspection and the tests run prior to this final inspection request.

12.10 The cost of all tests due to code requirements or manufacturer’s test requirements shall be fully borne by vendor.

12.11 A written certification of an acceptable hydrostatic test shall be completed by vendor. The certification shall be forwarded to the individual indicated on the Abener Teyma purchase order.

12.11.1 Asbestos or material containing asbestos shall not be used in the construction or manufacture of the equipment.

12.11.2 A stainless steel tag that includes the Project number, equipment Tag Number and the equipment Purchase Order number shall be fixed to all the associated equipment. The tag shall stand off the vessel, outside of the insulation. The location of the tag shall be determined during drawing review.

13. **Shipping**

13.1 All parts shall be skidded, boxed, or otherwise suitably prepared for shipment to protect against damage while in transit.

13.2 Vendor shall refer to specification 6007-ESP-ATP-00-60-G121 for shipping and preparation requirements.

14. **Installation Information**

14.1 The Vendor shall specify with quote any detailed installation requirements.

### Table: Issued For Purchase and Quotes

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>SMR</th>
<th>MZA</th>
<th>APF</th>
<th>WMP</th>
<th>MZA</th>
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### Specification For HTF Scrubbers

<table>
<thead>
<tr>
<th>Job No.:</th>
<th>120010</th>
<th>Spec. No.:</th>
<th>6007-ESP-ATP-44-62-V208</th>
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<td>See Spec No. Req’d.:</td>
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<td></td>
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<tr>
<td>Project:</td>
<td>Mojave</td>
<td></td>
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<tr>
<td>Ref.:</td>
<td>Issue: 1</td>
<td>Dated: 11/13/12</td>
<td></td>
</tr>
</tbody>
</table>

14.2 The Vendor shall include in their quotation one set of any special tools and wrenches required for installation and maintenance.

15. **Startup, Training and Field Services**

The Vendor shall state all startup, training and field services included in bid, clearly identifying duration, number of people, and specific services provided. The Vendor shall quote any additional assistance on a per diem rate.

16. **Qualifications**

The Vendor shall furnish equipment, designs, and materials that have been proven by successful operation for no less than five (5) years. Requests to use untried or unproven equipment, designs, or materials must be approved by the Purchaser in writing prior to incorporation into the purchase order.

17. **Proposal Requirements**

17.1 Vendor shall furnish a quote for the following equipment and services:

17.1.1 All engineering, design, equipment materials, labor, fabrication, testing, inspection, and shipping of the equipment.

17.1.2 All parts and accessories required for complete functional HTF Scrubbers.

17.1.3 Startup and commissioning spare parts with quantities.

17.1.4 Submittal of data as required in the Vendor Data Requirements Specification, 6007-ESP-ATP-44-62-V208V.

17.1.5 Start-up, training and commissioning, clearly identifying duration, number of people, and specific services included in bid. The Vendor shall quote any additional assistance on a per diem rate.

17.1.6 The Vendor shall separately quote one set of any special tools and wrenches required for maintenance.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>SMR</th>
<th>MZA</th>
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<td>TS</td>
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EC-94 (Rev. 05/2011)
17.2 The Vendor’s base quotation shall consist of the equipment and services identified herein. Pricing for Purchaser identified options shall be submitted as separate line items. Vendor identified alternatives may be submitted if system improvements and/or cost savings can be realized.

17.3 Comments and exceptions to the specification shall be listed in a separate part of the proposal titled “Exceptions to the Specification”. All exceptions shall be listed in this section and shall reference the appropriate specification section. No other exceptions will be allowed. After the purchase order is awarded, the Vendor shall be responsible to satisfy all requirements of this specification except for the agreed upon exceptions. Any requirements that are not included with the Vendor’s equipment and are in the equipment specification shall be furnished and installed at the Vendor’s expense.

17.4 Vendor shall complete and return the Equipment Data Sheets with the proposal. Failure to submit these sheets will result in an incomplete proposal that may not be considered.

17.5 Vendor shall furnish dimensioned envelope drawings with the proposal. Drawing shall show the location of all connections, supports, estimated weights, and other pertinent data.

17.6 Vendor shall provide minimum clearances required for maintenance, service and operation of the scrubber and its components.

18. Attachments

- 6007-ESP-ATP-44-62-V208V Vendor Data Requirements – HTF Scrubbers
- 6007-ESP-ATP-00-60-G100 Project Design Criteria
- 6007-ESP-ATP-00-60-G121 Shipping and Preparation Requirements
- 6007-ESP-ATP-68-61-CS72 Class 150 Carbon Steel
- 6007-ESP-ATP-68-61-CS30 Class 300 Carbon Steel
- 6007-ESP-ATP-00-60-N102 Two Coat System for High Temperature Non-Primed Carbon Steel
- 6007-ESP-ATP-00-60-N180 Shop Applied Paint
- 6007-ESP-ATP-00-30-M100 Electrical and Instrument Systems On Packaged Mechanical Equipment
- 6007-INS-ATM-77-13-0002 Annex 01 – Specification of Documentation to be sent by Subcontractors and Suppliers
- 6007-ESP-ATP-00-61-PS010 Material and Installation Standards Internal Pipe Cleaning
HTF Overflow Tank Vent Scrubbers, A-MV-208 and B-MV-208
## Data Sheets

**Vendor:** The Clean Air Group - Croll Reynolds Company (CRC)

### HTF OVERFLOW TANK VENT SCRUBBERS

#### A-MV-208, B-MV-208

<table>
<thead>
<tr>
<th>Type</th>
<th>ABENER / TEYMA REQUIREMENT</th>
<th>CRC INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>Packed Column</td>
<td>Low Pressure Packed Column – 20T-16H</td>
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#### DESIGN AND CONSTRUCTION

<table>
<thead>
<tr>
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<th>ASME Sec. VIII Div. 1</th>
<th>ASME Sec. VIII Div. 1</th>
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<tr>
<td>Stamp:</td>
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<td>Not Required</td>
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<tr>
<td>Design Pressure:</td>
<td>2.5 / FV</td>
<td>2.5 / FV</td>
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<tr>
<td>Design Temperature:</td>
<td>°F 350</td>
<td>350</td>
</tr>
<tr>
<td>Corrosion Allowance, in</td>
<td>0.0625 in</td>
<td>0.0625 in</td>
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</table>

#### Dimensions

- Inside Diameter, in.
- Shell Height, Tan to Tan, in.
- Overall Height, In.
- Head style / Flange height, in.
- Shell Thickness, in.
- Head thickness, in.
- Vessel Volume, Ft³

<table>
<thead>
<tr>
<th>Inside Diameter, in.</th>
<th>20”</th>
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<tbody>
<tr>
<td>Shell Height, Tan to Tan, in.</td>
<td>Nominally, 24.5 ft (294”)</td>
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<tr>
<td>Overall Height, In.</td>
<td>Nominally, 26.5 ft (318”)</td>
</tr>
<tr>
<td>Head style / Flange height, in.</td>
<td>Elliptical head / 10” nominally</td>
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<tr>
<td>Shell Thickness, in.</td>
<td>Nominally, 0.25”</td>
</tr>
<tr>
<td>Head thickness, in.</td>
<td>Nominally, 0.25”</td>
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<tr>
<td>Vessel Volume, Ft³</td>
<td>21.8 ft³</td>
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#### Materials of Construction

- Shell
- Head
- Internal Supports

<table>
<thead>
<tr>
<th>Shell</th>
<th>SA516-70</th>
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<tr>
<td>Head</td>
<td>SA516-70</td>
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<tr>
<td>Internal Supports</td>
<td>316 SS</td>
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#### Packing

- Height, in
- Material / Type

<table>
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<th>Height, in</th>
<th>16 ft (192”)</th>
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<tr>
<td>Material / Type</td>
<td>316SS / 1” High Flow</td>
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#### Spray Nozzle

- Quantity
- Type / Material
- Flow per Nozzle, gpm
- Required Supply Pressure to Nozzle, PSIG

<table>
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<th>Quantity</th>
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<tbody>
<tr>
<td>Type / Material</td>
<td>Bete / 316SS</td>
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<tr>
<td>Flow per Nozzle, gpm</td>
<td>22</td>
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<tr>
<td>Required Supply Pressure to Nozzle, PSIG</td>
<td>Nominally, 10 psig</td>
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</table>
### Specification For HTF Scrubbers

<table>
<thead>
<tr>
<th>Job No.: 120010</th>
<th>Spec. No.: 6007-ESP-ATP-44-62-V208</th>
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<tbody>
<tr>
<td>Item No.: See Spec</td>
<td>No. Req’d.: 4</td>
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<tr>
<td>Project: Mojave</td>
<td>Ref.: Issue: 1 Dated: 11/13/12</td>
</tr>
</tbody>
</table>

#### Data Sheets

**Vendor:** The Clean Air Group - Croll Reynolds Company (CRC)

**HTF OVERFLOW TANK VENT SCRUBBERS**

**A-MV-208, B-MV-208**

<table>
<thead>
<tr>
<th><strong>Mist Eliminator</strong></th>
<th><strong>ABENER / TEYMA REQUIREMENT</strong></th>
<th><strong>CRC INFORMATION</strong></th>
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</thead>
<tbody>
<tr>
<td>Height, in.</td>
<td>8” overall</td>
<td>316SS / Mesh</td>
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<tr>
<td>Material / Type</td>
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<table>
<thead>
<tr>
<th><strong>Connections</strong></th>
<th><strong>Size / Type / Rating</strong></th>
<th><strong>CRC INFORMATION</strong></th>
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</thead>
<tbody>
<tr>
<td>A - Gas Inlet, in.</td>
<td>6” / RF Flg. / Per Code</td>
<td></td>
</tr>
<tr>
<td>B - Gas Outlet, in.</td>
<td>8” / RF Flg. / Per Code</td>
<td></td>
</tr>
<tr>
<td>C - HTF Spray connection, in</td>
<td>4” / RF Flg. / Per Code</td>
<td></td>
</tr>
<tr>
<td>D - HTF Condensate Outlet, in</td>
<td>4” / RF Flg. / Per Code</td>
<td></td>
</tr>
<tr>
<td>E - Safety Valve</td>
<td>2” /RF Flg / Per code</td>
<td></td>
</tr>
<tr>
<td>F1 - Upper Manway, in</td>
<td>36” / RF Flg. w/ davit / Per Code</td>
<td>16”</td>
</tr>
<tr>
<td>F2 - Lower Manway, in</td>
<td>36” / RF Flg. w/ davit / Per Code</td>
<td>16”</td>
</tr>
<tr>
<td>G – Connections for PDG</td>
<td>2” / RF Flg / Per code</td>
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**Vessel Support Lugs, Qty.**

| Qty. | 4 |

**Insulation Support Rings**

<table>
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<th>Qty.</th>
<th>Required</th>
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</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>12</td>
</tr>
</tbody>
</table>

### Notes

- **Vessel Support Lugs, Qty.**
- **Insulation Support Rings**
- **Manway size subject to change based on vessel diameter.**
- **Note:** Differential Pressure Gauge Nozzles are supplied with isolation valves.

---

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EC-94 (Rev. 05/2011)
**Specification For HTF Scrubbers**

<table>
<thead>
<tr>
<th>Job No.:</th>
<th>120010</th>
<th>Spec. No.:</th>
<th>6007-ESP-ATP-44-62-V208</th>
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<td>Project:</td>
<td>Mojave</td>
<td>Ref.:</td>
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**Data Sheets**

**HTF OVERFLOW TANK VENT SCRUBBERS**

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<tr>
<th>Item No.:</th>
<th>See Spec</th>
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**A-MV-208, B-MV-208**

**PERFORMANCE**

**Minimum Concentration**

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<thead>
<tr>
<th></th>
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<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
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<tbody>
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<td>Total Gas Flow Rate, lb/hr</td>
<td>Design</td>
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<td>Gas Flow, scfm:</td>
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<td></td>
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<tr>
<td>Gas Flow, acfm:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature, °F:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Pressure, psia:</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td></td>
<td></td>
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**Gas Flow Composition:**

<p>| | | | | |</p>
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<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>HTF, lb/hr</td>
<td></td>
<td></td>
<td>51.58</td>
<td>0.74</td>
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<tr>
<td>Benzene, lb/hr</td>
<td>46.11</td>
<td>8.15</td>
<td>46.11</td>
<td>7.06</td>
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<td>Toluene, lb/hr</td>
<td>2.14</td>
<td>0.25</td>
<td>2.14</td>
<td>0.24</td>
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<tr>
<td>Phenol, lb/hr</td>
<td>1.88</td>
<td>0.05</td>
<td>1.88</td>
<td>0.12</td>
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<tr>
<td>Nitrogen, lb/hr</td>
<td>847</td>
<td>845</td>
<td>847</td>
<td>852.41</td>
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<tr>
<td>High Boilers, lb/hr</td>
<td>0.23</td>
<td>0.00</td>
<td>0.23</td>
<td>0.01</td>
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<td>50.13</td>
<td>8.46</td>
<td>50.13</td>
<td>7.42</td>
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<tr>
<td>Total Non-N₂, lb/hr</td>
<td>101.95</td>
<td>9.21</td>
<td>101.95</td>
<td>8.44</td>
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**HTF Liquid Flow Rate, lb/hr:**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<td>HTF Liquid Flow Rate, lb/hr</td>
<td>45,000</td>
<td>45,094</td>
<td>45,000</td>
<td>45,088.42</td>
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**HTF Liquid Flow, GPM:**

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<tbody>
<tr>
<td>HTF Liquid Temperature, °F:</td>
<td>87.1</td>
<td>87.3</td>
<td>87.1</td>
<td>87.3</td>
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<td>HTF Liquid Pressure, psia:</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>122.5</td>
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<tr>
<td>HTF Liquid Enthalpy, Btu/lb:</td>
<td>-162.9</td>
<td>-163.0</td>
<td>-162.9</td>
<td>-163.0</td>
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**HTF / Liquid Flow Composition:**

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF, lb/hr</td>
<td>44,169</td>
<td>44,220</td>
<td>44,169</td>
<td>44,220.82</td>
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<tr>
<td>Benzene, lb/hr</td>
<td>197</td>
<td>235</td>
<td>197</td>
<td>236.05</td>
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<tr>
<td>Toluene, lb/hr</td>
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<td>21</td>
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<td>Phenol, lb/hr</td>
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<td>167</td>
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<td>166.77</td>
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<td>Nitrogen, lb/hr</td>
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<td>11</td>
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<td>High Boilers, lb/hr</td>
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<td>440</td>
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<td>Total Low Boilers, lb/hr</td>
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<td>424</td>
<td>382</td>
<td>423.92</td>
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<td>44,990</td>
<td>45,083</td>
<td>44,990</td>
<td>44,216.18</td>
</tr>
</tbody>
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**Vendor: The Clean Air Group - Croll Reynolds Company (CRC)**

**ABENER / TEYMA REQUIREMENT**

**CRC INFORMATION**

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Data Sheets

**HTF OVERFLOW TANK VENT SCRUBBERS A-MV-208, B-MV-208**

<table>
<thead>
<tr>
<th>Performance</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
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</thead>
<tbody>
<tr>
<td>Maximum Concentration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Gas Flow Rate, lb/hr</td>
<td>1,087</td>
<td>809</td>
<td>1,087</td>
<td>811.58</td>
</tr>
<tr>
<td>Gas Flow, scfm:</td>
<td>208</td>
<td>186</td>
<td>208</td>
<td>186</td>
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<tr>
<td>Gas Flow, acfm:</td>
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<td>192</td>
<td>260</td>
<td>169.5</td>
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<tr>
<td>Operating Temperature, °F:</td>
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<td>120</td>
<td>240</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, psia:</td>
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<td>17.2</td>
<td>17.2</td>
<td>17.2</td>
</tr>
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<td>Gas Enthalpy, Btu/lb</td>
<td>142.93</td>
<td>32.04</td>
<td>142.93</td>
<td>32.04</td>
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</table>

Gas Flow Composition:

- **HTF, lb/hr**: 45.11, 0.60
- **Benzene, lb/hr**: 244.10, 38.91
- **Toluene, lb/hr**: 13.38, 1.41
- **Phenol, lb/hr**: 12.69, 0.32
- **Nitrogen, lb/hr**: 770, 768
- **High Boilers, lb/hr**: 1.57, 0.02
- **Total Low Boilers, lb/hr**: 270.16, 40.65
- **Total Non-N₂, lb/hr**: 316.85, 41.26

HTF Liquid Flow Rate, lb/hr: 45,000, 45,278
HTF Liquid Flow, GPM: 87.3, 87.9
HTF Liquid Temperature, °F: 120, 120
HTF Liquid Pressure, psia: 17.2, 17.2
HTF Liquid Enthalpy, Btu/lb: -156.20, -154.83

HTF / Liquid Flow Composition:

- **HTF, lb/hr**: 39,601, 39,646
- **Benzene, lb/hr**: 1,070, 1,275
- **Toluene, lb/hr**: 125, 137
- **Phenol, lb/hr**: 1,143, 1,155
- **Nitrogen, lb/hr**: 10, 12
- **High Boilers, lb/hr**: 3,052, 3,054
- **Total Low Boilers, lb/hr**: 2,337, 2,567
- **Total Non-N₂, lb/hr**: 44,990, 45,266

Vendor: The Clean Air Group - Croll Reynolds Company (CRC)

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HTF Expansion Vessel Vent Scrubber, A-MV-209 and B-MV-209
 Specification For HTF Scrubbers

<table>
<thead>
<tr>
<th>Job No.:</th>
<th>120010</th>
<th>Spec. No.:</th>
<th>6007-ESP-ATP-44-62-V208</th>
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<tbody>
<tr>
<td>Item No.:</td>
<td>See Spec</td>
<td>No. Req’d.:</td>
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<td>Project:</td>
<td>Mojave</td>
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<td></td>
<td>Issue: 1</td>
<td>Dated: 11/13/12</td>
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**Data Sheets**

**Vendor:** The Clean Air Group - Croll Reynolds Company (CRC)

**HTF EXPANSION VESSEL VENT SCRUBBERS A-MV-209, B-MV-209**

**ABENER / TEYMA REQUIREMENT**

**CRC INFORMATION**

- **TYPE**
  - Packed Column

**DESIGN AND CONSTRUCTION**

- **Code:** ASME Sec. VIII Div. 1
- **Stamp:** Required
- **Design Pressure:** 200 / Full Vacuum
- **Design Temperature:** 650°F
- **Corrosion Allowance, in:** 0.0625 in

**Dimensions**

- **Inside Diameter, in.** 36"
- **Shell Height, Tan to Tan, in.** Nominally, 26.7 ft (320")
- **Overall Height, In.** Nominally, 30 ft (360")
- **Head style / Flange height, in.** Elliptical / 18" nominally
- **Shell Thickness, in.** 0.25"
- **Head thickness, in.** 0.25"
- **Vessel Volume, Ft³** 71 ft³

**Materials of Construction**

- **Shell** SA516-70
- **Head** SA516-70
- **Internal Supports** 316 SS

**Packing**

- **Height, in** 16 ft (192")
- **Material / Type** 316SS / 2" High Flow

**Spray Nozzle**

- **Quantity** 4
- **Type / Material** Bete / 316SS
- **Flow per Nozzle, Required Supply Pressure to Nozzle, PSIG** 22

- **Nominally, 10 psig**
Data Sheets

<table>
<thead>
<tr>
<th>Vendor: The Clean Air Group - Croll Reynolds Company (CRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HTF EXPANSION VESSEL</strong></td>
</tr>
<tr>
<td><strong>VENT SCRUBBERS</strong></td>
</tr>
<tr>
<td><strong>A-MV-209, B-MV-209</strong></td>
</tr>
</tbody>
</table>

**Mist Eliminator**
- Height, in: 8" overall
- Material / Type: 316SS / Mesh

**Connections**
- **A** Gas Inlet, in: 6" / RF Flg. / Per Code
- **B** Gas Outlet, in: 6" / RF Flg. / Per Code
- **C** HTF Spray connection, in: Top center of upper head, 6" / RF Flg. / Per Code
- **D** HTF Condensate Outlet, in: 4" / RF Flg. / Per Code
- **E** Safety Valve: 4" / RF Flg. / Per code
- **F1** Upper Manway, in: 36" / RF Flg. w/ davit / Per Code
- **F2** Lower Manway, in: 36" / RF Flg. w/ davit / Per Code
- **G** – Connections for PDG: 2" / RF Flg. / Per code

**Vessel Support Lugs, Qty.**
- Qty: 4

**Insulation Support Rings**
- Qty: Required
- Dimensions: 16

## Manway size subject to change based on vessel diameter.

Note: Differential Pressure Gauge Nozzles are supplied with isolation valves.
### Specification For HTF Scrubbers

<table>
<thead>
<tr>
<th>Item No.:</th>
<th>See Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project:</td>
<td>Mojave</td>
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| Ref.: | Issue: 1 | Dated: 11/13/12 |

**Job No.: 120010**  
**Spec. No.: 6007-ESP-ATP-44-62-V208**

**HTF Scrubbers**

**Data Sheets**

**HTF EXPANSION VESSEL**  
**VENT SCRUBBERS**  
**A-MV-209, B-MV-209**

<table>
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<tr>
<th><strong>PERFORMANCE</strong></th>
<th><strong>INLET</strong></th>
<th><strong>OUTLET</strong></th>
<th><strong>INLET</strong></th>
<th><strong>OUTLET</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum Concentration at Design Flowrate</strong></td>
<td><strong>Design</strong></td>
<td><strong>Design</strong></td>
<td><strong>Design</strong></td>
<td><strong>Design</strong></td>
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<tr>
<td>Operating Temperature, °F:</td>
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<tr>
<td>Operating Pressure, psig:</td>
<td>157</td>
<td>156</td>
<td>157</td>
<td>156</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>13</td>
<td>9</td>
<td>13</td>
<td>9</td>
</tr>
</tbody>
</table>

**Gas Flow Composition:**

| **HTF, lb/hr** | 0.97 | 0.91 | 0.97 | 1.03 |
| Benzene, lb/hr | 65.50 | 10.07 | 65.50 | 9.36 |
| Toluene, lb/hr | 1.92 | 0.29 | 1.92 | 0.33 |
| Phenol, lb/hr | 0.24 | 0.06 | 0.24 | 0.16 |
| Nitrogen, lb/hr | 9,520 | 9,404 | 9,520 | 9,484 |
| High Boilers, lb/hr | 0.00 | 0.00 | 0.00 | 0.01 |
| Total Low Boilers, lb/hr | 67.66 | 10.42 | 67.66 | 9.85 |
| Total Non-N₂, lb/hr | 68.63 | 11.34 | 68.63 | 10.89 |

**HTF Liquid Flow Rate, lb/hr**  
**HTF Liquid Flow, GPM:**  
**HTF Liquid Temperature, °F:**  
**HTF Liquid Pressure, psia:**  
**HTF Liquid Enthalpy, Btu/lb:**

<table>
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<tr>
<th><strong>HTF / Liquid Flow Composition:</strong></th>
<th><strong>HTF, lb/hr</strong></th>
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<th>44,151</th>
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<th>44,150.67</th>
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<tr>
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<td>267</td>
<td>211</td>
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<td><strong>Phenol, lb/hr</strong></td>
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<td>10</td>
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<td>437</td>
<td>437</td>
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<tr>
<td><strong>Total Low Boilers, lb/hr</strong></td>
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<td>460</td>
<td>403</td>
<td>306.81</td>
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<tr>
<td><strong>Total Non-N₂, lb/hr</strong></td>
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<td>45,048</td>
<td>44,990</td>
<td>44,895</td>
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## Specification For HTF Scrubbers

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<tr>
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<th>Spec. No.: 6007-ESP-ATP-44-62-V208</th>
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### Data Sheets

**HTF EXPANSION VESSEL VENT SCRUBBERS A-MV-209, B-MV-209**

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<th>CRC INFORMATION</th>
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<tr>
<td>PERFORMANCE</td>
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<tr>
<td>Maximum Concentration at Design Flowrate</td>
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<td>Total Gas Flow Rate, lb/hr</td>
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<td>182</td>
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<td>Operating Temperature, °F:</td>
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<td>120</td>
<td>120</td>
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<td>157</td>
<td>156</td>
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**Gas Flow Composition:**

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<th>HTF, lb/hr</th>
<th>Benzene, lb/hr</th>
<th>Toluene, lb/hr</th>
<th>Phenol, lb/hr</th>
<th>Nitrogen, lb/hr</th>
<th>High Boilers, lb/hr</th>
<th>Total Low Boilers, lb/hr</th>
<th>Total Non-N₂, lb/hr</th>
<th>HTF Liquid Flow Rate, lb/hr</th>
<th>HTF Liquid Flow, GPM:</th>
<th>HTF Liquid Temperature, °F:</th>
<th>HTF Liquid Pressure, psia:</th>
<th>HTF Liquid Enthalpy, Btu/lb:</th>
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</thead>
<tbody>
<tr>
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<td>225.52</td>
<td>7.60</td>
<td>1.01</td>
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<td>235</td>
<td>45,000</td>
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<tr>
<td>0.53</td>
<td>225.52</td>
<td>7.60</td>
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**HTF / Liquid Flow Composition:**

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<th>Nitrogen, lb/hr</th>
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<th>Total Non-N₂, lb/hr</th>
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<th>HTF Liquid Flow, GPM:</th>
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<tr>
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<td>133</td>
<td>1,177</td>
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<td>45,312</td>
<td>88.3</td>
<td>120</td>
<td>171</td>
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<td>39,503</td>
<td>1,148</td>
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<td>2,459</td>
<td>44,990</td>
<td>45,000</td>
<td>87.3</td>
<td>120</td>
<td>174</td>
<td>-156</td>
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<tr>
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<td>139</td>
<td>1,178</td>
<td>131</td>
<td>3,029</td>
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<td>45,312</td>
<td>88.3</td>
<td>120</td>
<td>171</td>
<td>-187</td>
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**Data Sheets**

**HTF EXPANSION VESSEL**

**VENT SCRUBBERS**

**A-MV-209, B-MV-209**

**ABENER / TEYMA REQUIREMENT**

**CRC INFORMATION**

**PERFORMANCE**

<table>
<thead>
<tr>
<th>Minimum Concentration at Normal Flowrate</th>
<th>Inlet</th>
<th>Design</th>
<th>Outlet</th>
<th>Design</th>
<th>Inlet</th>
<th>Design</th>
<th>Outlet</th>
<th>Design</th>
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<tbody>
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**Gas Flow Composition:**

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<tr>
<th></th>
<th>HTF, lb/hr</th>
<th>Benzene, lb/hr</th>
<th>Toluene, lb/hr</th>
<th>Phenol, lb/hr</th>
<th>Nitrogen, lb/hr</th>
<th>High Boilers, lb/hr</th>
<th>Total Low Boilers, lb/hr</th>
<th>Total Non-N₂, lb/hr</th>
<th>HTF Liquid Flow Rate, lb/hr</th>
<th>HTF Liquid Flow, GPM:</th>
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<th>HTF Liquid Pressure, psig:</th>
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**HTF / Liquid Flow Composition:**

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<th>Benzene, lb/hr</th>
<th>Toluene, lb/hr</th>
<th>Phenol, lb/hr</th>
<th>Nitrogen, lb/hr</th>
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<th>Total Non-N₂, lb/hr</th>
<th>HTF, lb/hr</th>
<th>Benzene, lb/hr</th>
<th>Toluene, lb/hr</th>
<th>Phenol, lb/hr</th>
<th>Nitrogen, lb/hr</th>
<th>High Boilers, lb/hr</th>
<th>Total Low Boilers, lb/hr</th>
<th>Total Non-N₂, lb/hr</th>
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<tr>
<td></td>
<td>44,169</td>
<td>197</td>
<td>19</td>
<td>165</td>
<td>10</td>
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<td>382</td>
<td>44,990</td>
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<td>165</td>
<td>10</td>
<td>439</td>
<td>382</td>
<td>44,990</td>
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### Data Sheets
**HTF EXPANSION VESSEL VENT SCRUBBERS A-MV-209, B-MV-209**

#### PERFORMANCE

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<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
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</thead>
<tbody>
<tr>
<td><strong>Maximum Concentration at Normal Flowrate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Gas Flow Rate, lb/hr</td>
<td>5,111</td>
<td>4,871</td>
<td>5,111</td>
<td>4,955</td>
</tr>
<tr>
<td>Gas Flow, scfm:</td>
<td>1,069</td>
<td>1,029</td>
<td>1,069</td>
<td>1,029</td>
</tr>
<tr>
<td>Gas Flow, acfm:</td>
<td>108</td>
<td>104</td>
<td>118</td>
<td>107</td>
</tr>
<tr>
<td>Operating Temperature, °F:</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>119.9</td>
</tr>
<tr>
<td>Operating Pressure, psig:</td>
<td>157</td>
<td>156</td>
<td>157</td>
<td>156</td>
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<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>22.03</td>
<td>11.04</td>
<td>22.03</td>
<td>11.04</td>
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#### Gas Flow Composition:

<table>
<thead>
<tr>
<th>Component</th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF, lb/hr</td>
<td>0.31</td>
<td>0.41</td>
<td>0.31</td>
<td>0.46</td>
</tr>
<tr>
<td>Benzene, lb/hr</td>
<td>137.20</td>
<td>22.20</td>
<td>137.20</td>
<td>23.60</td>
</tr>
<tr>
<td>Toluene, lb/hr</td>
<td>4.54</td>
<td>0.83</td>
<td>4.54</td>
<td>0.99</td>
</tr>
<tr>
<td>Phenol, lb/hr</td>
<td>0.60</td>
<td>0.20</td>
<td>0.60</td>
<td>0.53</td>
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<tr>
<td>Nitrogen, lb/hr</td>
<td>4,969</td>
<td>4,848</td>
<td>4,969</td>
<td>4,929.69</td>
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<tr>
<td>High Boilers, lb/hr</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.05</td>
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<tr>
<td>Total Low Boilers, lb/hr</td>
<td>142.34</td>
<td>23.23</td>
<td>142.34</td>
<td>25.12</td>
</tr>
<tr>
<td>Total Non-N₂, lb/hr</td>
<td>142.66</td>
<td>23.65</td>
<td>142.66</td>
<td>25.31</td>
</tr>
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#### HTF Liquid Flow Rate, lb/hr

<table>
<thead>
<tr>
<th></th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>45,000</td>
<td>45,240</td>
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#### HTF Liquid Flow Composition:

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<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
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</thead>
<tbody>
<tr>
<td>HTF, lb/hr</td>
<td>39,601</td>
<td>39,601</td>
<td>39,601</td>
<td>39,601</td>
</tr>
<tr>
<td>Benzene, lb/hr</td>
<td>1,070</td>
<td>1,185</td>
<td>1,070</td>
<td>1,183.6</td>
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<tr>
<td>Toluene, lb/hr</td>
<td>125</td>
<td>129</td>
<td>125</td>
<td>128.55</td>
</tr>
<tr>
<td>Phenol, lb/hr</td>
<td>1,143</td>
<td>1,143</td>
<td>1,143</td>
<td>1143.07</td>
</tr>
<tr>
<td>Nitrogen, lb/hr</td>
<td>10</td>
<td>131</td>
<td>10</td>
<td>49.37</td>
</tr>
<tr>
<td>High Boilers, lb/hr</td>
<td>3,052</td>
<td>3,052</td>
<td>3,052</td>
<td>3,051.96</td>
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<tr>
<td>Total Low Boilers, lb/hr</td>
<td>2,337</td>
<td>2,456</td>
<td>2,337</td>
<td>2,455.26</td>
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<tr>
<td>Total Non-N₂, lb/hr</td>
<td>44,990</td>
<td>45,109</td>
<td>44,990</td>
<td>45,108</td>
</tr>
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</table>
Instructions:

1. Initialing (By/Chk’d/App’d) required on cover sheet only. All other title block information must be included on all pages.

2. Revisions are identified in the body of the Specification.

<table>
<thead>
<tr>
<th>Rev. No.</th>
<th>Date</th>
<th>By</th>
<th>Chk’d</th>
<th>App’d</th>
<th>Description of Revision Including Page Numbers</th>
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<tbody>
<tr>
<td>0</td>
<td>9 Sept 11</td>
<td>JOA</td>
<td>HED/MZA</td>
<td>TS/APF</td>
<td>For Bid</td>
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<tr>
<td>2</td>
<td>06 March 12</td>
<td>RGTD</td>
<td>MZA</td>
<td>APF</td>
<td>General revision. Pages 3, 4, 5, 6, 8, 9, 10, 12, 14, 18, 21, 22</td>
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</tbody>
</table>
1. **Project description**
   A new 280 MW solar power plant will be constructed at a “greenfield” site near Hinkley, California. Heat transfer fluid (HTF) will be circulated, transferring heat energy from the solar collection fields to the power generation system.

2. **General**
   2.1 This specification covers the minimum requirements for furnishing drawings, design, all materials, equipment, tools, accessories, labor and supervision, necessary for fabrication, assembly, testing, inspections, and shipping of process pressure vessels, as specified herein.
   2.2 Definitions: Vendor means “Vessel Design and Fabrication Vendor” for which this specification is intended. Purchaser shall mean “Abener Teyma Mojave General Partnership”. Owner shall mean “Mojave Solar LLC”.
   2.3 The attachments identified are part of this specification. All specifications and attachments shall be met and followed by the Vendor in full.

3. **Function**
   The HTF Expansion Vessels allow for the change in volume of the HTF due to the thermal expansion and contraction of the fluid. The vessels are pressurized with nitrogen to provide sufficient pressure throughout the HTF recirculation loop to both blanket the stored HTF and prevent the HTF from vaporizing/flashing.

4. **Operation**
   The vessels will be filled and emptied daily. The vessels will experience pressure and temperature cycles daily. The vessels and all associated components shall be designed to operate continuously, year round.

5. **Location**
   The vessels will be located outdoors. The equipment shall meet all the design conditions including the seismic and climatic conditions in this specification. See attached specification 6007-ESP-ATP-00-60-G100 Project Design Criteria for site specific information.
6. Scope

6.1 Vendor shall furnish four (4) vessels per Alpha Plant and four (4) vessels per Beta Plant, refer to 6007-ESP-ATP-58-62-V200D, HTF Expansion Vessels data sheets, attached to this package.

6.2 Vendor shall furnish all the vessels complete as shown on data sheets and as noted herein and shall included all necessary blind flanges, studs, nuts, bolts, clips, lifting lugs, davits, and gaskets.

6.3 All vessels, with physical dimensions within the allowable limits for shipping, shall be completely shop fabricated and tested before shipment. Tests shall include, but not limited to, 100% radiographed welds, fully heat treated for stress relieving and test pressure.

6.4 Shop fabricated vessels shall include lifting lugs and tailing lugs, designed by vendor to include the weight of the insulation and jacket, for use in loading, unloading, and field erection of vessel. Empty weight shall be marked on the vessel by using lettering no less than 6 inches high. Vendor shall include 2 nameplates (one in the tank and one in the skirt) placed at a visible height indicating the following: Item tag number, design code, fabricated by, fabrication number and date, final client name, fluid inside, erection weight and capacity, design pressure and temperature, test pressure and periodic test pressure, inspect stamp, stress relieving, percentage of welds radiographed and purchase order or contract number. The nameplate placed in the tank shall be welded to a bracket which is welded to the tank with a projection of 8 inches (insulation thickness), the nameplate itself will be a 8x10” plate with a thickness of 3/25 inches in stainless steel. The nameplate placed in the skirt shall be welded to the skirt prior to painting.

6.5 All welds in the tanks shall be 100% radiographed and fully heat treated for stress relieve.

6.6 Anchor bolt size and quantity shall be as specified by Vendor. Vendor shall provide anchor bolt material, drawings and loading diagrams for foundation design. Anchor bolts shall be in galvanized steel and shall be provided by Vendor.

6.7 Vendor shall provide support skirt for vertical vessels. Support geometry shall be coordinated with the Abener Teyma to allow for pipe routing and skirt access. All internal supports (if needed) for the skirt itself shall also be provided by Vendor. The internal supports shall be placed to allow access and insulation of the tank bottom.

6.8 Vendor shall include piping from bottom nozzle to skirt perimeter. End of pipe shall extend minimum 6 inches past outside surface of skirt. Skirt openings for piping shall have a 1/2 in. minimum clearance between the pipe OD, including insulation, and the skirt. All other piping
connections shall have, as minimum, a projection of 10 inches, to assure that the piping will protrude out of the 8 inches insulation.

6.9 Vendor shall provide supports to the piping from bottom nozzle to allow piping growth through the skirt perimeter as is shown in the data sheet 6007-ESP-ATP-58-62-V200D.

6.10 A single skirt access manway, of 24 in. diameter, shall be provided in each skirt Bottom of access opening shall be 18 inches above skirt base. No piping shall pass through access openings. Access shall be a 24 in pipe opening. Vendor shall provide adequate top handle inside the skirt and appropriate ladder rungs.

6.11 Vendor shall provide a single 24 in manway placed in the tank shell, near to the bottom tangent. Access opening shall have a flanged cover with davit. Vendor shall provide adequate top handle inside the shell and appropriate ladder rungs. Vendor shall also provide exterior ladder and platform to assure a safety access to the manway.

6.12 At least six vents shall be provided in skirt. The vents shall be minimum NPS 6, Schedule 80 and shall be equally spaced at a maximum of 6 ft around the skirt circumference. Vents shall be fully open access.

6.13 Each vessel shall include four stainless steel grounding lugs. Grounding lugs shall be a minimum of 3” wide x 3” tall x ¼” thick plate, and shall be made of 304 grade stainless steel. The grounding lugs shall be drilled to match “Burndy Qiklug” type “QA28-2N” which utilizes NEMA bolt spacing. Grounding lugs shall be welded to the skirt 12” above the base foundation flange.

6.14 Each vessel shall include insulation support rings. For each vessel, their shall be 7 rings, each extending 5 inches beyond the shell circumference, evenly spaced at maximum 9 feet, starting near the bottom tangent. Spacing should be in 3 foot increments. Top ring should be near the top tangent. Rings can be segmented and detachable for shipment. Any attachment brackets shall be continuously welded to the vessel.

6.15 Vessels shall be designed for 200 PSIG and full vacuum. Vendor shall provide vacuum rings. Vacuum rings shall be also used as an insulation support ring, however, an insulation support ring shall not be used as a vacuum ring.

6.16 Each vessel shall include insulation support pins welded to the heads. Pins are to be #10 ga. (3.6mm) weld pins on 12” centers. The companion 2-1/2” square speed clips shall be shipped with the vessel. The pins shall be carbon steel and shall be length compatible with the insulation thickness of 8”.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>General revision</th>
<th>RGTD</th>
<th>MZA</th>
<th>APF</th>
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<tr>
<td>0</td>
<td>9-Sept-2011</td>
<td>For Bid</td>
<td>JAO</td>
<td>HED</td>
<td>TS</td>
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<td></td>
<td></td>
<td></td>
<td>MZA</td>
<td></td>
<td>APF</td>
</tr>
</tbody>
</table>

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EC-94 (Rev. 05/2011)
6.17 Each vessel shall include four welded reinforcing pads 12” x 12” on the vessel top head for attachment or pipe supports. Pads and clips shall be designed and reinforced to accommodate the following combined loads:

6.17.1 Downward Load: 10,000 lb.

6.17.2 Bending Moment (+/- radial to center of vessel): 100,000 ft*lb.

6.17.3 Bending Moment (+/- tangential): 100,000 ft*lb.

6.18 Vendor shall provide reinforcing pads and clips to support vertical piping attached to the vessel shell.

6.19 Vendor shall provide a vortex breaker for the connection located at the bottom of the HTF expansion vessels.

6.20 Vendor shall provide a foundation template that matches the anchor bolt pattern on vessel skirt. Template shall be sturdy steel construction. Template can be either one piece or multi piece bolted construction. For multi piece bolted assembly, the sections should include a pin and hole arrangement to assure proper alignment and tolerances. One template will be re-used for each of the vessel foundations. Template shall be delivered to job site within 6 weeks of anchor bolt arrangement approval.

6.21 For the HTF Expansion Vessels, refer to data sheets within this specification. For the HTF Flash Expansion Vessels, refer to data sheets within this specification. Vendor should complete the data sheet at the end of this specification and submit it with the proposal.

6.22 Each Flash Expansion Vessel shall include an internal stand pipe. The stand pipe shall be fully welded to the inside of the bottom head. The stand pipe shall be designed to retain the static head if full of HTF with zero level of HTF outside the stand pipe. The stand pipe shall be designed to retain the static head if full of HTF outside the stand pipe and zero level of HTF inside the stand pipe. The stand pipe shall be designed to resist seismic loading when full of HTF with zero level of HTF outside of the stand pipe. The stand pipe shall include 2 times the corrosion allowance as specified on the data sheet. The stand pipe shall be provided with four (4) ½” diameter holes located 6” above the bottom of the stand pipe. These holes are for static leveling between the vessel and stand pipe. The stand pipe shall be provided with one (1) ½” diameter hole located at the bottom of the stand pipe next to the vessel head, to allow for complete drainage of the vessel. See 6007-HDD-ATP-58-62-C103 Data sheet for Therminol VP-1 for the HTF properties.
6.23 Each Flash Expansion Vessel shall be provided with an internal spray shield. The spray shield is to prevent extreme thermal gradients in the shell where the HTF in the vessel is warmer than the HTF cooling spray injected into the vessel. The spray shield shall have an OD 4” smaller than the ID of the vessel. The spray shield shall be permanently attached to the top head via welding. The attachments shall be clips that allow open space (minimum 2” gap) between the top head and the spray shield. A 2” gap between the spray shield and vessel is to be maintained. The open space is to allow vapor to escape when the liquid level exceeds the bottom of the spray shield. The spray shield shall be a minimum of 5/16” thick.

6.24 On the Flash Expansion Vessel, the manway cover shall be provided with a nozzle pipe welded through the center of the cover. This pipe shall have prepped weld ends inside and outside the vessel. The pipe shall extend 6” either side of the manway cover. Vendor shall weld a spray head to the inside end of the nozzle pipe and shall provide it according the following:

6.24.1 Supplier: BETE.
6.24.2 Model: TC1480W.
6.24.4 Characteristics: 8 inches, schedule 40, operating flow = 1,370,000 lb/h, BW, maximum recommended differential pressure = 60 PSI, design temperature = 750 °F.

6.25 On nozzles with weld end prep, the thicker nozzle on the vessel will need to be taper bored by the vendor to match the mating field pipe inside diameter.

7. Codes and standards

7.1 The requirements of ASME Sec VIII Division 1 are to be fully adhered to by Vendor for the complete project. “Code” as referenced herein, shall mean ASME Sec VIII Division 1, unless indicated otherwise.

7.2 The building codes for the site are those approved by San Bernardino County, California, and the California Energy Commission, and include their local amendments and additions to the following:

7.2.1 CBC – California Building Standards Code – Title 24, California Code of Regulations
7.2.2 IMC – International Mechanical Code - 2006
7.3 The following codes, standards, regulations, and guides are to be referred to by Vendor as guidelines for this project. As deemed appropriate by the Vendor, additional codes and regulations not mentioned below shall be followed based on prudent design practice.

7.3.1 AISC – American Institute for Steel Construction
7.3.2 AISI – American Iron and Steel Institute
7.3.3 ANSI – American National Standards Institute
7.3.4 ASME – American Society of Mechanical Engineers
7.3.5 ASNT – American Society for Nondestructive Testing
7.3.6 ASTM – American Society for Testing and Materials
7.3.7 AWS – American Welding Society
7.3.8 IBC - International Building Code 2006
7.3.9 ISO - International Standardization Organization
7.3.10 NFPA – National Fire Protection Agency
7.3.11 SSPC – Society for Protective Coatings
7.3.12 Occupational Safety and Health Administration Federal laws, statutes, regulations, ordinances and inspections.
7.3.13 Codes, laws, statutes, and regulations, ordinances and inspections, for the State, County, and Local Governments.

7.4 Should there be any conflict between applicable codes, standards of practice, specifications, or vendor’s recommendations noted herein and those of the locality of the project, the more stringent code shall apply.

8. Engineering & Design

8.1 Vendor shall provide all engineering services required to fulfill the obligations of this contract.

8.2 Vendor shall provide engineering drawings and calculations for approval prior to the start of fabrication.

8.2.1 Refer to and comply with specification 6007-ESP-ATP-58-62-V200V, Vendor Data Requirements Heat Transfer Fluid Expansion Vessels, attached to this package.
8.2.2 Approval of Vendor’s drawings and calculations is limited to verifying general compliance with specifications and design drawings, and does not imply verification of dimensions, quantities, or calculations. Vendor is not relieved from responsibility for accurate dimensioning, equipment sizing, fabrication to required tolerances, and fabrication fit-up.

8.2.3 Engineering units indicated shall be U.S. customary. Volumes shall be indicated in gallons.

8.2.4 Drawings:

8.2.4.1 A general arrangement drawing shall be furnished for each vessel, and shall contain the data shown in 6007-ESP-ATP-58-62-V200D. The location of the vessel marking or nameplate, the size and orientation of all nozzles and connections, and the anchor bolt layout shall also be shown on this drawing. **Drawing shall include the insulation thickness (supplied by others) in order to show the appropriate projection of the nozzles.**

8.2.4.2 A separate outline drawing for each vessel shall be furnished with appropriate markings to cross-reference each component (shell plates, heads, nozzles, flanges, forgings, skirt plates, etc.) to the applicable mill test certificates for the steels used in the construction.

8.2.4.3 Vendor shall provide all drawings that are issued for fabrication, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

8.2.4.4 Fabrication drawings shall show weld details and shall reference applicable welding procedures. The drawings shall also include impact test requirements, showing (as applicable):

8.2.4.4.1 Component
8.2.4.4.2 Thickness for impact purposes
8.2.4.4.3 Material specification
8.2.4.4.4 Critical Exposure Temperature
8.2.4.4.5 Minimum Design Metal Temperature
8.2.4.4.6 Appropriate Charpy impact requirements (average/minimum values)
8.2.5 Data and Calculations

8.2.5.1 Design calculations (including lifting attachments and supports) made by the Vendor shall be furnished prior to or along with submission of drawings for approval. When calculations are made using a computer, all input data, assumptions, computer program version used, and a summary of the results shall be furnished.

8.2.5.2 Vendor shall provide their structural calculation package, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

8.3 Vessels shall be designed for a minimum 30 year life.

8.4 Vessels shall be designed to withstand internal or external pressure and mechanical loads induced by vessel dead load, process, contents, earthquake, wind and other specified loadings. Wind and earthquake loads shall be in accordance with the Project Design Criteria described in Specification 6007-ESP-ATP-00-62-G100. Load combinations must be appropriately considered. Record design calculations are required.

8.5 The minimum insulation design load shall be for 8” thickness on heads and shell using 8 lb / ft³ mineral wool insulation with aluminum jacket.

8.6 Materials of construction shall be per this specification and the attached data sheet. In the event of conflict between parts of this specification and the attached data sheet, the vessel data sheet shall govern the requirements. Where materials of construction are not specified, Vendor shall propose materials for each item as appropriate for the service conditions.

8.7 All materials purchased by Vendor shall meet nationally recognized standards unless otherwise approved by Abener Teyma.

8.8 All materials shall be compatible with the vessel contents and in accordance with all applicable welding procedures.

8.9 Copies of mill test reports for materials shall be provided to Abener Teyma by Vendor.

8.10 The design shall be such to avoid any corrosion of vessel equipment.

8.11 The design shall be such to avoid any contamination of the vessel contents once the vessel is put into service.

8.12 The layout of weld seams shall be such that it will allow full access for inspection. Circumferential seams shall not be located within a distance of 1-1/2” of any external
compression ring, internal ring, support ring, etc. Nozzles and manholes shall not intersect any weld seams, unless approved by Abener Teyma.

8.13 All manway covers shall be equipped with davits.

8.14 Vendor shall provide corrosion allowances as specified by the data sheets.

8.15 The minimum required thickness of plate and other structural members shall be that which is necessary to satisfy tension and compression strength requirements for the specified design conditions, without inclusion of corrosion allowance.

8.16 All nozzles shall be flush with the inside surface of the vessel wall, unless otherwise specified.

8.17 Nozzle flanges and manway flanges shall be the material as indicated on the Data Sheet.

8.18 Internal bolting is not allowed.

8.19 Nozzles shall not be located in vessel plate weld seams, unless prior approval has been given by Abener Teyma.

8.20 Vessel shall be designed for daily cyclic operation, 450 cycles per year, 30 year life cycle.

8.20.1 Vendor shall include Cyclic Analysis in their design. Vendor shall provide Cyclic Analysis calculations with other design calculations for Abener Teyma approval.

8.20.2 Cyclic operating conditions are:

Daily cycle of filling from low level at bottom tangent point (118 psig at 392°F) to level at 90% of straight side height (177 psig at 560°F), and back to low level (118 psig at 392°F).

8.21 Vessel design shall also be capable of a liquid level at the top tangent line operating with HTF at 100°F with nitrogen blanket at 15 psig.

8.22 Vendor to indicate on project drawings the maximum allowable loads on nozzles. **Nozzles shall be designed for a minimum of the loads as indicated for the CL300 in the specification 6007-ESP-ATP-00-G130 and showed below:**

<table>
<thead>
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<th>Force (pounds)</th>
<th>Moments (foot pounds)</th>
</tr>
</thead>
<tbody>
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<td>Sum</td>
</tr>
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<td>3 and smaller</td>
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</tr>
<tr>
<td>4</td>
<td>1400</td>
</tr>
<tr>
<td>6</td>
<td>2000</td>
</tr>
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9. Fabrication

9.1 Any fabrication shall not be sublet to others without the written approval of Abener Teyma.

9.2 All vessels must meet the latest edition of the code indicated on the data sheets for shop practices, welding, stress relieving, radiographing, and testing.

9.3 All plate and other material used in the execution of this work shall be new and clean stock, free from surface laminations and other physical imperfections.

9.4 All materials shall be identified throughout fabrication. Material certification shall be provided on request by the Abener Teyma inspector. Material certification test reports shall become a permanent record of the documentation package.

9.5 Machines surfaces which are warped or distorted due to welding, etc., shall be re-machined after these operations are finished, with minimum thickness maintained as specified. Machine surfaces shall be finished to the smoothness limit indicated on the design drawings.

9.6 The axes of any shell nozzle shall be radial and perpendicular to the longitudinal axis of the vessel. Flange face shall be perpendicular to the nozzle axis. All welds protruding beyond the flange face shall be ground flush.

9.7 Flange bolt holes of shell nozzles shall straddle the axial center line.

9.8 Vendor shall prepare the weld end nozzles end face in accordance with ASME B31.3 and ASME B16.25, to match the piping as indicated in the piping specification referenced in this specification. Abener Teyma shall review each weld end nozzle face prior to purging and protection for shipment. Vendor is to protect each weld end nozzle face against damage during handling and transporting.

9.9 All permanent attachments, stiffeners, clip angles, ring angles, etc., shall be joined to vessels by continuous welding, unless approved otherwise by Abener Teyma.
9.10 Remove all sharp edges and burrs.

9.11 All welds and surfaces exposed to vessel contents, its vapor or condensate shall be free of gouges, pits, cracks or other surface defects.

9.12 All welds and materials discovered to be non-compliant through inspection and/or testing shall be fully repaired at vendor’s cost.

9.13 Fabricated location and orientation of nozzles will be reviewed by Abener Teyma. If there are any discrepancies with project documents, the Vendor will make corrections.

9.14 Vendor shall notify Abener Teyma regarding any necessary repair work and have written approval before proceeding.

9.15 Vendor shall provide whatever additional treatment, such as preheat and/or post weld heating, as required for the material being used. Shop drawings must identify such treatments.

9.15.1 For any required heat treatment, Vendor shall provide written procedures for Abener Teyma review.

9.15.2 At completion, Vendor shall provide a Product Certification for PWHT, including a copy of time / temperature chart records.

9.16 To prevent contamination of the vessel contents, Vendor shall mechanically clean the interior surface of the vessel to remove all weld spatter, scale, rust, filings, dirt, etc., as well as all foreign materials.

9.16.1 Mechanical cleaning shall meet all requirements of NACE No. 3 (Commercial Blast Cleaning).

9.16.2 Vendor shall not commence mechanical cleaning until after all testing has been completed.

9.16.3 Vendor shall not commence mechanical cleaning until instructed by Abener Teyma to do so.

9.16.4 At the completion of mechanical cleaning, Vendor shall purge and seal the vessel with an inert gas.

9.16.4.1 Warning signs shall be placed by Vendor on the vessel and manway clearly indicating the vessel has an inert gas seal that must be purged before entry.

9.16.4.2 Warning signs shall be placed by Vendor on the vessel and manway clearly indicating the vessel has storage desiccant inside that must be removed
prior to start-up. The desiccant should be placed in a hook under the manway cover to make the desiccant removal easier.

9.16.4.3 An acceptable method for sealing weld end nozzles is with a flat plate welded to pipe end, in a manner that will minimize any damage to the weld end prep. We want to minimize any weld end prep required at the job site.

9.16.4.4 Sealing with inert gas shall include a pressure gauge that proves purge gas in the vessel. Pressure gauge is to stay with sealed vessel. Pressure gauge is to be protected from damage during shipment. Pressure gauge is to include shut off valve.

10. **Tolerances**

10.1 The vendor shall choose the more stringent between Code requirement and the following. For nozzle elevations and positions, the tolerance shall be as measured from the bottom tangent line or datum, and not accumulated by multiple dimensioning possibly shown on the design drawings.

11. **Inspection and testing**

11.1 Abener Teyma (or an inspector on their behalf) reserves the right to inspect the equipment at any time during the course of fabrication. Abener Teyma retains the right to provide personnel to observe all fabrication work within the scope of the contracted work (including testing and inspection). Such individuals shall be afforded full and free access for these purposes, subject to safety and schedule constraints.

11.2 Inspector means Abener Teyma (or an inspector on their behalf).

11.3 Inspector shall have free access, at all reasonable times, to the areas where the work on equipment is being performed. Vendor shall notify Abener Teyma purchasing department in advance (minimum one week) of scheduled vessel testing to allow time for the Inspector to arrange to be at the test site before testing begins.

11.4 Mill and shop inspection shall not release the Vendor from responsibility for replacing any defective material and for repairing any defective workmanship that may be discovered in the field.
11.5 Vendor’s currently qualified welders and procedures under ASME Sec. IX, must be submitted to Inspector for approval. Additional qualifications necessary are to be at vendor’s expense.

11.6 All vessels shall be inspected and tested according to the applicable code as listed in the vessel data sheets.

11.7 For any required radiographic examination, a certified copy of a written report confirming that the work was inspected as set forth herein shall be provided when specified. Refer to 6007-ESP-ATP-58-62-V200V Contractor Data Requirements. The report shall include the following:

11.7.1 A summary of inspection of radiographs.
11.7.2 Identification of unacceptable radiographs and a statement of the action taken to rectify unsatisfactory welds.

11.8 Tell-tale holes shall be used to pneumatically test all welded attachments prior to hydrostatic testing. Tell-tale holes shall not be plugged during hydrostatic testing of the vessel.

11.9 Vendor shall submit letters of completion to Abener Teyma at least twenty days prior to the requested final inspection date. The equipment must be ready for inspection and the tests run prior to this final inspection request.

11.10 The cost of all tests due to code requirements or manufacturer’s test requirements shall be fully borne by vendor.

11.11 A written certification of an acceptable hydrostatic test shall be completed by vendor. The certification shall be forwarded to the individual indicated on the Abener Teyma purchase order.

12. Paint

12.1 Vendor shall **sand blast clean all the surfaces and** prime coat (finish) the vessel skirt as follows:

12.1.1 The vessel skirt shall be shop prime coated, exterior and interior, in accordance with specification 6007-ESP-ATP-00-60-N102, Paint System for High Temp. Non-primed Steel.

12.1.2 All shop priming and painting shall be in accordance with specification 6007-ESP-ATP-00-60-N180 “Shop Applied Painting”.

12.1.3 No paint shall be applied until after all tests and examinations have been completed.

12.1.4 Flange faces and other machined areas shall not be painted unless specifically designated.
### 12.1.5 Davit arms and manways shall be shop painted (finish).

### 12.2 Vendor shall sand blast and prime coat the exterior of the vessels to avoid corrosion in the field while insulation is installed.

### 12.3 After cleaning and sand blasting the interior of the tanks, Vendor shall apply a corrosion inhibitor (Chempro Ferroxichem or equivalent).

### 13. Installation information

13.1 Vendor shall separately quote one set of any special tools and wrenches required for installation and maintenance.

13.2 Supply all spare parts necessary for system assembly, testing, start-up, and commissioning. Vendor shall provide Abener Teyma a list of suggested spare parts within 1 month after project award. Vendor shall supply one spare set of gaskets for each manway; tagged with the item number and purchase order number.

### 14. Shipping

All parts shall be skidded, boxed, or otherwise suitably prepared for shipment to protect against damage while in transit per specification 6007-ESP-ATP-00-60-G121.

### 15. Additional requirements

15.1 A permanent stainless steel nameplate with standoff shall be fixed to the equipment that includes the information as indicated in ASME Code for the marking of nameplates. Dimensions are to be indicated in feet and inches. Volumes are to be indicated in gallons.

15.2 In addition to the ASME requirements a permanent stainless steel nameplate with standoff shall be fixed to all pressure vessels including, but is not limited to, the following information:

- Customers Equipment Number
- Customers Equipment Name
- Customers PO number
- Nominal Diameter

### General revision

<table>
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<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>RGTD</th>
<th>MZA</th>
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<td>9-Sept-2011</td>
<td>For Bid</td>
<td>JAO</td>
<td>HED/ MZA</td>
<td>TS</td>
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15.2.5 Nominal Overall Height
15.2.6 Empty Weight
15.2.7 Internal Capacity
15.2.8 Design Specific Gravity
15.2.9 Material of Construction
15.3 Data

15.3.1 A Manufacturer’s data report shall be furnished and shall contain the same information as required by form U-1 of ASME SEC VIII D1. Certified material test reports shall be furnished, and they shall represent the properties in the as fabricated condition. The data report shall be signed by the Vendor, by an Authorized Inspector as defined in Par. UG-91 of the ASME Code, or as otherwise required by the applicable code. Signed copies of data reports and other required documentation shall be submitted to Abener Teyma prior to shipment of each vessel.

15.3.2 Welding, PWHT, and weld repair procedures shall be submitted to Abener Teyma for review prior to the start of fabrication.

15.3.3 Upon completion of fabrication, the Vendor shall supply Abener Teyma with:

15.3.3.1 Copy of PWHT recording (if applicable)
15.3.3.2 Copy of hydrostatic test chart
15.3.3.3 Copy of NDE (RT, UT, MT, PT, WFMT, etc.) test records

16. Vendor proposal data

16.1 Vendor shall include with their proposal the data sheets found at the end of this specification, completed with all the information.

16.2 Vendor shall complete the Vendor Commitment column of 6007-ESP-ATP-58-62-V200V and submit with the proposal. Failure to submit these data sheets will result in an incomplete proposal that may not be considered.

17. Exceptions

17.1 Comments and exceptions to the specification shall be listed in a separate part of the proposal title “Exceptions to the Specification”. All Exceptions shall be listed in this section and shall reference the appropriate specification section. No other exceptions will be allowed.

18. Schedule
18.1 After issue of purchase order, Vendor shall provide a detailed schedule indicating dates for engineering, procurement, fabrication, testing, cleaning, painting, and shipping.
19. Attachments

6007-ESP-ATP-00-62-G100 Project Design Criteria
6007-ESP-ATP-00-60-G120 Equipment Modeling Vendor Data Requirements
6007-ESP-ATP-00-60-G121 Shipping Preparation
6007-ESP-ATP-00-60-G130 Required Allowable Nozzle Loads
6007-ESP-ATP-68-61-CS30 Class 300 Carbon Steel – Piping System - HTF Return
6007-ESP-ATP-00-60-N102 Paint System for High Temp Non-primed Steel.
6007-ESP-ATP-00-60-N180 Shop Applied Painting

### Specification For HTF Expansion Vessels

<table>
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<tr>
<td>Item No.:</td>
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<tr>
<td>Project:</td>
<td>Mojave</td>
<td></td>
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<tr>
<td>Ref.:</td>
<td>Issue: 2</td>
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#### Data Sheets with Proposal

<table>
<thead>
<tr>
<th>VENDOR:</th>
<th>Vessel MV-205 A,B,C</th>
<th>Vessel MV-205 E</th>
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<tr>
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<tr>
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</tr>
<tr>
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<td>Shell thickness (course 1)</td>
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<td>Shell thickness (course 1)</td>
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<td>Shell thickness (course 1)</td>
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<tr>
<td>Shell thickness (course 1)</td>
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</tr>
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<td>Head thickness (top)</td>
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<tr>
<td>Head thickness (bottom)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skirt thickness</td>
<td></td>
<td></td>
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<tr>
<td>Exceptions to Specification? (Y / N)</td>
<td></td>
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EC-94 (Rev. 05/2011)
## Specification For HTF Expansion Vessels

<table>
<thead>
<tr>
<th>Item</th>
<th>Vendor Name</th>
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<tbody>
<tr>
<td>Tank (bottom, shell and roof). Required (8 tanks)</td>
<td>Abener</td>
</tr>
<tr>
<td>Tank supports (skirt)</td>
<td>Required</td>
</tr>
<tr>
<td>Manways, including davit arms, bolts, gasket, blind flange, ladder</td>
<td>Required</td>
</tr>
<tr>
<td>rungs and handle inside.</td>
<td></td>
</tr>
<tr>
<td>Nozzles with a projection of 10 inches</td>
<td>Required</td>
</tr>
<tr>
<td>Equipment mounting flanges</td>
<td>Required</td>
</tr>
<tr>
<td>Internals</td>
<td>Required</td>
</tr>
<tr>
<td>Electrical grounding lugs (SS)</td>
<td>Required</td>
</tr>
<tr>
<td>Studs, nuts, bolts, clips, lifting lugs</td>
<td>Required</td>
</tr>
<tr>
<td>Nondestructive testing. 100% X-ray in welds.</td>
<td>Required</td>
</tr>
<tr>
<td>Hydrostatic and pneumatic testing</td>
<td>Required</td>
</tr>
<tr>
<td>Name plates</td>
<td>Required</td>
</tr>
<tr>
<td>Anchor bolts (design and material)</td>
<td>Required</td>
</tr>
<tr>
<td>Piping from bottom nozzle to skirt perimeter with supports</td>
<td>Required</td>
</tr>
<tr>
<td>Open access to the skirt and vents</td>
<td>Required</td>
</tr>
<tr>
<td>4 Grounding lugs (SS)</td>
<td>Required</td>
</tr>
<tr>
<td>Vacuum rings</td>
<td>Required</td>
</tr>
<tr>
<td>Insulation rings and insulation pins</td>
<td>Required</td>
</tr>
<tr>
<td>4 welded reinforcing pads on top</td>
<td>Required</td>
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<tr>
<td>Reinforcing pads and clips for vertical piping</td>
<td>Required</td>
</tr>
<tr>
<td>Pipe clips for fire protection piping</td>
<td>Required</td>
</tr>
<tr>
<td>Vortex breaker</td>
<td>Required</td>
</tr>
<tr>
<td>Foundation template</td>
<td>Required</td>
</tr>
<tr>
<td>Internal spray shield for the flash vessel</td>
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</tr>
<tr>
<td>Internal stand pipe for the flash vessels</td>
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<tr>
<td>Internal nozzle pipe for the flash vessels</td>
<td>Required</td>
</tr>
<tr>
<td>Tank sealing with inert gas and desiccant</td>
<td>Required</td>
</tr>
<tr>
<td>Tank interior surface: blast clean and corrosion inhibitor</td>
<td>Required</td>
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</tbody>
</table>

### Scope of work

- **Included** = When the item specified is included in your base price
- **Optional** = When the item is quoted like an option
- **Not Provided** = When it is not included in your base price and is not either quoted as an option.

Use the "notes" blank to include all the clarifications you need.
### Specification For
HTF Expansion Vessels

<table>
<thead>
<tr>
<th>Item</th>
<th>Abener</th>
<th>Vendor name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank exterior surface: blast clean and prime coat</td>
<td>Required</td>
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</tr>
<tr>
<td>Skirt, davits and manways: Shop painted (finish)</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Access and platform to shell manway</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Insulation rings and pins</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Spares</td>
<td>2 gaskets per manway required</td>
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<tr>
<td>Thermowells</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>PE stamping / Stamping</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Final documentation (2 electronic copies and 10 paper copies)</td>
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<td>Others</td>
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**Notes:**

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<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>RGTD</th>
<th>MZA</th>
<th>APF</th>
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<tr>
<td>0</td>
<td>9-Sept-2011</td>
<td>For Bid</td>
<td>JAO</td>
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<td>TS</td>
</tr>
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</table>

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### CONSTRUCTION

**CODE:** ASME SEC VII, DIV 1  
**STAMP:** ASME  
**PRESS. (PSIG):** MAX. OP. 174  
**MIN. OP.:** FV  
**DESIGN: 200/FV**  
**TEMP. (°F):** MAX. OP. 680  
**MIN. OP.:** 100  
**DESIGN: 750**  
**WIND VELOCITY:** SEE SPEC.  
**CORR. ALLOW: 0.0625” (1/16”)**  
**SEISMIC ZONE:** SEE SPEC.  
**PHYS. & CHEM. TESTS:** SEE SPEC.  
**STRESS RELIEVE:** SEE SPEC.  

<table>
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<tr>
<th>MATERIAL</th>
<th>SPEC</th>
<th>MATERIAL</th>
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<tbody>
<tr>
<td>SHELL</td>
<td>SA-516-70</td>
<td>INTERNALS</td>
<td>N/R</td>
</tr>
<tr>
<td>HEADS</td>
<td>SA-516-70</td>
<td>DAVIT/HINGE PLATFORMS</td>
<td>YES, SEE SPEC</td>
</tr>
<tr>
<td>SKIRT</td>
<td>SA-516-70</td>
<td>LADDER (CAGED) CLIPS AND PADS (PIPE SUPPORT)</td>
<td>YES, SEE SPEC</td>
</tr>
<tr>
<td>NOZZLES</td>
<td>CODE, SEE PIPE SPEC.</td>
<td>PAINTER TROLLEY</td>
<td>N/R</td>
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<tr>
<td>PIPE</td>
<td>CODE, SEE PIPE SPEC.</td>
<td>LIFTING LUGS</td>
<td>YES, SEE SPEC</td>
</tr>
<tr>
<td>COUPLINGS</td>
<td>N/R</td>
<td>PAINT</td>
<td>SKIRT AND TANK PRIMED</td>
</tr>
<tr>
<td>GASKETS</td>
<td>SEE PIPE SPEC.</td>
<td>INSULATION</td>
<td>BY OTHERS, SEE SPEC, 8”</td>
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<tr>
<td>BOLTS</td>
<td>CODE</td>
<td>INSUL SUPPORTS, PINS</td>
<td>YES, SEE SPEC</td>
</tr>
<tr>
<td>NUTS</td>
<td>CODE</td>
<td>GUARDRAIL</td>
<td>YES, FOR THE MANWAY (A)</td>
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### CONNECTION SCHEDULE

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<th>LOCATION</th>
<th>SERVICE</th>
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<tr>
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<td>CODE</td>
<td>RF</td>
<td>BOT SHELL</td>
<td>MANWAY</td>
<td>10”</td>
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<tr>
<td>B</td>
<td>1</td>
<td>3”</td>
<td>CS32</td>
<td>WELD END</td>
<td>TOP</td>
<td>HTF MAIN PUMP ORIFICE</td>
<td>10”</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>3”</td>
<td>CS30</td>
<td>WELD END</td>
<td>TOP</td>
<td>N2 ULLAGE</td>
<td>10”</td>
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<tr>
<td>D</td>
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<td>8”</td>
<td>CS30</td>
<td>WELD END</td>
<td>BOTTOM</td>
<td>HTF INLET/OUTLET</td>
<td>6”</td>
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<tr>
<td>E</td>
<td>1</td>
<td>8”</td>
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<td>THERMOWELL</td>
<td>X”</td>
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<td>H</td>
<td>6</td>
<td>6”</td>
<td>SCH 80</td>
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<td>SKIRT</td>
<td>VENTS</td>
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### NOTES:

1. "SPECIFICATION" OR "SPEC" REFERS TO ASME B31.3 AND ASME B16.34.
2. VENDOR TO PREPARE FACE OF WELD.
4. 0% OPERATING LEVEL AT LOWER TANK.
5. NOT USED.
6. NET WORKING VOLUME IS BASED ON TANGENT BASIS.
7. ALL VESSELS ARE INTERCONNECTED TO HEADER. THERE WILL BE A COMMON HEADER.
8. VESSELS SHALL BE INSULATED.
9. VESSELS ARE NOT INTERNALLY COATED AND TO USE OF CORROSION INHIBITORS.
10. AT LEAST SIX (6) VENTS SHALL BE 80, EQUALLY-SPACED AT MAXIMUM CIRCUMFERENCE.
11. VORTEX BREAKER REQUIRED.
## Construction

**Code:** ASME Sec VII, Div 1  
**Stamp:** ASME

**Pressure (PSIG):**
- Max. Op.: 174
- Min. Op.: FV

**Temperature (°F):**
- Max. Op.: 770
- Min. Op.: 100

**Wind Velocity:** See Spec.  
**Corr. Allow:** 0.0625” (1/16”)

**Seismic Zone:** See Spec.

**Stress Relieve:** See Spec.

### Material

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<td>Shell</td>
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<td>SA-516-70</td>
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<td>SA-516-70</td>
<td>Spray Shield</td>
<td>SA-516-70</td>
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<td>Davit/Hinge</td>
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<td>Couplings</td>
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<td>Paint</td>
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<td>Skirt and Tank Primed</td>
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<td>Bolts</td>
<td>Code</td>
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<td>Code</td>
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## Connection Schedule

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<th>Facing</th>
<th>Location</th>
<th>Service</th>
<th>Proj</th>
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<td>3”</td>
<td>CS32</td>
<td>WELD END</td>
<td>TOP</td>
<td>HTF MAIN PUMP ORIFICE</td>
<td>10”</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>3”</td>
<td>CS30</td>
<td>WELD END</td>
<td>TOP</td>
<td>N2 ULLAGE</td>
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</tr>
<tr>
<td>D</td>
<td>1</td>
<td>36”</td>
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<td>BOTTOM</td>
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<tr>
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**Total Volume (T/D):** 6390 Cubic Feet
LETTER OF TRANSMITTAL

Date: May 27, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-12
Description: Specifications for the ullage/expansion vent system.
Submittal No.: AQ-12-01-00
To: Mr. Dale Rundquist, CPM
California Energy Commission

WE ARE SENDING YOU

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<th>Title</th>
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<td>AQ-12 Technical Memorandum HTF Expansion System Basis</td>
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<td>Specification For Carbon Filters</td>
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THESE ARE TRANSMITTED as checked below:

☒ For Review

REMARKS

COPY TO: File
SIGNED BY: Vernon D. Leeming
Permitting Engineer
ABEINS SA EPC
Mr. Dale Rundquist, CPM  
California Energy Commission  
1516 Ninth Street (MS-2000)  
Sacramento, CA 95814  
DRundquist@energy.state.ca.us

Dear Mr. Rundquist,

In compliance with AQ-12 we are submitting the Specifications for the ullage/expansion vent system of the Mojave Solar Project for your review.

For your convenience, we are including the Compliance language below:

**AQ-12**  The ullage/expansion system nitrogen venting shall be carried out only through vents which have vapor condensing coolers which shall be maintained at or below 120 degrees Fahrenheit. **District permit numbers C012015 and C012016.**

**Verification:**  The project owner shall provide the District and CPM manufacturer design specifications showing compliance with this condition at least 30 days prior to the installation of the ullage/expansion vent system. The project owner shall have active temperature gauges that can be inspected to show compliance with this condition.

Should you have any questions or comments, please don’t hesitate to contact me.

COPY TO:  File SIGNED BY:  

[Signature]  
Vernon D. Leeming  
Permitting Engineer  
ABEINSAN EPC
HTF Expansion System Basis

The heat transfer fluid (HTF) will be Therminol VP-1, produced by Solutia, Inc., which is comprised of diphenyl oxide (73 - 73.5%) and biphenyl (26.5 - 27%). This material in gaseous form represents VOCs. As the HTF is normally cycled from 422 °F to 740 °F every day, there will be some degradation of the HTF. This degradation will result in primarily benzene and phenol with smaller concentrations of toluene and naphthalene. These degradation products will affect the thermal efficiency of the HTF and increase vapor pressure. Benzene is classified as a hazardous air pollutant (HAP) and the plant’s ullage system design basis is to limit the amount of benzene released to the atmosphere, as well as limit the overall VOC emissions. Both benzene and VOC emissions are expected to be below the allowable threshold as currently permitted.

Based on Solutia’s simulations and lab/field tests, daily degraded low boilers are calculated to be approximately 128.6 lbs/day per plant (257.1 lbs/day for both plants).

The Mojave project has two identical Alpha and Beta plants. The numbers on the following flow diagram are representative of a single plant and the total project site is expected to have twice the numbers listed on the diagram. The HTF system of each plant will consist of 4 vertical ASME-rated expansion vessels, one horizontal ASME rated condensate receiver vessel, one ullage condenser, two ullage scrubbing units, two sets of activated carbon filters, and two vertical HTF overflow tanks.

These expansion vessels and the condensate receiver vessels will be sized such that during normal operation, the expansion of the HTF will: first, allow the nitrogen / vapor space pressure to increase from 8 bara to 12 bara nominally; and second, vent the volume of vapor space equivalent to the remaining expansion of the HTF to operating temperature, through the ullage system. However, after filling all pipes initially at ambient temperature (with high density – lower specific volume), the expansion of the HTF from the ambient temperature to the daily operating temperatures will push the HTF that is not needed in the system during daily operation into two overflow tanks that will be kept cooler (at about 150 °F) and blanketed with 2-15 inches Water Column (in. WC) of nitrogen.

During daytime operation, when the HTF is heated and expands, the expanded volume will move into the expansion vessels and the nitrogen will be compressed until the pressure reaches 12 bara, upon which any additional volume expansion will push the equivalent volume of vapor space through the ullage system. This additional volume being vented will be condensed in a nitrogen ullage condenser, stored in the pressurized, horizontal condensate receiver vessel, and pumped back into the system. At night, when the HTF cools and contracts, the HTF will move back into the system piping and allow the vapor
space pressure to lower to 8 bara before nitrogen is added to the expansion vessels to maintain this overnight pressure.

After some time of operation, the HTF will begin to break down into Low Boilers (LB’s) such as Benzene, Toluene, Phenol, etc.; and High Boilers (HB’s) – heavier sludge. After several years of operation, these HB’s and LB’s may accumulate to high enough concentrations that they may need to be removed from the system.

Although venting is reduced by letting the nitrogen space pressure rise and fall, the LB’s and HTF (Therminol) which will be released into the vapor space at operating temperature will be removed from the nitrogen space by cooling and condensing them in the nitrogen ullage condenser to 120 °F. The concentration of LB’s and HTF in the vent stream will be further reduced by sending the stream through a scrubber against a cooled liquid HTF flow, at 117 °F. Any residual LB’s and HTF remaining in the vapor stream exiting the scrubber will be sent to a carbon filter system for further reduction before venting to the atmosphere.

Types of Venting

There are two types of venting from the HTF system:

- the venting of nitrogen due to HTF overflow tank breathing
- the daily venting of vapor space due to HTF expansion into the expansion vessels.

Overflow Tank Venting: As indicated above, during most normal operation, there will be no exchange of HTF or nitrogen between the expansion vessels and the overflow tanks. However, during the winter months when the HTF temperature drops below the normal daily range, some of the HTF in the overflow tanks may need to be transferred into the expansion vessels to maintain the minimum expansion tank’s level. During these conditions, the overflow tank levels may fall and rise, thus requiring nitrogen space venting.

The worst case would be if the HTF system became very cold (limited to 120 °F) after a few days of no sun, in which case all the HTF from the overflow tanks would be pumped back into the system. The next time the system is brought back to normal operation, all of the HTF that was pumped out of the overflow tanks would return to the overflow tanks. Under that condition, the total amount of nitrogen vented is calculated to be 24,731 cu ft total for both plants.

The overflow tanks have vent scrubbers on their stacks before feeding into the carbon filters. Nitrogen and HTF mixture to be released passes through these scrubbers where it is cooled to 117 °F by the cooled liquid HTF stream flowing countercurrent. This overflow tank vent scrubber will condense most of the HTF vapor vented from the overflow tanks before reaching the carbon filters. The overflow tanks have a design temperature of 350 °F, but the worst case vapor space temperature has been calculated to be around 250 °F. The overflow tanks are designed to be maintained at 150 °F to minimize HTF venting but at the same time be sufficiently higher than the heat tracing (electric heating) initiation temperature of 120 °F. The HTF overflow tank has a liquid HTF cooler to maintain this tank’s temperature at 150 °F.
Expansion Vessel Venting: As the HTF expands and contracts daily into and out of the expansion vessels, the LB’s along with some vaporous HTF will be released into the vapor space. To help this separation of LB’s into the vapor space, a side stream of HTF will also be sprayed to the top of the expansion vessels continuously. As the expansion vessels fill up with HTF, the nitrogen space is compressed until the pressure reaches 12 bara, upon which the vent valve opens and allows any further expansion to force the vapor space through the ullage system. The nitrogen + vapors will be pushed through the nitrogen ullage condenser, where most of the HTF and low boiler degradation products will be condensed and collected in the low boiler condensate receiver vessel. The nitrogen and other non-condensable constituents will pass through the expansion vessel vent scrubber where the 117 °F, countercurrent liquid HTF flow will bring even more HTF and low boilers into the liquid phase. The nitrogen, degradation products, and vaporous HTF remaining in the vapor phase at the exit of the scrubber will enter the carbon filters for further cleaning before venting to the atmosphere.

Low Boilers Removal Scheme: The HTF system is sized to minimize the nitrogen venting due to HTF expansion. On a daily basis, the low boilers and some HTF will be vented from the expansion vessels. Since the vessels are first allowed to pressurize from 8 bara to 12 bara, the amount of nitrogen being vented is reduced and is equivalent to the volume of four expansion vessels from the 27% level to the 72% level (normal operating level), or 45% of the total volume of the four expansion vessels. This vented nitrogen at 12 bar (174 psia) will include small amounts of HTF and HTF degraded by-products, the LB’s.

An ASPEN simulation predicted that it is better to condense the low boilers under pressure than to expand the mixture and cool it. The expansion vessel’s vent stream is cooled to 120 °F at 174 psia through a water-cooled nitrogen ullage condenser. The non-condensable vapors and nitrogen remaining in the vent stream will be passed through the rest of the ullage system for further cleaning before venting to the atmosphere. The condensed HTF along with low boilers will be sent to the low boiler condensate receiver vessel for temporary storage. The condensate stored in the receiver vessel will be pumped back into the main system.

Release Control Efficiency: Expected VOC emissions, per plant, from nitrogen venting are thus 0.47 lb/day HTF with a maximum of 27% or 0.13 lb/day comprised of biphenyl; 1.68 lbs/day of benzene, toluene, and phenol; and 0.02 lb/day high boilers, primarily dibenzofuran. Of this 1.68 lbs/day low boiler venting, 1.39 lbs/day of this is Benzene, which is within the present permit level of 1.9 lbs/day for this HAP venting. The Title V threshold for hazardous air pollutants is 10 tons/year for any individual HAP. So the HTF and benzene release, as calculated, is much less than the maximum allowable level.

Based on the calculations submitted, this control reduces the potential mass of HTF released, per plant, from 4921 lbs/day to 0.47 lbs/day resulting in an overall VOC control efficiency of about 99.99%. These results are outlined on the attached Process Flow Block Diagram.

Based on the above design considerations and system control efficiency, the project is not anticipating the need for any additional add-on VOC controls.
Therefore, the HTF overflow and expansion venting system will result in VOC (HTF plus low boiler and high boiler compounds) emissions on the order of 9.45 lbs/hr, 4.33 lbs/day (based on 40 minutes/day of expansion vessel venting and 20 minutes/day of overflow tank venting), 1,581 lbs/year, or 0.791 tpy for the entire facility. VOC emissions for a single power block would be approximately 4.73 lbs/hr, 2.17 lbs/day (based on 40 minutes/day of expansion vessel venting and 20 minutes/day of overflow tank venting), 791 lbs/yr, or 0.395 tpy. The VOC emissions is broken down by component in the table shown on the next page and the values for the HTF overflow and expansion venting emissions represents the emissions for a single power block. The most stringent permitted value is for the Benzene emissions, which is permitted at an HAP emission level of 1.9 lbs/day. With 95% efficient carbon filters, the Benzene emissions will be 3.06 lbs/hr, 1.39 lbs/day, 506.79 lbs/yr, or 0.253 tpy per power block.

HTF VOC fugitive emissions from valves, flanges, pumps, seals, etc., will be 1.34 lbs/hr, 21.33 lbs/day, 7,784 lbs/year, or 3.89 tpy, based on the data and assumptions in the VOC Component Count and Emissions spreadsheet attached at the end of this report.

The following table includes a breakdown of emissions on a component basis for both the HTF overflow and expansion venting emissions and HTF fugitive emissions and the values listed in the table represent values for a single power block:

<table>
<thead>
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<th>Compound</th>
<th>HTF Overflow and Expansion Venting Emissions</th>
<th>HTF Fugitive Emissions</th>
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<td>lbs/hr Maximum</td>
<td>lbs/day Normal Annual Average</td>
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<td>Diphenyl ether</td>
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<td>Biphenyl</td>
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<td>Benzene (HAP)</td>
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<td>Toluene</td>
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<td>VOC</td>
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<td>2.17</td>
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Waste hauling (total load-out emissions for the 250 MW facility), when needed (initially it is not expected to be needed for several years) will be approximately 0.0013 lbs/hr, 0.0013 lbs/day, 0.0157 lbs/yr, or 7.84E-6 tpy. These emissions are based on the following data and assumptions:

a) 12 facility load-outs per year (1 per month) maximum.

b) 2 hours per load-out (1 hour at each power block). The actual load-out pumping or transfer time will be less than an hour, but an hour was used as the basic emission period.

c) VOC emissions loss rate is ~0.0013 lbs/hr (based upon the haul truck evacuated vapor space volume and VOC concentration in the vapor per facility load-out).
### HTF System Component Count and Fugitive Emissions Estimate

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Notes:
1. The component counts listed above are the actual number of each component purchased as of 04/05/2013, with a 10% margin.
2. The Emission Factor (EF) values listed above and guidance for light liquid vs. heavy liquid operating hours came from the following source: CEC, Supplemental Staff Assessment - Part B, Abengoa Mojave Solar, May 2010, 09-AFC-5, CEC-700-2010-003-SUPB.
Instructions:

1. Initialing (By/Chk’d/App’d) required on cover sheet only. All other title block information must be included on all pages.

2. Revisions are identified in the body of the Specification.

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1. **Project Summary**

1.1 The project consists of two, 140 MW, parabolic trough solar power plants, referred to as Alpha Plant and Beta Plant. The plants will be built on adjacent sites in an unincorporated area of San Bernardino County near Hinkley, California. The plant sites are located approximately six miles north of highway CA-58 on Harper Lake Road, approximately 20 miles west of Barstow.

1.2 The Vendor shall furnish carbon filters for each plant site meeting the requirements set forth in this specification. This specification covers the minimum requirements for the performance, design, materials, fabrication, testing and delivery of the filters.

2. **General**

2.1 The attachments identified in this document are considered to be part of this specification. Attached specifications shall be met and followed by the Vendor in full. All drawings and documents included in this package are considered “Contract Documents”.

2.2 **Definitions**

a. “Vendor” shall mean “Condorchem Envitech” for which this specification is intended.

b. “Engineer”, “Purchaser” or “Customer” shall mean the “Abener Teyma Mojave General Partnership”.

c. “Owner” shall mean “Mojave Solar LLC”.

d. “Construction Manager” or “Construction Superintendent” shall mean “Abener Teyma Mojave General Partnership”.

2.3 The imperative language of this specification is directed to the Vendor, unless specifically noted otherwise. All directives such as “provide”, “perform”, “test”, etc., are addressed solely to Vendor, whether or not the word “Vendor” is specifically mentioned. Work by Others will be specifically identified.
3. **Function**

The carbon filters will be used to minimize the emission of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) to the atmosphere. The VOC emissions will be Heat Transfer Fluid (HTF) vapors (di-phenyl ether and biphenyl) and its degradation products including, benzene, toluene, and phenol in nitrogen vented from the HTF Overflow Tanks and the HTF Expansion Vessels.

4. **Operation**

The HTF vapors and nitrogen will be displaced from the HTF Overflow Tanks and HTF Expansion Vessels due to thermal expansion of the HTF as it is warmed to operating temperatures each day. The HTF system will be vented as needed to control the maximum system pressure. The HTF Overflow Tank vent gases will pass through a HTF Scrubber prior to entering the filter. The HTF expansion vessel vent gases will pass through an ullage cooler, condensate receiver and a HTF Scrubber prior to entering the filter. The HTF Overflow Tanks will vent for approximately 20 minutes per day, when required. The HTF Expansion Vessel will vent approximately 40 minutes each day. The venting from the overflow tanks and the expansion vessels will be sequential and not simultaneous.

5. **Location**

5.1 The filters shall be installed outdoors. For proposal purposes, assume the filters will be on a concrete foundation at grade.

5.2 Electrical Area Classification - The filters will be installed in an area that is classified as a Class I Division 2 location per NEC 500.5 (Classification of Locations).

5.3 The equipment shall be designed to meet all design and climatic conditions set forth in this specification. Refer to specification 6007-ESP-ATP-00-60-G100 Project Design Criteria, for site specific information.
6. **Schedule**

The vendor shall propose the best available delivery. Vendor’s schedule shall comply with the Abener Teyma project schedule.

7. **Scope**

7.1 Vendor shall design, fabricate, assemble, inspect, test, pack and ship the carbon filters as specified herein.

7.2 Vendor shall furnish four sets of carbon filters; one set for the Alpha plant and one set for the Beta plant. The general arrangement will be two vessels installed in parallel, one for low pressure stream (Overflow Tanks) and one for high pressure stream (Expansion Vessels) per plant.

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7.3 The vendor will provide the following:

a. Filter vessels
b. Vessel nozzles
c. Manways
d. Piping, valves, and distribution manifolds within the vessels
e. Supports for internal components
f. Vessel support legs and seismic restraints
g. Anchor bolt design
h. Grounding lugs

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EC-94 (Rev. 05/2011)
i. Filter media, (1st fill)

j. Start up and commissioning spare parts (Quote as a separate line item.)

k. Spare parts for one year of operation (Quote as a separate line item.)

l. Other items as specified on the Equipment Data Sheets

m. Rupture Disk Alarm for PSV

n. Inlet ductwork for 2 vessels with 2 wafer valves

o. Outlet ductwork for 2 vessels with 2 wafer valves

p. Two test ports for each carbon filter sets (inlet and outlet)

q. Four vessel support legs

r. Lifting Lugs

s. Spiral Wound Gaskets

t. 4 load cells complete with high speed digital weight indicator and mounting accessories

u. Pressure/vacuum safety valve (Rupture disk and spare for startup)

v. Ladder and inspection platform

w. Pressure transmitters for inlet and outlet for each filter sets

x. Junction boxes

y. Flanges

7.4 Vendor Data

The Vendor shall furnish the Vendor Submittal Data for the Carbon Filters as specified here-in. Refer to specification 6007-ESP-ATP-44-62-F206V for additional Vendor Data Requirements.

7.5 Work By Others

The following is out of the scope of this specification:

a. Receiving, unloading, storage and handling of the filters on site

b. Installation of the filters

c. Foundations

d. Furnishing and installation of anchor bolts

e. Piping prior to the inlet flange of the filters and after the outlet flange of the filters

f. Interconnecting piping between the filter vessels

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8. **Performance**

8.1 The vendor supplied equipment shall meet the performance requirements defined in this specification and under the column marked “Abener Teyma Requirement” on the Data Sheets; included herein.

8.2 The vendor shall provide with his quotation guaranteed final vent values for Benzene and Toluene at the design flow rate.

8.3 The vendor shall provide with his quotation the “expected” final vent values for all the gas constituents at the design flow rate.

8.4 Vendor shall have sole responsibility for meeting the performance requirements. Vendor shall provide all equipment, appurtenances, and accessories required in order to meet this performance.

8.5 The vendor shall determine the optimal filter design including; vessel arrangement, vessel dimensions, filter media, media depth, and gas distribution system to meet these requirements.

8.6 The filters (including any auxiliaries) shall be designed and constructed for a minimum service life of 30 years.

8.7 The vendor shall provide with his quotation the expected life of the filter media.

9. **Codes and Standards**

9.1 At a minimum all applicable portions of the codes and standards listed below shall be followed.

a. **AISI** – American Iron and Steel Institute

b. **ANSI** – American National Standards Institute

c. **ASME** – American Society of Mechanical Engineers

d. **ASTM** – American Society of Testing Materials

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e. AWS – American Welding Society  
f. CAL/OSHA – California Occupational Safety and Health Administration  
g. CBC – California Building Standards Code (2010)  
h. EPA – Environmental Protection Agency  
i. NEC – National Electric Code  
j. NFPA – National Fire Protection Association  
k. OSHA – Occupational Safety and Health Act  
l. SSPC – The Society for Protective Coatings

9.2 Vendor shall meet all federal, state, and local laws and regulations.

9.3 Should there be any conflict between applicable codes, standards, specifications noted herein or vendor’s recommendations and those of the locality of the project, the more stringent code shall apply.

10. Design

10.1 General

10.1.1 The vendor shall design the filters to meet the operating conditions and performance requirements set forth in this specification. Any conflicts between the specification, the data sheets and the appropriate codes and standards shall be referred to Abener Teyma for resolution.

10.2 Vessels

10.2.1 The carbon filters, being low pressure vessels, may be non-code vessels and do not require an ASME code stamp.

10.2.2 Vessels shall be designed to withstand internal or external pressure and mechanical loads induced by vessel dead load, process, contents, earthquake, wind and other specified loadings. Wind and earthquake loads shall be in accordance with the Project Design Criteria described in Specification 6007-ESP-ATP-00-60-G001.
combinations must be appropriately considered. Structural / seismic design calculations are required.

10.2.3 All vessels shall have physical dimensions within the allowable limits for shipping, and shall be completely shop fabricated and tested prior to shipping.

10.2.4 Vendor shall furnish the vessels complete as shown on data sheets and as noted herein and shall include all necessary nozzles, blind flanges, studs, nuts, bolts, clips, support brackets, lifting lugs, davits, and gaskets.

10.2.5 The design shall be such to avoid any corrosion of vessel equipment.

10.2.6 The design shall be such to avoid any contamination of the vessel contents once the vessel is put into service.

10.2.7 The layout of weld seams shall be such that it will allow full access for inspection. Circumferential seams shall not be located within a distance of 1-1/2” of any external compression ring, internal ring, support ring, etc. Nozzles and manholes shall not intersect any weld seams, unless approved by Abener Teyma.

10.2.8 Pressure and Vacuum Relief

(1) The vendor shall furnish and install pressure and vacuum relief to protect the vessel from damage due to over pressurization or vacuum.

10.2.9 Nozzles

(1) Vendor to indicate on project drawings the maximum allowable loads on nozzles. Minimum design of nozzles shall be in accordance with specification 6007-ESP-ATP-00-60-G130, Required Allowable Nozzle Loads.

(2) Vendor shall extend nozzles 6 inches beyond the exterior surface of the vessel unless otherwise specified.
3. All nozzles shall be flush at the interior surface of the vessel wall, unless otherwise specified.

4. Nozzle sizes and locations shall be coordinated with Abener engineering prior to fabrication. Abener will review locations and sizes on the submittal drawings.

5. Vendor shall provide sample ports

10.2.10 Manways

1. Two (2) manways shall be provided in each vessel for accessing and ventilating the filter interior.

2. Manways shall be located to provide easy access for maintenance and cleaning of the filter.

3. Manway covers shall be equipped with hinges or davits and handles to aid in removing and replacing the covers.

10.2.11 Lifting Lugs

1. Vessels shall include lifting lugs and tailing lugs, designed by vendor, for use in loading, unloading, and field erection of vessel. Empty weight shall be marked on the vessel by using lettering no less than 6 inches high.

10.2.12 Anchor Bolts

1. Anchor bolts shall be furnished by Abener Teyma as sized and selected by the Vendor. Vendor shall specify bolt material, size, and quantities and provide drawings and loading diagrams for structural design.
Specification For Carbon Filters

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<th>Job No.:</th>
<th>120010</th>
<th>Spec. No.:</th>
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10.2.13 **Ground Lugs**

(1) Each filter shall include two stainless steel grounding lugs. Grounding lugs shall be a minimum of 3” wide x 3 “tall x ½” thick plates, and shall be made of 304 grade stainless steel. The grounding lugs shall be drilled to match “Burndy Qiklug” type “QA28-2N” which utilizes NEMA bolt spacing. Grounding lugs shall be welded to the vessel support lugs. The lugs shall be oriented so that the holes in the lug are on the vertical centerline.

10.2.14 **Vessel Internals**

(1) The filter shall be designed to prevent channeling and provide a uniform gas velocity across the filter cross section.

(2) The gas velocity through the filter shall not cause the carbon media to be fluidized.

(3) The maximum pressure drop from the inlet to outlet of the filter set shall not exceed the value listed in the equipment data sheet.

(4) The vendor shall design the filters to allow for complete removal and re-filling of the filter media.

(5) The vendor shall state the maximum allowable gas flow and inlet pressure to the filters.

(6) The vendor shall provide the operator a means of determining the remaining media life.

10.3 **Media**

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10.3.1 The filter media should be coal based pellet and depth of media shall be by the vendor.

10.3.2 The Vendor shall provide the 1st fill of media for the filters.

10.3.3 The vendor shall provide instructions and on-site supervision of the first media fill and the first media replacement.

10.4 Materials of Construction

10.4.1 All materials shall be new and free from defects.

10.4.2 Materials of construction shall be per the attached data sheet. Where materials of construction are not specified, Vendor shall propose materials for each item as appropriate for the service conditions.

10.4.3 All materials purchased by Vendor shall meet nationally recognized standards unless otherwise approved by Abener Teyma.

10.4.4 All vessel materials shall be compatible with the vessel contents and in accordance with all applicable welding procedures.

10.4.5 Copies of mill test reports for materials shall be provided to Abener Teyma by Vendor.

10.4.6 Asbestos or material containing asbestos shall not be used in the construction or manufacture of the equipment.

10.5 Insulation and Heat Tracing

10.5.1 The filters vessels will not be insulated or heat traced.

10.6 Painting

10.6.1 Vessel exteriors shall be painted per manufactures standard.
10.7 **Nameplate**

10.7.1 Permanent stainless steel nameplates shall be fixed to each vessel including, but is not limited to, the following information:

1. Customers Equipment Number
2. Customers Equipment Name
3. Customers PO number
4. Nominal Diameter
5. Nominal Overall Length
6. Empty Weight
7. Internal Capacity
8. Design Specific Gravity
9. Material of Construction

10.7.2 The location of the tag shall be determined during drawing review.

11. **Submittals**

11.1 Vendor shall provide engineering drawings and calculations for approval prior to the start of fabrication.

11.2 Refer to and comply with specification 6007-ESP-ANC-44-62-F206V, Vendor Data Requirements – Carbon Filters.

11.3 Approval of Vendor’s drawings and calculations is limited to verifying general compliance with specifications and design drawings, and does not imply verification of dimensions, quantities, or calculations. Vendor is not relieved from responsibility for accurate dimensioning, equipment sizing, fabrication to required tolerances, and fabrication fit-up.
11.4 U. S. customary units shall be used on all drawings and calculations.

11.5 Drawings:

11.5.1 A general arrangement drawing shall be furnished for each vessel. The general arrangement drawing shall include:
   (1) Overall dimensions of the vessel,
   (2) Size and location and orientation of all nozzles and connections,
   (3) Size and locations of manways,
   (4) Anchor bolt layout,
   (5) Required clearances for media replacement and other maintenance access,
   (6) Vessel data:
      (i) Empty weight, shipping weight, operating weight, flooded weight
      (ii) Shell dimensions
      (iii) Shell thickness
      (iv) Head style and dimensions
      (v) Head thickness (nominal)
      (vi) Head volume
      (vii) Total volume
      (viii) Maximum and minimum allowable working pressures
      (ix) Materials of construction
   (7) Location of the vessel nameplate and the actual data to be inscribed on the name plate.

11.5.2 Vendor shall provide all drawings that are issued for fabrication, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

11.6 Data and Calculations

11.6.1 Design calculations (including lifting attachments and support lugs) made by the Vendor shall be furnished prior to or along with submission of drawings for approval. When calculations are made using a computer, all input data, assumptions, computer program version used, and a summary of the results shall be furnished.

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11.6.2 Vendor shall provide their structural calculation package, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

12. Fabrication

12.1 Any fabrication sub-contracted to others shall require written approval by Abener Teyma.

12.2 All plate and other material used in the execution of this work shall be new and clean stock, free from surface laminations and other physical imperfections.

12.3 The axis of any nozzle on the vessel shell shall be radial and perpendicular to the longitudinal axis of the vessel unless otherwise specified. The axis of any nozzle on the vessel head shall be parallel to the longitudinal axis of the vessel unless otherwise specified. The flange face shall be perpendicular to the nozzle axis. All welds protruding beyond the flange face shall be ground flush.

12.4 Flange bolt holes of shell nozzles shall straddle the axial center line.

12.5 Vendor shall prepare weld end nozzles end face in accordance with ASME B31.3 and ASME B16.25. Abener Teyma shall review each weld end nozzle face prior to protection for shipment. Vendor is to protect each weld end nozzle face against damage during handling and transporting.

12.6 All permanent attachments, stiffeners, clip angles, ring angles, etc., shall be joined to vessels by continuous welding, unless approved otherwise by Abener Teyma.

12.7 Remove all sharp edges and burrs.

12.8 All welds and surfaces shall be free of gouges, pits, cracks or other surface defects.

12.9 All welds and materials discovered to be non-compliant through inspection and/or testing shall be fully repaired at vendor’s cost.

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12.10 Fabricated location and orientation of nozzles will be reviewed by Abener Teyma. If there are any discrepancies with project documents, the vendor will make corrections.

12.11 To prevent contamination of the vessel contents, Vendor shall mechanically clean the interior surface of the vessel to remove all weld spatter, scale, rust, filings, dirt, etc., as well as all foreign materials. Vendor shall not commence mechanical cleaning until after all testing has been completed.

13. Inspection

13.1 Abener Teyma (or an inspector on their behalf) reserves the right to inspect the equipment at any time during the course of fabrication. Abener Teyma retains the right to provide personnel to observe all fabrication work within the scope of the contracted work (including testing and inspection). Such individuals shall be afforded full and free access for these purposes, subject to safety and schedule constraints.

13.2 Inspector means Abener Teyma (or an inspector on their behalf).

13.3 Inspector shall have free access, at all reasonable times, to the areas where the work on equipment is being performed. Vendor shall notify Abener Teyma purchasing department in advance (minimum one week) of scheduled vessel testing to allow time for the Inspector to arrange to be at the test site before testing begins.

13.4 Mill and shop inspection shall not release the vendor from responsibility for replacing any defective material and for repairing any defective workmanship that may be discovered in the field.

13.5 Vendor shall submit letters of completion to Abener Teyma at least twenty days prior to the requested final inspection date. The equipment must be ready for inspection and the tests run prior to this final inspection request.
13.6 The cost of all tests due to code requirements or manufacturer’s test requirements shall be fully borne by vendor.

13.7 The carbon filter vessels shall be tested for leaks by filling with water.

13.8 A written certification of an acceptable water fill test shall be completed by vendor. The certification shall be forwarded to the individual indicated on the Abener Teyma purchase order.

14. **Shipping**

14.1 All parts shall be skidded, boxed, or otherwise suitably prepared for shipment to protect against damage while in transit.

14.2 Vendor shall refer to specification 6007-ESP-ATP-00-60-G121 for shipping and preparation requirements.

15. **Installation Information**

15.1 The Vendor shall specify with quote any detailed installation requirements.

15.2 The Vendor shall include in their quotation one set of any special tools and wrenches required for installation and maintenance.

16. **Startup, Training and Field Services**

The Vendor shall state all startup, training and field services included in bid, clearly identifying duration, number of people, and specific services provided. The Vendor shall quote any additional assistance on a per diem rate.
17. **Qualifications**

   The Vendor shall furnish equipment, designs, and materials that have been proven by successful operation for no less than five (5) years. Requests to use untried or unproven equipment, designs, or materials must be approved by the Purchaser in writing prior to incorporation into the purchase order.

18. **Warranty:**

   All components of the purchased system shall be covered under warranty by the Vendor. The Vendor shall troubleshoot and repair any malfunctioning system element at no cost to the Purchaser during the warranty period. Reference commercial documentation for the warranty period and terms conditions.

19. **Guarantees:**

   19.1 Vendor shall guarantee the minimum removal efficiency of Benzene and Toluene through a temperature range from 80°F up to 140°F at the design flow rates.

   19.2 Vendor shall guarantee the maximum pressure drops through the filter set during expansion vessel venting and overflow tank venting.

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<td>APF</td>
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</tbody>
</table>

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20. Proposal Requirements

20.1 Vendor shall furnish a quote for the following equipment and services:

20.1.1 Design, materials, labor, fabrication, testing, inspection, and shipping of the equipment.

20.1.2 All parts and accessories required for complete functional Carbon Filters.

20.1.3 As a separate line item the vendor shall quote the cost of replacement carbon for a period of one year. Usage shall be based on venting of the expansion vessels and overflow tanks once per day as described in the data sheets below.

20.1.4 Submittal of data as required in the Vendor Data Requirements Specification, 6007-ESP-ATP-44-62-F206V.

20.1.5 Start-up, training and commissioning, clearly identifying duration, number of people, and specific services included in bid. The Vendor shall quote any additional assistance on a per diem rate.

20.1.6 Spare parts recommended for startup and commissioning, with quantities. Quote as a separate line item.

20.1.7 Recommended spare parts for two years of operation, with quantities. Quote as a separate line item.

20.1.8 The Vendor shall separately quote one set of any special tools and wrenches required for maintenance. Quote as a separate line item.

20.2 The Vendor’s base quotation shall consist of the equipment and services identified herein. Pricing for Purchaser identified options shall be submitted as separate line items. Vendor identified alternatives may be submitted if system improvements and/or cost savings can be realized. Vendor may propose alternate arrangements based on their experience.
20.3 Vendor shall state their equipment Warranty in the proposal.

20.4 Vendor shall state their Performance Guarantee in the proposal.

20.5 Comments and exceptions to the specification shall be listed in a separate part of the proposal titled “Exceptions to the Specification”. All exceptions shall be listed in this section and shall reference the appropriate specification section. No other exceptions will be allowed. After the purchase order is awarded, the Vendor shall be responsible to satisfy all requirements of this specification except for the agreed upon exceptions. Any requirements that are not included with the Vendor’s equipment and are in the equipment specification shall be furnished and installed at the Vendor’s expense.

20.6 Vendor shall complete and return the Equipment Data Sheets with the proposal. Failure to submit these sheets will result in an incomplete proposal that may not be considered.

20.7 Vendor shall furnish dimensioned envelope drawings with the proposal. Drawing shall show the location of all connections, supports, estimated weights, and other pertinent data.

20.8 Vendor shall provide minimum clearances and access required for maintenance, service and operation of the filter and its components.

21. Attachments

6007-ESP-ATP-44-62-F206V Vendor Data Requirements – Carbon Filters
6007-ESP-ATP-00-60-G100 Project Design Criteria
6007-ESP-ATP-00-60-G120 Equipment Modeling Vendor Data Requirements
6007-ESP-ATP-00-60-G121 Shipping and Preparation Requirements
6007-ESP-ATP-00-60-G130 Required Allowable Nozzle Loads

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>JS</th>
<th>MZA</th>
<th>APF</th>
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<td>Issue for Purchase</td>
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<td></td>
<td></td>
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<td>11/13/2012</td>
<td>Re-issued for Bid</td>
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<td>3/29/2012</td>
<td>Issued for Bid</td>
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## Specification For Carbon Filters

**Job No.:** 120010  
**Spec. No.:** 6007-ESP-ATP-44-62-F206  
**Item No.:** See Spec  
**No. Req'd.:** See Spec  
**Project:** Mojave  
**Ref.:** Issue: 1  
**Dated:** 11/28/12

### Carbon Filters, MF-206

<table>
<thead>
<tr>
<th>Data Sheets</th>
<th>Vendor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARBON FILTERS MF-206C</td>
<td>ABENER / TEYMA REQUIREMENT</td>
</tr>
</tbody>
</table>

#### TYPE: EXPANSION

- Activated Carbon Bed

#### DESIGN AND CONSTRUCTION

<table>
<thead>
<tr>
<th>Vessel Design Code:</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stamp:</td>
<td>Not Required</td>
</tr>
</tbody>
</table>

- Operating Pressure: in H₂O: ≤75 to 0  
- Operating Temperature: °F: 80 to 120  
- Design Pressure: in H₂O: 84  
- Design Temperature: °F: 25 to 140  
- Corrosion Allowance, in: By vendor  

- Number of Filters per Plant Site: By Vendor - (See note 1)  
- Filter Vessel Orientation: Horizontal  
- Vessel Dimensions:  
  - Inside Diameter, in.: By vendor  
  - Shell Height, Seam to Seam, in.: By vendor  
  - Overall Height, In.: By vendor  
  - Head style / Flange height, in.: By vendor/By vendor  
  - Shell Thickness, in.: By vendor  
  - Head thickness, in.: By vendor  
  - Head Volume, Ft³: By vendor  
  - Vessel Volume, Ft³: By vendor  
  - Vessel Support Legs, Qty.: By vendor  

- Nozzles / Manways:  
  - **A - Inlet, in.:** By vendor  
  - **B - Outlet, in.:** By vendor  
  - **C - Media Fill, in.:** By vendor  
  - **D - Media Removal, in:** By vendor  
  - **E - Pressure Relief, in:** By vendor  

<table>
<thead>
<tr>
<th>Size / Type / Class</th>
<th>8/150#</th>
</tr>
</thead>
</table>

### Notes:

- By vendor - (See note 1)  
- 2 in parallel (for expansion)  
- HORIZONTAL  
- Length 108  
- 128  
- KORBOGEN  
- 0.12  
- 0.16  
- 275 (TOTAL)  
- 4

---

**EC-94 (Rev. 05/2011)**

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## Data Sheets

<table>
<thead>
<tr>
<th>CARBON FILTERS MF-206C</th>
<th>ABENER / TEYMA REQUIREMENT</th>
<th>VENDOR INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 - Upper Manway, in</td>
<td>24*</td>
<td>20</td>
</tr>
<tr>
<td>F2 - Lower Manway, in</td>
<td>30*</td>
<td>NONE</td>
</tr>
</tbody>
</table>

### Materials of Construction

- **Shell**: SA 182 /SS304
- **Head**: SA 182 /SS304
- **Internal Supports**: SA 182 /SS304
- **Internal Piping**: SA 182 /SS304

### Media

- **Media**
- **Vendor**: By vendor
- **Type**: Activated Carbon
- **Vendor**: CONDORCHEM
- **Designation**: Coal Pellet
- **Size**: 4 mm
- **Depth, in**: 71
- **Media Life**: 242 days/62 days

---

2 11/27/2012 Issue for Purchase JS MZA APF
1 11/13/2012 Re-issued for Bid JS MZA APF
0 3/29/12 Issued for Bid WMP MZA APF

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EC-94 (Rev. 05/2011)
**ABENER TEYMA MOJAVE**

---

**Specification For Carbon Filters**

<table>
<thead>
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<th>Field</th>
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<tr>
<td>Job No.</td>
<td>120010</td>
</tr>
<tr>
<td>Spec. No.</td>
<td>6007-ESP-ATP-44-62-F206</td>
</tr>
<tr>
<td>Item No.</td>
<td>See Spec</td>
</tr>
<tr>
<td>No. Req’d.</td>
<td>See spec</td>
</tr>
<tr>
<td>Project:</td>
<td>Mojave</td>
</tr>
<tr>
<td>Ref.:</td>
<td>Issue: 1</td>
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<tr>
<td>Dated:</td>
<td>11/28/12</td>
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**Carbon Filters, MF-206**

<table>
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<th>Data Sheets</th>
<th>Vendor:</th>
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<tbody>
<tr>
<td>CARBON FILTERS MF-206C</td>
<td>ABENER / TEYMA REQUIREMENT</td>
</tr>
</tbody>
</table>

---

**TYPE: OVERFLOW**

Activated Carbon Bed

---

**DESIGN AND CONSTRUCTION**

Vessel Design Code: None

Stamp: Not Required

Operating Pressure: \(\leq 29 \text{ to } 1\) atm

Operating Temperature: 80 to 120 °F

Design Pressure: in \(\text{H}_2\text{O}\)

Design Temperature: 84 °F

Corrosion Allowance, in

Number of Filters per Plant Site: By Vendor - (See note 1)

Filter Vessel Orientation: Horizontal

Vessel Dimensions

- Inside Diameter, in.: By vendor
- Shell Height, Seam to Seam, in.: By vendor
- Overall Height, In.: By vendor
- Head style / Flange height, in.: By vendor/ By vendor
- Shell Thickness, in.: By vendor
- Head thickness, in.: By vendor
- Head Volume, Ft\(^3\): By vendor
- Vessel Volume, Ft\(^3\): By vendor
- Vessel Support Legs, Qty.: By vendor

Nozzles / Manways

<table>
<thead>
<tr>
<th>Type</th>
<th>Size / Type / Class</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Inlet, in.</td>
<td>By vendor</td>
<td></td>
</tr>
<tr>
<td>B - Outlet, in.</td>
<td>By vendor</td>
<td></td>
</tr>
<tr>
<td>C - Media Fill, in</td>
<td>By vendor</td>
<td></td>
</tr>
<tr>
<td>D - Media Removal, in</td>
<td>By vendor</td>
<td></td>
</tr>
<tr>
<td>E - Pressure Relief, in</td>
<td>By vendor</td>
<td></td>
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<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
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<th>Date</th>
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EC-94 (Rev. 05/2011)
## Specification For Carbon Filters

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<tr>
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<td>Mojave</td>
</tr>
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<td>Ref.</td>
<td>Issue: 1 Dated: 11/28/12</td>
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<tr>
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### Materials of Construction

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<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Shell</td>
<td>SA 182 / SS304</td>
</tr>
<tr>
<td>Head</td>
<td>SA 182 / SS304</td>
</tr>
<tr>
<td>Internal Supports</td>
<td>SA 182 / SS304</td>
</tr>
<tr>
<td>Internal Piping</td>
<td>SA 182 / SS304</td>
</tr>
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### Media

<table>
<thead>
<tr>
<th>Media Vendor</th>
<th>By vendor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media</td>
<td>Activated Carbon</td>
</tr>
<tr>
<td>Media Type / Designation</td>
<td>Coal Pellet</td>
</tr>
<tr>
<td>Depth, in</td>
<td>By vendor</td>
</tr>
<tr>
<td>Media life (mas flow rate/max concen.)</td>
<td>By vendor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Media</th>
<th>Activated Carbon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media Vendor</td>
<td>CONDORCHEM</td>
</tr>
<tr>
<td>Media Type / Designation</td>
<td>Pellet 4 mm</td>
</tr>
<tr>
<td>Depth, in</td>
<td>51</td>
</tr>
<tr>
<td>Media life (mas flow rate/max concen.)</td>
<td>63days/15 days</td>
</tr>
</tbody>
</table>

### Notes

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<td>Issue: 1</td>
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<tr>
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<td>11/28/12</td>
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**Maximum Flow Rate Case Data Sheets**

**CARBON FILTERS MF-206**

#### PERFORMANCE

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gas Flow Rate lb/min.</td>
<td>92.89</td>
<td>By vendor</td>
<td>0.0075</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Flow Duration, min. /day</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Composition, lb/min</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphenyl ether</td>
<td>0.0075</td>
<td>By vendor</td>
<td>0.0075</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0027</td>
<td>By vendor</td>
<td>0.0027</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Benzene</td>
<td>0.0908</td>
<td>≤1% of inlet</td>
<td>0.0908</td>
<td>0.0009(*)</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.0028</td>
<td>≤1% of inlet</td>
<td>0.0028</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0006</td>
<td>By vendor</td>
<td>0.0006</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>92.78</td>
<td>92.78</td>
<td>92.78</td>
<td>92.78</td>
</tr>
<tr>
<td>High Boilers</td>
<td>0.0000</td>
<td>By vendor</td>
<td>0.0000</td>
<td>0.0000(*)</td>
</tr>
<tr>
<td>Total Low Boilers</td>
<td>0.0942</td>
<td>By vendor</td>
<td>0.0942</td>
<td>0.0009(*)</td>
</tr>
<tr>
<td>Total Non-N₂</td>
<td>0.1044</td>
<td>By vendor</td>
<td>0.1044</td>
<td>0.0010(*)</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>10.15</td>
<td>10.15</td>
<td>10.15</td>
<td>10.15</td>
</tr>
<tr>
<td>Gas Flow, acfm: (See note 2)</td>
<td>1365.22</td>
<td>By vendor</td>
<td>1365.22</td>
<td>1365.22</td>
</tr>
<tr>
<td>Operating Temperature, °F</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, in H₂O:</td>
<td>≤75</td>
<td>1</td>
<td>75-29</td>
<td>ATM</td>
</tr>
<tr>
<td>Diff. Pressure @ design flow, in H₂O</td>
<td>≤74</td>
<td></td>
<td></td>
<td>14.8</td>
</tr>
<tr>
<td>(Note 3) Guaranteed VOC Removal</td>
<td>99%</td>
<td></td>
<td></td>
<td>99%</td>
</tr>
</tbody>
</table>

---

**Notes:**

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. (*') Expected/**(*')guaranteed

---

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>JS</th>
<th>MZA</th>
<th>APF</th>
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<tbody>
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### Specification For Carbon Filters

|---------|-----------|----------|------------|---------|------|-------|-------|

### Maximum Flow Rate Case

#### Data Sheets

<table>
<thead>
<tr>
<th>CARBON FILTERS</th>
<th>ABENER / TEMYMA REQUIREMENT</th>
<th>VENDOR INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF-206</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### PERFORMANCE

<table>
<thead>
<tr>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gas Flow Rate lb/min.</td>
<td>14.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Duration, min./day</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Composition, lb/min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphenyl ether</td>
<td>0.0105</td>
<td>By vendor</td>
<td>0.0105</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0038</td>
<td>By vendor</td>
<td>0.0038</td>
</tr>
<tr>
<td>Benzene</td>
<td>0.1442</td>
<td>≤1% of inlet</td>
<td>0.1442</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.0045</td>
<td>≤1% of inlet</td>
<td>0.0045</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0010</td>
<td>By vendor</td>
<td>0.0010</td>
</tr>
<tr>
<td>High Boilers</td>
<td>0.0001</td>
<td>By vendor</td>
<td>0.0001</td>
</tr>
<tr>
<td>Total Low Boilers</td>
<td>0.1497</td>
<td>By vendor</td>
<td>0.1497</td>
</tr>
<tr>
<td>Total Non-N&lt;sub&gt;2&lt;/sub&gt;</td>
<td>0.1641</td>
<td>By vendor</td>
<td>0.1641</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>15.26</td>
<td>15.26</td>
<td>15.26</td>
</tr>
<tr>
<td>Gas Flow, acfm: (Note 1)</td>
<td>209.35</td>
<td>By vendor</td>
<td>209.35</td>
</tr>
<tr>
<td>Operating Temperature, °F:</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, in H&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>≤29</td>
<td>1&quot;</td>
<td>29-75</td>
</tr>
<tr>
<td>Diff. Pressure @ design flow, in H&lt;sub&gt;2&lt;/sub&gt;O (Note 3)</td>
<td>≤28</td>
<td></td>
<td>14.8</td>
</tr>
<tr>
<td>Guaranteed VOC Removal</td>
<td>99%</td>
<td></td>
<td>99%</td>
</tr>
</tbody>
</table>

#### Notes:

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. (* *) Expected/***) guaranteed

---

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>JS</th>
<th>MZA</th>
<th>APF</th>
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EC-94 (Rev. 05/2011)
Maximum Flow Rate Case

**Operating Mode 1: Expansion Tank Venting**  Duration: 40 minutes

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0.0075</td>
<td>0.2984</td>
<td>0.0545</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0027</td>
<td>0.1075</td>
<td>0.0196</td>
</tr>
<tr>
<td>Benzene</td>
<td>0.0908</td>
<td>3.6310</td>
<td>0.6631</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.0028</td>
<td>0.1118</td>
<td>0.0204</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0006</td>
<td>0.0252</td>
<td>0.0046</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>92.78</td>
<td>3711.37</td>
<td>677.78</td>
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Temp (F) 120
Pressure 75" H2O Max
Flow (acfm at 15psia) 1,365.22

<table>
<thead>
<tr>
<th>Overflow Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Toluene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Temp (F) N/A
Pressure 29° H2O Max
Flow (acfm at 15psia) 0

Notes:
1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. Per vendor’s design.

---

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Maximum Flow Rate Case

Operating Mode 2: Overflow Tank Venting  Duration: 20 minutes

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Biphenyl</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Toluene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

Temp (F): N/A
Pressure: 75’ H2O Max

<table>
<thead>
<tr>
<th>Overflow Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0.0105</td>
<td>0.2106</td>
<td>0.0385</td>
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<tr>
<td>Biphenyl</td>
<td>0.0038</td>
<td>0.0759</td>
<td>0.0139</td>
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<tr>
<td>Benzene</td>
<td>0.1442</td>
<td>2.8845</td>
<td>0.5268</td>
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<tr>
<td>Toluene</td>
<td>0.0045</td>
<td>0.0895</td>
<td>0.0164</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0010</td>
<td>0.0196</td>
<td>0.0036</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>14.09</td>
<td>281.78</td>
<td>51.46</td>
</tr>
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</table>

Temp (F): 120
Pressure: 29” H2O Max
Flow (acfm at 15psia): 209.35

Notes:
1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. Per vendor’s design.
### Specification For Carbon Filters

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<td>6007-ESP-ATP-44-62-F206</td>
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<th>Item No.</th>
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<th>Project</th>
<th>Ref.</th>
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<td>Mojave</td>
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### Maximum Concentration Case

#### Data Sheets

**CARBON FILTERS MF-206**

#### Vendor:

**VENDOR INFORMATION**

### PERFORMANCE

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gas Flow Rate lb/min</td>
<td>81.40</td>
<td>By vendor</td>
<td>0.0056</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Flow Duration, min. /day</td>
<td>40</td>
<td></td>
<td>0.0020</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Flow Composition, lb/min</td>
<td>Diphenyl ether</td>
<td>0.0056</td>
<td>By vendor</td>
<td>0.0056</td>
</tr>
<tr>
<td></td>
<td>Biphenyl</td>
<td>0.0020</td>
<td>By vendor</td>
<td>0.0020</td>
</tr>
<tr>
<td></td>
<td>Benzene</td>
<td>0.3832</td>
<td>≤1% of inlet</td>
<td>0.3832</td>
</tr>
<tr>
<td></td>
<td>Toluene</td>
<td>0.0147</td>
<td>≤1% of inlet</td>
<td>0.0147</td>
</tr>
<tr>
<td></td>
<td>Phenol</td>
<td>0.0037</td>
<td>By vendor</td>
<td>0.0037</td>
</tr>
<tr>
<td></td>
<td>Nitrogen</td>
<td>80.99</td>
<td>80.99</td>
<td>80.99</td>
</tr>
<tr>
<td></td>
<td>High Boilers</td>
<td>0.0003</td>
<td>By vendor</td>
<td>0.0003</td>
</tr>
<tr>
<td></td>
<td>Total Low Boilers</td>
<td>0.4015</td>
<td>By vendor</td>
<td>0.4015</td>
</tr>
<tr>
<td></td>
<td>Total Non-N₂</td>
<td>0.4094</td>
<td>By vendor</td>
<td>0.4094</td>
</tr>
<tr>
<td></td>
<td>Gas Enthalpy, Btu/lb</td>
<td>11.85</td>
<td>11.85</td>
<td>11.85</td>
</tr>
<tr>
<td></td>
<td>Gas Flow, acfm: (See note 2)</td>
<td>1193.30</td>
<td>By vendor</td>
<td>1193.30</td>
</tr>
<tr>
<td></td>
<td>Operating Temperature, °F:</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Operating Pressure, in H₂O:</td>
<td>≤75</td>
<td>1</td>
<td>75-29</td>
</tr>
<tr>
<td></td>
<td>Diff. Pressure @ design flow, in H₂O (Note 3)</td>
<td>≤74</td>
<td></td>
<td>14.8</td>
</tr>
<tr>
<td></td>
<td>Guaranteed VOC Removal</td>
<td>99%</td>
<td></td>
<td>99%</td>
</tr>
</tbody>
</table>

### Notes:

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. (*) Expected/(***)guaranteed

### Issued for Purchase

<table>
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<tr>
<th>No.</th>
<th>Date</th>
<th>JS</th>
<th>MZA</th>
<th>APF</th>
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EC-94 (Rev. 05/2011)
### Maximum Concentration Case
#### Data Sheets
**CARBON FILTERS**
**MF-206**

#### ABENER / TEMYAM REQUIREMENT

##### PERFORMANCE

<table>
<thead>
<tr>
<th></th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overflow Tank Venting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Gas Flow Rate lb/min.</td>
<td>13.55</td>
<td></td>
<td>0.0084</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Flow Duration, min. /day</td>
<td>20</td>
<td></td>
<td>0.0030</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Flow Composition, lb/min</td>
<td></td>
<td></td>
<td>0.6815</td>
<td>0.0068(**)</td>
</tr>
<tr>
<td>Diphenyl ether</td>
<td>0.0084</td>
<td>By vendor</td>
<td>0.0084</td>
<td></td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0030</td>
<td>By vendor</td>
<td>0.0030</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>0.6815</td>
<td>≤1% of inlet</td>
<td>0.6815</td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>0.0252</td>
<td>≤1% of inlet</td>
<td>0.0252</td>
<td>0.0003(*)</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.0060</td>
<td>By vendor</td>
<td>0.0060</td>
<td>0.0001(*)</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>12.83</td>
<td></td>
<td>12.83</td>
<td>12.83</td>
</tr>
<tr>
<td>High Boilers</td>
<td>0.0004</td>
<td>By vendor</td>
<td>0.0004</td>
<td>&lt;0.0001(*)</td>
</tr>
<tr>
<td>Total Low Boilers</td>
<td>0.7127</td>
<td>By vendor</td>
<td>0.7127</td>
<td>0.0071(*)</td>
</tr>
<tr>
<td>Total Non-N&lt;sub&gt;2&lt;/sub&gt;</td>
<td>0.7245</td>
<td>By vendor</td>
<td>0.7245</td>
<td>0.0072(*)</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>33.80</td>
<td>33.80</td>
<td>33.80</td>
<td>33.80</td>
</tr>
<tr>
<td>Gas Flow, acfm: (Note 1)</td>
<td>193.59</td>
<td>By vendor</td>
<td>19.59</td>
<td>193.59</td>
</tr>
<tr>
<td>Operating Temperature, °F:</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, in H&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>≤29</td>
<td>1&quot;</td>
<td>29-75</td>
<td>ATM</td>
</tr>
<tr>
<td>Diff. Pressure @ design flow, in H&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>≤28</td>
<td>14.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed VOC Removal</td>
<td>99%</td>
<td></td>
<td>99%</td>
<td></td>
</tr>
</tbody>
</table>

#### Notes:
1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 °F.
3. Maximum differential pressure across filter set from flange to flange.
4. (*) Expected/**)guaranteed

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<td>MZA</td>
<td>APF</td>
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EC-94 (Rev. 05/2011)
Maximum Concentration Case

**Operating Mode 1: Expansion Tank Venting**  Duration: 40 minutes

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td>0.0056</td>
<td>0.2248</td>
<td>0.0411</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>0.0020</td>
<td>0.0810</td>
<td>0.0148</td>
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<tr>
<td>Benzene</td>
<td>0.3832</td>
<td>15.3265</td>
<td>0.7989</td>
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<tr>
<td>Toluene</td>
<td>0.0147</td>
<td>0.5863</td>
<td>0.1071</td>
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<tr>
<td>Phenol</td>
<td>0.0037</td>
<td>0.1465</td>
<td>0.0268</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>80.99</td>
<td>3239.79</td>
<td>591.66</td>
</tr>
<tr>
<td>Temp (F)</td>
<td>120</td>
<td></td>
<td></td>
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<tr>
<td>Pressure</td>
<td>75° H2O Max</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow (acfm at 15psia)</td>
<td>1,193.30</td>
<td></td>
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<table>
<thead>
<tr>
<th>Final Vent</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
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<tbody>
<tr>
<td>Diphenyl ether</td>
<td>Note 4</td>
<td>Note 4</td>
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<tr>
<td>Nitrogen</td>
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<td>3239.79</td>
<td>591.66</td>
</tr>
<tr>
<td>Temp (F)</td>
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</tr>
<tr>
<td>Pressure</td>
<td>1°</td>
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<tr>
<td>Flow (acfm at 15psia)</td>
<td>Note 4</td>
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</table>

**Notes:**

1. Vendor to provide type, size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. Per vendor’s design.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
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<td>MZA</td>
<td>APF</td>
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Maximum Concentration Case

Operating Mode 2: Overflow Tank Venting  Duration: 20 minutes

<table>
<thead>
<tr>
<th>Expansion Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl ether</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biphenyl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Toluene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temp (F)  Pressure  Flow (acfm at 15psia)  Final Vent

| | | | |
| Expansion | | | |
| Bags | | | |

<table>
<thead>
<tr>
<th>Overflow Tank Venting</th>
<th>lbs/min</th>
<th>lbs/day</th>
<th>tons/year</th>
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<tr>
<td>Diphenyl ether</td>
<td>0.0084</td>
<td>0.1672</td>
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<td>Biphenyl</td>
<td>0.0030</td>
<td>0.0602</td>
<td>0.0110</td>
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<td>Benzene</td>
<td>0.6815</td>
<td>13.6305</td>
<td>2.4892</td>
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<td>Toluene</td>
<td>0.0252</td>
<td>0.5047</td>
<td>0.0922</td>
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<tr>
<td>Phenol</td>
<td>0.0060</td>
<td>0.1197</td>
<td>0.0219</td>
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<tr>
<td>Nitrogen</td>
<td>12.83</td>
<td>256.52</td>
<td>46.85</td>
</tr>
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</table>

Temp (F)  Pressure  Flow (acfm at 15psia)  Final Vent

| | | | |
| Overflow | | | |
| Bags | | | |

Notes:
1. Vendor to provide size and quantity of filters.
2. ACFM measured at 15 psia and 120 F.
3. Maximum differential pressure across filter set from flange to flange.
4. Per vendor’s design.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Issued For</th>
<th>Description</th>
<th>JS</th>
<th>MZA</th>
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EC-94 (Rev. 05/2011)
### Specification For Carbon Filters

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<th>Chk’d</th>
<th>App’d</th>
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EC-94 (Rev. 05/2011)
**Instructions:**

1. Initializing (By/Chk’d/App’d) required on cover sheet only. All other title block information must be included on all pages.

2. Revisions are identified in the body of the Specification.

<table>
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<th>Date</th>
<th>By</th>
<th>Chk’d</th>
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1. Project Summary

1.1 The project consists of two, 140 MW, solar thermal powered electric generating plants, referred to as Alpha Plant and Beta Plant. The plants will be built on adjacent sites in an unincorporated area of San Bernardino County near Hinkley, California. The plant sites are located approximately six miles north of highway CA-58 on Harper Lake Road, approximately 20 miles west of Barstow.

1.2 The Vendor shall furnish two (2) HTF Overflow Tank Vent Scrubbers, one (1) per plant site, and two (2) HTF Expansion Tank Vent Scrubbers, one (1) per plant site, meeting the requirements set forth in this specification. This specification covers the minimum requirements for the performance, design, materials, fabrication, testing and delivery of the scrubbers.

2. General

2.1 The attachments identified in this document are considered to be part of this specification. Attached specifications shall be met and followed by the Vendor in full. All drawings and documents included in this package are considered “Contract Documents”.

2.2 Definitions

a. “Vendor” or “vendor” shall mean The Clean Air Group, A Croll Reynolds Company, supplier of the HTF Overflow Tank Vent Scrubber and HTF Expansion Tank Vent Scrubber for which this specification is intended.

b. “Engineer”, “Purchaser” or “Customer” shall mean the “Abener Teyma Mojave General Partnership”.

c. “Owner” shall mean “Mojave Solar LLC”.

d. “Construction Manager” or “Construction Superintendent” shall mean “Abener Teyma Mojave General Partnership”.

2.3 The imperative language of this specification is directed to the Vendor, unless specifically noted otherwise. All directives such as “provide”, “perform”, “test”, etc., are addressed solely to Vendor, whether or not the word “Vendor” is specifically mentioned. Work by Others will be specifically identified.
3. **Function**

The HTF Overflow Tank Vent Scrubber and HTF Expansion Tank Vent Scrubber will be used to remove HTF vapors from the vent gases of the HTF Overflow Tanks and the HTF Low Boiler Condensate Receiver Vessel. The scrubbers will consist of a spray scrubbing tower using a cooled HTF liquid spray and a packing media to condense the HTF vapors including benzene, toluene, and phenol from the vent gases. The vent gases will enter at the bottom of the scrubber and pass upward through the packing media, spray and mist eliminators before being vented out of the scrubber to a carbon filter furnished by others.

4. **Operation**

The scrubbers will operate intermittently, as required, during the day. The HTF vapors will be displaced at least once daily from the HTF Overflow Tank and the Expansion Vessels due to thermal expansion of the HTF as it is warmed to operating temperatures. The HTF system will be vented as needed to control the maximum system pressures. The venting and condensing is expected to occur during morning start-up and operate for approximately 40 minutes.

5. **Location**

5.1 The scrubbers shall be installed outdoors. For proposal purposes, assume the vessel is attached to an open structure with the bottom nozzle 35 feet above grade.

5.2 Electrical Area Classification - The scrubbers shall be installed in an area that is classified as a Class I Division 2 location per NEC 500.5 (Classification of Locations).

5.3 The equipment shall meet all the design conditions including the seismic and climatic conditions in this specification. Refer to specification 6007-ESP-ATP-00-60-G100 Project Design Criteria, for site specific information.

6. **Schedule**

Vendor’s schedule shall comply with the Abener Teyma schedule. The vendor shall propose the best available delivery.
7. **Performance**

7.1 The vendor supplied equipment shall meet the performance requirements defined in this specification and under the column marked “Abener Teyma Requirement” on the Data Sheets; included herein.

7.2 Over time the HTF will degrade and the quantity of low boilers; benzene, toluene, and phenol, in the HTF will increase. The HTF will be cleaned and/or replaced after seven years of operation. The included data sheets describe the concentrations of inlet gases and the allowable concentrations of the outlet gases for both the minimum and maximum concentrations.

7.3 Vendor shall have sole responsibility for meeting the performance requirements. Vendor shall provide all equipment, appurtenances, and accessories required in order to meet this performance.

7.4 The vendor shall determine the optimal scrubber design, including vessel dimensions, packing type and depth, spray nozzle quantity and type, and mist eliminator type and depth.

7.5 The scrubbers (including any auxiliaries) shall be designed and constructed for a minimum service life of 30 years.

8. **Scope**

8.1 Vendor shall furnish the design, submittal data, fabrication, assembly, inspection, testing, packing, and shipping of the scrubbers as specified herein.

8.2 Vendor shall furnish four (4) HTF Scrubbers.

<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Tag Number</th>
<th>Plant Site</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF Overflow Vent Scrubber</td>
<td>A-MV-208</td>
<td>Alpha</td>
<td>1</td>
</tr>
<tr>
<td>HTF Expansion Tank Vent Scrubber</td>
<td>A-MV-209</td>
<td>Alpha</td>
<td>1</td>
</tr>
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<td>Beta</td>
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</tr>
<tr>
<td>HTF Expansion Tank Vent Scrubber</td>
<td>B-MV-209</td>
<td>Beta</td>
<td>1</td>
</tr>
</tbody>
</table>
8.3 The scrubbers shall include, but are not limited to, the following:

a. Scrubber vessel
b. Packing
c. Spray nozzles
d. Internal spray manifold
e. Mist eliminators
f. Supports for internal components
g. Manways with davits
h. Vessel nozzles per data sheet.
i. Vessel support lugs / saddles and seismic restraints designed per CBC 2010
j. Anchor bolt sizing and selection
k. Insulation support rings and pins
l. Start up and commissioning spare parts
m. Spare parts for one year of operation.
n. Other items as specified on the Equipment Data Sheets

8.4 Vendor Data

The Vendor shall furnish the Vendor Submittal Data for the HTF Scrubbers as specified here-in. Refer to specification 6007-ESP-ATP-44-62-V208V for additional Vendor Data Requirements.

8.5 Work By Others

The following is out of the scope of this specification:

a. Receiving, unloading, storage and handling of HTF Scrubbers on site.

b. **(deleted)**

c. Installation of the Scrubbers.

d. Furnishing and installation of anchor bolts.

e. Piping prior to the vessel inlet flanges or after the outlet flanges.

f. Insulation.
9. Codes and Standards

9.1 At a minimum all applicable portions of the codes and standards listed below shall be followed.
   a. AISC - American Institute of Steel Construction
   b. AISI – American Iron and Steel Institute
   c. ANSI – American National Standards Institute
   d. ASME – American Society of Mechanical Engineers
   e. ASNT – American Society for Nondestructive Testing
   f. ASTM – American Society of Testing Materials
   g. AWS – American Welding Society
   h. CAL/OSHA – California Occupational Safety and Health Administration
   i. CBC – California Building Standards Code (2010)
   j. NEC – National Electric Code
   k. NFPA – National Fire Protection Association
   l. OSHA – Occupational Safety and Health Act
   m. SSPC – The Society for Protective Coatings

9.2 Vendor shall meet all federal, state, and local laws and regulations.

9.3 Should there be any conflict between applicable codes, standards, specifications noted herein or
   vendor’s recommendations and those of the locality of the project, the more stringent code shall
   apply.

10. Design

The vendor shall design the scrubbers to meet the operating conditions and performance requirements
set forth in this specification. Any conflicts between the specification, the data sheets and the
appropriate codes and standards shall be referred to Abener Teyma for resolution.

10.1 Submittals

10.1.1 Vendor shall provide engineering drawings and calculations for approval prior to the
   start of fabrication.

10.1.2 Refer to and comply with specification 6007-ESP-ATP-44-62-V208V, Vendor Data
   Requirements - HTF Scrubbers.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
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10.1.3 Approval of Vendor’s drawings and calculations is limited to verifying general compliance with specifications and design drawings, and does not imply verification of dimensions, quantities, or calculations. Vendor is not relieved from responsibility for accurate dimensioning, equipment sizing, fabrication to required tolerances, and fabrication fit-up.

10.1.4 U.S. customary units shall be used on all drawings and calculations.

10.1.5 Drawings:

(1) A general arrangement drawing shall be furnished for each vessel, and shall contain the data shown in the appropriate Data Sheet. The location of the vessel marking or nameplate, the size and orientation of all nozzles and connections, and the anchor bolt layout shall also be shown on this drawing.

(2) A separate outline drawing for each vessel shall be furnished with appropriate markings to cross-reference each component (shell plates, heads, nozzles, flanges, forgings, skirt plates, etc.) to the applicable mill test certificates for the steels used in the construction.

(3) Vendor shall provide all drawings that are issued for fabrication, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

(4) Fabrication drawings shall show weld details and shall reference applicable welding procedures. The drawings shall also include impact test requirements, showing (as applicable):
   a. Component
   b. Thickness for impact purposes
   c. Material specification
   d. Critical Exposure Temperature
   e. Minimum Design Metal Temperature
   f. Appropriate Charpy impact requirements (average/minimum values)
10.1.6 Data and Calculations

(1) Design calculations (including lifting attachments and support lugs) made by the Vendor shall be furnished prior to or along with submission of drawings for approval. When calculations are made using a computer, all input data, assumptions, computer program version used, and a summary of the results shall be furnished.

(2) Vendor shall provide their structural calculation package, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

10.2 Vessels

10.2.1 The HTF Expansion Tank Vent Scrubbers shall be designed, manufactured, tested and stamped by the manufacturer in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII Division 1.

10.2.2 The HTF Overflow Tank Vent Scrubbers shall be designed and manufactured by the manufacturer in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII Division 1. However, the HTF Overflow Tank Vent Scrubbers, being low pressure vessels, shall not require an ASME code stamp.

10.2.3 Vessels shall be designed to withstand internal or external pressure and mechanical loads induced by vessel dead load, process, contents, earthquake, wind and other specified loadings. Wind and earthquake loads shall be in accordance with the Project Design Criteria described in Specification 6007-ESP-ATP-00-60-G001. Load combinations must be appropriately considered. Record design calculations are required.

10.2.4 The minimum insulation design load shall be for 3” thickness on heads and shell using 8 lb. / ft² mineral wool insulation with aluminum jacket.

10.2.5 All vessels, with physical dimensions within the allowable limits for shipping, shall be completely shop fabricated and tested before shipment.
10.2.6 Vendor shall furnish the vessels complete as shown on data sheets and as noted herein and shall include all necessary nozzles, blind flanges, studs, nuts, bolts, clips, support brackets, lifting lugs, davits, and gaskets.

10.2.7 Vessels shall include lifting lugs and tailing lugs, designed by vendor, for use in loading, unloading, and field erection of vessel. Empty weight shall be marked on the vessel by using lettering no less than 6 inches high.

10.2.8 Anchor bolts shall be furnished by Abener Teyma as specified by Vendor. Vendor shall specify bolt material, size, and quantities and provide drawings and loading diagrams for structural design.

10.2.9 Vendor shall extend nozzles a minimum 8 inches outside surface of the vessel. **Vendor shall check the projection to ensure that every nozzle is outside of the insulation by at least 5 inches.**

10.2.10 Each vessel shall include four stainless steel grounding lugs. Grounding lugs shall be a minimum of 3” wide x 3 “tall x ½” thick plates, and shall be made of 304 grade stainless steel. The grounding lugs shall be drilled to match “Burndy Qiklug” type “QA28-2N” which utilizes NEMA bolt spacing. Grounding lugs shall be welded to the vessel support lugs. The lugs shall be oriented so that the holes in the lug are on the vertical centerline.

10.2.11 Materials of construction shall be per the attached data sheet. Where materials of construction are not specified, Vendor shall propose materials for each item as appropriate for the service conditions.

10.2.12 All materials purchased by Vendor shall meet nationally recognized standards unless otherwise approved by Abener Teyma.

10.2.13 All materials shall be compatible with the vessel contents and in accordance with all applicable welding procedures.

10.2.14 Copies of mill test reports for materials shall be provided to Abener Teyma by Vendor.

10.2.15 The design shall be such to avoid any corrosion of vessel equipment.
10.2.16 The design shall be such to avoid any contamination of the vessel contents once the vessel is put into service.

10.2.17 The layout of weld seams shall be such that it will allow full access for inspection. Circumferential seams shall not be located within a distance of 1-1/2” of any external compression ring, internal ring, support ring, etc. Nozzles and manholes shall not intersect any weld seams, unless approved by Abener Teyma.

10.2.18 Vendor shall provide corrosion allowances as specified by the data sheets.

10.2.19 The minimum required thickness of plate and other structural members shall be that which is necessary to satisfy tension and compression strength requirements for the specified design conditions, plus the corrosion allowance.

10.2.20 All nozzles shall be flush with the inside surface of the vessel wall, unless otherwise specified.

10.2.21 Nozzle flanges and manway flanges shall be the material as indicated on the Data Sheets.

10.2.22 Internal bolting is not allowed unless required for maintenance purposes. Nuts and bolts shall use safety wire, cotter pins or other mechanical methods to prevent bolts from loosening due to vibration.

10.2.23 Vendor to indicate on project drawings the maximum allowable loads on nozzles. Nozzles shall be designed for a minimum of the loads as indicated below.

<table>
<thead>
<tr>
<th>Nozzle Size (NPS)</th>
<th>Force (pounds)</th>
<th>Moments (foot pounds)</th>
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<tbody>
<tr>
<td></td>
<td>Sum Force</td>
<td>Sum Force</td>
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<tr>
<td>3 and smaller</td>
<td>750 428</td>
<td>1500 855</td>
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<tr>
<td>4</td>
<td>1400 800</td>
<td>2500 1425</td>
</tr>
<tr>
<td>6</td>
<td>2000 1140</td>
<td>6000 3425</td>
</tr>
<tr>
<td>8</td>
<td>2800 1600</td>
<td>12000 6850</td>
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<td>16000 9120</td>
</tr>
<tr>
<td>12</td>
<td>4600 2625</td>
<td>25000 14250</td>
</tr>
</tbody>
</table>

Example: NPS-3 nozzle would be subjected to simultaneous loads of F axial= 428. lbs, F circumferential= 428. lbs, F radial= 428. lbs, and M axial= 855. ft-lbs, M circumferential= 855. ft-lbs, M radial= 855. ft-lbs
10.2.24 Manways

1. Manways shall be provided for accessing and ventilating the scrubber interior.

2. Manways shall be located to provide easy access for maintenance and cleaning of the scrubber including cleaning or replacement of the packing, spray nozzles and mist eliminators.

3. Manway covers shall be equipped with davits and handles to aid in removing and replacing the covers.

10.2.25 Each vessel shall include insulation support rings. Rings shall be provided at the top and bottom tangents. Additional rings shall be provided as required at no more than 10 foot spacing. Rings shall extend 2 inches beyond the shell outside diameter. Rings shall be segmented and detachable for shipment. Attachment brackets shall be continuously welded to the vessel.

10.2.26 Each vessel shall include insulation support pins welded to the bottom head. Insulation will be 3” thick mineral wool. Pins are to be #10 gauge (3.6mm) weld pins 3-1/2” long on 12” centers. The companion 2-1/2” square speed clips shall be shipped with the vessel. The pins shall be carbon steel.

10.2.27 Any instrumentation provided by the vendor must comply with the attached specification, 6007-ESP-ATP-00-30-M100 (Electrical and Instrument Systems On Packaged Mechanical Equipment)

10.3 Vessel Internals

10.3.1 The Vendor shall design the scrubber packing, mist eliminators and spray nozzles to allow for removal through nozzles F1 & F2 for cleaning and maintenance.

10.3.2 The selection of type, size, and depth of packing shall be by the vendor.

10.3.3 The scrubber and packing design shall prevent channeling and provide a uniform gas velocity across the scrubber cross section.
10.3.4 The maximum pressure drop from the inlet to outlet of the scrubber shall not exceed the value listed in the equipment data sheet. **Vendor to provide the maximum pressure drop across all elements of the scrubber, from inlet to outlet.**

10.3.5 The selection of type, size, and quantity of the spray nozzles shall be by the vendor.

10.3.6 The maximum total flow and inlet pressure of the HTF to the spray nozzles shall be as indicated on the data sheet.

10.3.7 The selection of type, size, and depth of the mist eliminator shall be by the vendor. The mist eliminator shall coalesce and remove entrained HTF droplets from the gas stream to prevent carry over to the carbon filters.

10.4 **Insulation and Heat Tracing**

10.4.1 Piping and vessel insulation will be mineral wool bats furnished and installed by others.

10.4.2 Aluminum insulation jacketing will be furnished and installed by others.

10.4.3 Vessels and associated piping will be electrically heat traced by others.

10.5 **Painting**

10.5.1 Vessel exteriors shall be (deleted) painted according to the attached specification, 6007-ESP-ATP-00-60-N102 (Two Coat System for High Temperature Non-Primed Carbon Steel) to prevent rust and corrosion during shipping and installation.

10.5.2 Painting vessel interiors is not required. See section 11.17 of this spec.

11. **Fabrication**

11.1 Any fabrication sub-contracted to others shall require written approval by Abener Teyma.

11.2 All vessels must meet the latest edition of the ASME Boiler and Pressure Vessel Code for shop practices, welding, and stress relieving.
11.3 Vessels requiring a Code Stamp must meet the latest edition of the ASME Boiler and Pressure Vessel Code for radiographing, and testing.

11.4 All plate and other material used in the execution of this work shall be new and clean stock, free from surface laminations and other physical imperfections.

11.5 All materials shall be identified throughout fabrication. Material certification shall be provided on request by the Abener Teyma inspector. Material certification test reports shall become a permanent record of the documentation package.

11.6 Machined surfaces which are warped or distorted due to welding, etc., shall be re-machined after these operations are finished, with minimum thickness maintained as specified. Machine surfaces shall be finished to the smoothness limit indicated on the design drawings.

11.7 The axis of any shell nozzle shall be radial and perpendicular to the longitudinal axis of the vessel. Flange face shall be perpendicular to the nozzle axis. All welds protruding beyond the flange face shall be ground flush.

11.8 Flange bolt holes of shell nozzles shall straddle the axial center line.

11.9 Vendor shall prepare the weld end nozzles end face in accordance with ASME B31.3 and ASME B16.25, to match the piping as indicated in the piping specification referenced in this specification. Abener Teyma shall review each weld end nozzle face prior to purging and protection for shipment. Vendor is to protect each weld end nozzle face against damage during handling and transporting.

11.10 All permanent attachments, stiffeners, clip angles, ring angles, etc., shall be joined to vessels by continuous welding, unless approved otherwise by Abener Teyma.

11.11 Remove all sharp edges and burrs.

11.12 All welds and surfaces exposed to vessel contents, its vapor or condensate shall be free of gouges, pits, cracks or other surface defects.

11.13 All welds and materials discovered to be non-compliant through inspection and/or testing shall be fully repaired at vendor’s cost.
11.14 Fabricated location and orientation of nozzles will be reviewed by Abener Teyma. If there are any discrepancies with project documents, the Vendor will make corrections.

11.15 Vendor shall notify Abener Teyma regarding any necessary repair work and have written approval before proceeding.

11.16 Vendor shall provide whatever additional treatment, such as preheat and/or post weld heating, as required for the material being used. Shop drawings must identify such treatments.

11.16.1 For any required heat treatment, Vendor shall provide written procedures for Abener Teyma review.

11.16.2 At completion, Vendor shall provide a Product Certification for PWHT, including a copy of time / temperature chart records.

11.17 To prevent contamination of the vessel contents, Vendor shall mechanically clean the interior surface of the vessel to remove all weld spatter, scale, rust, filings, dirt, etc., as well as all foreign materials.

11.17.1 Mechanical cleaning shall meet all requirements of NACE No. 3 (Commercial Blast Cleaning).

11.17.2 Vendor shall not commence mechanical cleaning until after all testing has been completed.

11.17.3 Vendor shall not commence mechanical cleaning until instructed by Abener Teyma to do so.

11.17.4 At the completion of mechanical cleaning, Vendor shall purge and seal the vessel with an inert gas to a minimum 2 psig.

(1) Warning signs shall be placed by Vendor on the vessel and manway clearly indicating the vessel has an inert gas seal that must be purged before entry.

(2) Method for sealing weld end nozzles shall minimize damage to weld end prep, and minimize any required weld end prep at the job site.
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(3) Sealing with inert gas shall include a pressure gauge that proves purge gas in the vessel. Pressure gauge is to stay with sealed vessel. Pressure gauge is to be protected from damage during shipment. Pressure gauge is to include shut off valve.

(4) Apply water-soluble rust inhibitor during hydrotest, according to specification 6007-ESP-ATP-00-61-PS010.

12. Inspection

12.1 Abener Teyma (or an inspector on their behalf) reserves the right to inspect the equipment at any time during the course of fabrication. Abener Teyma retains the right to provide personnel to observe all fabrication work within the scope of the contracted work (including testing and inspection). Such individuals shall be afforded full and free access for these purposes, subject to safety and schedule constraints.

12.2 Inspector means Abener Teyma (or an inspector on their behalf).

12.3 Inspector shall have free access, at all reasonable times, to the areas where the work on equipment is being performed. Vendor shall notify Abener Teyma purchasing department in advance (minimum one week) of scheduled vessel testing to allow time for the Inspector to arrange to be at the test site before testing begins.

12.4 Mill and shop inspection shall not release the Vendor from responsibility for replacing any defective material and for repairing any defective workmanship that may be discovered in the field.

12.5 Vendor’s currently qualified welders and procedures under ASME Sec. IX, must be submitted to Inspector for approval. Additional qualifications necessary are to be at vendor’s expense.

12.6 All vessels shall be inspected and tested according to the applicable code as listed in the vessel data sheets.

12.7 For any required radiographic examination, a certified copy of a written report confirming that the work was inspected as set forth herein shall be provided when specified. Refer to 6007-ESP-ATP-44-62-V208V Vendor Data Requirements. The report shall include the following:

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>SMR</th>
<th>MZA</th>
<th>APF</th>
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<tbody>
<tr>
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a. A summary of inspection of radiographs.
b. Identification of unacceptable radiographs and a statement of the action taken to rectify unsatisfactory welds.

12.8 Tell-tale holes shall be used to pneumatically test all welded attachments prior to hydrostatic testing. Tell-tale holes shall not be plugged during hydrostatic testing of the vessel.

12.9 Vendor shall submit letters of completion to Abener Teyma at least twenty days prior to the requested final inspection date. The equipment must be ready for inspection and the tests run prior to this final inspection request.

12.10 The cost of all tests due to code requirements or manufacturer’s test requirements shall be fully borne by vendor.

12.11 A written certification of an acceptable hydrostatic test shall be completed by vendor. The certification shall be forwarded to the individual indicated on the Abener Teyma purchase order.

12.11.1 Asbestos or material containing asbestos shall not be used in the construction or manufacture of the equipment.

12.11.2 A stainless steel tag that includes the Project number, equipment Tag Number and the equipment Purchase Order number shall be fixed to all the associated equipment. The tag shall stand off the vessel, outside of the insulation. The location of the tag shall be determined during drawing review.

13. Shipping

13.1 All parts shall be skidded, boxed, or otherwise suitably prepared for shipment to protect against damage while in transit.

13.2 Vendor shall refer to specification 6007-ESP-ATP-00-60-G121 for shipping and preparation requirements.

14. Installation Information

14.1 The Vendor shall specify with quote any detailed installation requirements.
14.2 The Vendor shall include in their quotation one set of any special tools and wrenches required for installation and maintenance.

15. **Startup, Training and Field Services**

The Vendor shall state all startup, training and field services included in bid, clearly identifying duration, number of people, and specific services provided. The Vendor shall quote any additional assistance on a per diem rate.

16. **Qualifications**

The Vendor shall furnish equipment, designs, and materials that have been proven by successful operation for no less than five (5) years. Requests to use untried or unproven equipment, designs, or materials must be approved by the Purchaser in writing prior to incorporation into the purchase order.

17. **Proposal Requirements**

17.1 Vendor shall furnish a quote for the following equipment and services:

17.1.1 All engineering, design, equipment materials, labor, fabrication, testing, inspection, and shipping of the equipment.

17.1.2 All parts and accessories required for complete functional HTF Scrubbers.

17.1.3 Startup and commissioning spare parts with quantities.

17.1.4 Submittal of data as required in the Vendor Data Requirements Specification, 6007-ESP-ATP-44-62-V208V.

17.1.5 Start-up, training and commissioning, clearly identifying duration, number of people, and specific services included in bid. The Vendor shall quote any additional assistance on a per diem rate.

17.1.6 The Vendor shall separately quote one set of any special tools and wrenches required for maintenance.
17.2 The Vendor’s base quotation shall consist of the equipment and services identified herein. Pricing for Purchaser identified options shall be submitted as separate line items. Vendor identified alternatives may be submitted if system improvements and/or cost savings can be realized.

17.3 Comments and exceptions to the specification shall be listed in a separate part of the proposal titled “Exceptions to the Specification”. All exceptions shall be listed in this section and shall reference the appropriate specification section. No other exceptions will be allowed. After the purchase order is awarded, the Vendor shall be responsible to satisfy all requirements of this specification except for the agreed upon exceptions. Any requirements that are not included with the Vendor’s equipment and are in the equipment specification shall be furnished and installed at the Vendor’s expense.

17.4 Vendor shall complete and return the Equipment Data Sheets with the proposal. Failure to submit these sheets will result in an incomplete proposal that may not be considered.

17.5 Vendor shall furnish dimensioned envelope drawings with the proposal. Drawing shall show the location of all connections, supports, estimated weights, and other pertinent data.

17.6 Vendor shall provide minimum clearances required for maintenance, service and operation of the scrubber and its components.

18. Attachments

<table>
<thead>
<tr>
<th>Specification For HTF Scrubbers</th>
<th>Job No.: 120010</th>
<th>Spec. No.: 6007-ESP-ATP-44-62-V208</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item No.: See Spec</td>
<td>Item No.: See Spec</td>
<td>Item No.: See Spec</td>
</tr>
<tr>
<td>Ref.: Mojave</td>
<td>Ref.: Mojave</td>
<td>Ref.: Mojave</td>
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<tr>
<td>Issue: 1</td>
<td>Dated: 11/13/12</td>
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<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>SMR</th>
<th>MZA</th>
<th>APF</th>
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<tbody>
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<td>APF</td>
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<td></td>
<td></td>
<td>Chk’d</td>
<td>App’d</td>
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</tbody>
</table>

6007-ESP-ATP-44-62-V208V Vendor Data Requirements – HTF Scrubbers
6007-ESP-ATP-00-60-G100 Project Design Criteria
6007-ESP-ATP-00-60-G121 Shipping and Preparation Requirements
6007-ESP-ATP-68-61-CS72 Class 150 Carbon Steel
6007-ESP-ATP-68-61-CS30 Class 300 Carbon Steel
6007-ESP-ATP-00-60-N102 Two Coat System for High Temperature Non-Primed Carbon Steel
6007-ESP-ATP-00-60-N180 Shop Applied Paint
6007-ESP-ATP-00-30-M100 Electrical and Instrument Systems On Packaged Mechanical Equipment
6007-INS-ATM-77-13-0002 Annex 01 – Specification of Documentation to be sent by Subcontractors and Suppliers
6007-ESP-ATP-00-61-PS010 Material and Installation Standards Internal Pipe Cleaning

EC-94 (Rev. 05/2011)
Specification For
HTF Scrubbers

HTF Overflow Tank Vent Scrubbers, A-MV-208 and B-MV-208
## Data Sheets

<table>
<thead>
<tr>
<th>Vendor: The Clean Air Group - Croll Reynolds Company (CRC)</th>
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</thead>
</table>

### HTF OVERFLOW TANK VENT SCRUBBERS
A-MV-208, B-MV-208

#### ABENER / TEYMA REQUIREMENT

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<th>TYPE</th>
<th>Packed Column</th>
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#### DESIGN AND CONSTRUCTION

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<tr>
<th>Code:</th>
<th>ASME Sec. VIII Div. 1</th>
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<tr>
<td>Stamp:</td>
<td>Not Required</td>
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<tr>
<td>Design Pressure:</td>
<td>PSIG 2.5 / FV</td>
</tr>
<tr>
<td>Design Temperature:</td>
<td>°F 350</td>
</tr>
<tr>
<td>Corrosion Allowance, in</td>
<td>0.0625 in</td>
</tr>
</tbody>
</table>

#### Dimensions

| Inside Diameter, in. | 20” |
| Shell Height, Tan to Tan, in. | Nominally, 24.5 ft (294”) |
| Overall Height, In. | Nominally, 26.5 ft (318”) |
| Head style / Flange height, in. | Elliptical head / 10” nominally |
| Shell Thickness, in. | Nominally, 0.25” |
| Head thickness, in. | Nominally, 0.25” |
| Vessel Volume, Ft³ | 21.8 ft³ |

#### Materials of Construction

| Shell | SA516-70 |
| Head | SA516-70 |
| Internal Supports | 316 SS |

#### Packing

| Height, in | 16 ft (192”) |
| Material / Type | 316SS / 1” High Flow |

#### Spray Nozzle

| Quantity | 4 |
| Type / Material | Bete / 316SS |
| Flow per Nozzle, gpm | 22 |
| Required Supply Pressure to Nozzle, PSIG | Nominally, 10 psig |

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EC-94 (Rev. 05/2011)
### Data Sheets

**Vendor:** The Clean Air Group - Croll Reynolds Company (CRC)

**HTF OVERFLOW TANK VENT SCRUBBERS**

A-MV-208, B-MV-208

<table>
<thead>
<tr>
<th>Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Mist Eliminator</strong></td>
<td></td>
</tr>
<tr>
<td>Height, in.</td>
<td></td>
</tr>
<tr>
<td>Material / Type</td>
<td></td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td></td>
</tr>
<tr>
<td>A - Gas Inlet, in.</td>
<td>Size / Type / Rating</td>
</tr>
<tr>
<td>B - Gas Outlet, in.</td>
<td>6” / RF Flg. / Per Code</td>
</tr>
<tr>
<td>C - HTF Spray connection, in</td>
<td>8” / RF Flg. / Per Code</td>
</tr>
<tr>
<td>D - HTF Condensate Outlet, in</td>
<td>4” / RF Flg. / Per Code</td>
</tr>
<tr>
<td>E - Safety Valve</td>
<td>2” /RF Flg. / Per code</td>
</tr>
<tr>
<td>F1 - Upper Manway, in</td>
<td>36” / RF Flg. w/ davit / Per Code</td>
</tr>
<tr>
<td>F2 - Lower Manway, in</td>
<td>36” / RF Flg. w/ davit / Per Code</td>
</tr>
<tr>
<td>G – Connections for PDG</td>
<td>2” /RF Flg. / Per code</td>
</tr>
<tr>
<td><strong>Vessel Support Lugs, Qty.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td><strong>Insulation Support Rings</strong></td>
<td>Required</td>
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<tr>
<td>Qty.</td>
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<tr>
<td>Dimensions</td>
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**EC-94 (Rev. 05/2011)**
## Data Sheets
### HTF OVERFLOW TANK VENT SCRUBBERS
#### A-MV-208, B-MV-208

### Performance

<table>
<thead>
<tr>
<th>Minimum Concentration</th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
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<tbody>
<tr>
<td>Total Gas Flow Rate, lb/hr</td>
<td>949</td>
<td>854</td>
<td>949</td>
<td>860.58</td>
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<tr>
<td>Gas Flow, scfm:</td>
<td>214</td>
<td>201</td>
<td>214</td>
<td>201</td>
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<tr>
<td>Gas Flow, acfm:</td>
<td>260</td>
<td>208</td>
<td>260</td>
<td>208</td>
</tr>
<tr>
<td>Operating Temperature, °F:</td>
<td>240</td>
<td>120</td>
<td>240</td>
<td>120</td>
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<tr>
<td>Operating Pressure, psia:</td>
<td>17.2</td>
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### Gas Flow Composition:

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<thead>
<tr>
<th></th>
<th>Inlet</th>
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<tbody>
<tr>
<td>HTF, lb/hr</td>
<td>51.58</td>
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<td>Benzene, lb/hr</td>
<td>46.11</td>
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<tr>
<td>Toluene, lb/hr</td>
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<tr>
<td>Phenol, lb/hr</td>
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<td>Nitrogen, lb/hr</td>
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<td>50.13</td>
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<td>Total Non-N2, lb/hr</td>
<td>101.95</td>
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### HTF Liquid Flow Rate, lb/hr

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<tr>
<td>45,000</td>
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### HTF Liquid Flow, GPM:

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<td>87.1</td>
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### HTF Liquid Temperature, °F:

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### HTF Liquid Pressure, psia:

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<tr>
<td>17.2</td>
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### HTF Liquid Enthalpy, Btu/lb:

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<tr>
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### HTF / Liquid Flow Composition:

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<td>44,220</td>
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<td>Benzene, lb/hr</td>
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<td>Toluene, lb/hr</td>
<td>19</td>
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<td>Phenol, lb/hr</td>
<td>165</td>
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<tr>
<td>Nitrogen, lb/hr</td>
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<td>High boilers, lb/hr</td>
<td>439</td>
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<td>Total Low boilers, lb/hr</td>
<td>382</td>
<td>424</td>
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<tr>
<td>Total Non-N2, lb/hr</td>
<td>44,990</td>
<td>45,083</td>
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EC-94 (Rev. 05/2011)
### Specification For HTF Scrubbers

**Item No.:** See Spec  
**No. Req’d.:** 4  
**Project:** Mojave  
**Ref.:** Issue: 1  
**Dated:** 11/13/12

---

### Data Sheets

**HTF OVERFLOW TANK VENT SCRUBBERS**  
**A-MV-208, B-MV-208**

#### PERFORMANCE

<table>
<thead>
<tr>
<th>Maximum Concentration</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
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<tbody>
<tr>
<td>Total Gas Flow Rate, lb/hr</td>
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<td>809</td>
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<td>Gas Flow, scfm:</td>
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<td>186</td>
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<td>Gas Flow, acfm:</td>
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<td>Operating Temperature, °F:</td>
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<td>Operating Pressure, psia:</td>
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<tr>
<td>Gas Enthalpy, Btu/lb</td>
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#### Gas Flow Composition:

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<thead>
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<th>Inlet lb/hr</th>
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</tr>
</thead>
<tbody>
<tr>
<td>HTF, lb/hr</td>
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<td>Benzene, lb/hr</td>
<td>244.10</td>
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<td>Phenol, lb/hr</td>
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<td>Total Non-N₂, lb/hr</td>
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#### HTF Liquid Flow Rate, lb/hr

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<tr>
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<th>Inlet lb/hr</th>
<th>Outlet lb/hr</th>
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</thead>
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<tr>
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<td>Total Non-N₂, lb/hr</td>
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#### Vendor: The Clean Air Group - Croll Reynolds Company (CRC)

**HTF OVERFLOW TANK VENT SCRUBBERS**  
**A-MV-208, B-MV-208**

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**EC-94 (Rev. 05/2011)**

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HTF Expansion Vessel Vent Scrubber, A-MV-209 and B-MV-209

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### Data Sheets

**Vendor:** The Clean Air Group - Croll Reynolds Company (CRC)

#### HTF EXPANSION VESSEL

**VENT SCRUBBERS**

A-MV-209, B-MV-209

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<th><strong>ABENER / TEYMA REQUIREMENT</strong></th>
<th><strong>CRC INFORMATION</strong></th>
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<td><strong>High Pressure Packed Column</strong></td>
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<td></td>
<td>– 36T-16H</td>
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#### DESIGN AND CONSTRUCTION

- **Code:** ASME Sec. VIII Div. 1
- **Stamp:** Required
- **Design Pressure:** PSIG 200 / Full Vacuum
- **Design Temperature:** °F 650
- **Corrosion Allowance, in:** 0.0625 in

**Dimensions**

- **Inside Diameter, in.** 36
- **Shell Height, Tan to Tan, in.** Nominally, 26.7 ft (320"
- **Overall Height, In.** Nominally, 30 ft (360"
- **Head style / Flange height, in.** Elliptical / 18” nominally
- **Shell Thickness, in.** 0.25
- **Head thickness, in.** 0.25
- **Vessel Volume, Ft³** 71 ft³

**Materials of Construction**

- **Shell** SA516-70
- **Head** SA516-70
- **Internal Supports** 316 SS

**Packing**

- **Height, in** 16 ft (192"
- **Material / Type** 316SS / 2” High Flow

**Spray Nozzle**

- **Quantity** 4
- **Type / Material** Bete / 316SS
- **Flow per Nozzle,** Required Supply Pressure to Nozzle, PSIG
- **Nominally, 10 psig**
### Data Sheets

**Vendor:** The Clean Air Group - Croll Reynolds Company (CRC)

**HTF EXPANSION VESSEL**

**VENT SCRUBBERS**

**A-MV-209, B-MV-209**

<table>
<thead>
<tr>
<th><strong>Mist Eliminator</strong></th>
<th><strong>ABENER / TEYMA REQUIREMENT</strong></th>
<th><strong>CRC INFORMATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Height, in.</td>
<td>8” overall</td>
<td>316SS / Mesh</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Connections</strong></th>
<th><strong>Size / Type / Rating</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A Gas Inlet, in.</td>
<td>6” / RF Flg. / Per Code</td>
<td>6”</td>
</tr>
<tr>
<td>B Gas Outlet, in.</td>
<td>Top center of upper head</td>
<td>6”</td>
</tr>
<tr>
<td>C HTF Spray connection, in</td>
<td>4” / RF Flg. / Per Code</td>
<td>4”</td>
</tr>
<tr>
<td>D HTF Condensate Outlet, in</td>
<td>4” / RF Flg. / Per Code</td>
<td>4”</td>
</tr>
<tr>
<td>E Safety Valve</td>
<td>4” / RF Flg. / Per code</td>
<td>4”</td>
</tr>
<tr>
<td>F1 Upper Manway, in</td>
<td>36” / RF Flg. w/ davit / Per Code</td>
<td>36”</td>
</tr>
<tr>
<td>F2 Lower Manway, in</td>
<td>36” / RF Flg. w/ davit / Per Code</td>
<td>36”</td>
</tr>
<tr>
<td>G – Connections for PDG</td>
<td>2” / RF Flg. / Per code</td>
<td>2”</td>
</tr>
</tbody>
</table>

| **Vessel Support Lugs, Qty.** |                  | 4                |

<table>
<thead>
<tr>
<th><strong>Insulation Support Rings</strong></th>
<th><strong>Qty.</strong></th>
<th><strong>Dimensions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>16</td>
<td>1”</td>
</tr>
</tbody>
</table>

### Notes

- **Note:** Differential Pressure Gauge Nozzles are supplied with isolation valves.
- ### Manway size subject to change based on vessel diameter.
<table>
<thead>
<tr>
<th>Specification For HTF Scrubbers</th>
<th>Job No.: 120010</th>
<th>Spec. No.: 6007-ESP-ATP-44-62-V208</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item No.: See Spec</td>
<td>No. Req’d.: 4</td>
<td></td>
</tr>
<tr>
<td>Project: Mojave</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref.:</td>
<td>Issue: 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dated : 11/13/12</td>
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**Data Sheets**

**HTF EXPANSION VESSEL VENT SCRUBBERS A-MV-209, B-MV-209**

**ABENER / TEYMA REQUIREMENT**

**CRC INFORMATION**

<table>
<thead>
<tr>
<th>Performance</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Concentration at Design Flowrate</td>
<td>9,588</td>
<td>9,415</td>
<td>9,588</td>
<td>9,495</td>
</tr>
<tr>
<td>Total Gas Flow Rate, lb/hr</td>
<td>9,588</td>
<td>9,415</td>
<td>9,588</td>
<td>9,495</td>
</tr>
<tr>
<td>Gas Flow, scfm:</td>
<td>2,034</td>
<td>1,989</td>
<td>2,034</td>
<td>1,989</td>
</tr>
<tr>
<td>Gas Flow, acfm:</td>
<td>205</td>
<td>202</td>
<td>205</td>
<td>205</td>
</tr>
<tr>
<td>Operating Temperature, °F:</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, psig:</td>
<td>157</td>
<td>156</td>
<td>157</td>
<td>156</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>13</td>
<td>9</td>
<td>13</td>
<td>9</td>
</tr>
</tbody>
</table>

**Gas Flow Composition:**

- **HTF, lb/hr:**
  - 0.97
  - 0.91
  - 0.97
  - 1.03
- **Benzene, lb/hr:**
  - 65.50
  - 10.07
  - 65.50
  - 9.36
- **Toluene, lb/hr:**
  - 1.92
  - 0.29
  - 1.92
  - 0.33
- **Phenol, lb/hr:**
  - 0.24
  - 0.06
  - 0.24
  - 0.16
- **Nitrogen, lb/hr:**
  - 9,520
  - 9,404
  - 9,520
  - 9,484
- **High Boilers, lb/hr:**
  - 0.00
  - 0.00
  - 0.00
  - 0.01
- **Total Low Boilers, lb/hr:**
  - 67.66
  - 10.42
  - 67.66
  - 9.85
- **Total Non-N₂, lb/hr:**
  - 68.63
  - 11.34
  - 68.63
  - 10.89

**HTF Liquid Flow Rate, lb/hr:**

- 45,000
- 45,173
- 45,000
- 45,094.25

**HTF Liquid Flow, GPM:**

- 87.1
- 87.8
- 87.1
- 87.8

**HTF Liquid Temperature, °F:**

- 120
- 120
- 120
- 120

**HTF Liquid Pressure, psia:**

- 174
- 171
- 174
- 171

**HTF Liquid Enthalpy, Btu/lb:**

- -163
- -194
- -163
- -194

**HTF / Liquid Flow Composition:**

<table>
<thead>
<tr>
<th>HTF, lb/hr</th>
<th>44,151</th>
<th>44,151</th>
<th>44,151</th>
<th>44,150.67</th>
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</thead>
<tbody>
<tr>
<td>Benzene, lb/hr</td>
<td>211</td>
<td>267</td>
<td>211</td>
<td>267.14</td>
</tr>
<tr>
<td>Toluene, lb/hr</td>
<td>21</td>
<td>22</td>
<td>21</td>
<td>22.59</td>
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<tr>
<td>Phenol, lb/hr</td>
<td>171</td>
<td>171</td>
<td>171</td>
<td>171.08</td>
</tr>
<tr>
<td>Nitrogen, lb/hr</td>
<td>10</td>
<td>126</td>
<td>10</td>
<td>45.77</td>
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<tr>
<td>High Boilers, lb/hr</td>
<td>437</td>
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<td>437</td>
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<tr>
<td>Total Low Boilers, lb/hr</td>
<td>403</td>
<td>460</td>
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<td>306.81</td>
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<tr>
<td>Total Non-N₂, lb/hr</td>
<td>44,990</td>
<td>45,048</td>
<td>44,990</td>
<td>44,895</td>
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EC-94 (Rev. 05/2011)
### Specification For HTF Scrubbers

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<tr>
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<th>Spec. No.:</th>
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<tr>
<td>Project: Mojave</td>
<td>Ref.:</td>
<td>Issue: 1</td>
<td>Dated:</td>
<td>11/13/12</td>
</tr>
</tbody>
</table>

**Data Sheets**

**HTF EXPANSION VESSEL**  
**VENT SCRUBBERS**  
**A-MV-209, B-MV-209**

**Vendor:** The Clean Air Group - Croll Reynolds Company (CRC)

#### Performance

<table>
<thead>
<tr>
<th></th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Concentration at Design Flowrate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Gas Flow Rate, lb/hr</td>
<td>8,589</td>
<td>8,277</td>
<td>8,589</td>
<td>8,360.61</td>
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<td>Gas Flow, scfm</td>
<td>1,797</td>
<td>1,748</td>
<td>1,797</td>
<td>1,748</td>
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<td>Gas Flow, acfm</td>
<td>182</td>
<td>177</td>
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<td>179.9</td>
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<td>Operating Temperature, °F</td>
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<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Operating Pressure, psig</td>
<td>157</td>
<td>157</td>
<td>157</td>
<td>156</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>22</td>
<td>11</td>
<td>22</td>
<td>11</td>
</tr>
</tbody>
</table>

**Gas Flow Composition:**

<table>
<thead>
<tr>
<th></th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF, lb/hr</td>
<td>0.53</td>
<td>0.68</td>
<td>0.53</td>
<td>0.78</td>
</tr>
<tr>
<td>Benzene, lb/hr</td>
<td>225.52</td>
<td>42.14</td>
<td>225.52</td>
<td>42.67</td>
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<tr>
<td>Toluene, lb/hr</td>
<td>7.60</td>
<td>1.52</td>
<td>7.60</td>
<td>1.77</td>
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<tr>
<td>Phenol, lb/hr</td>
<td>1.01</td>
<td>0.35</td>
<td>1.01</td>
<td>0.93</td>
</tr>
<tr>
<td>Nitrogen, lb/hr</td>
<td>8,354</td>
<td>8,233</td>
<td>8,354</td>
<td>8,314</td>
</tr>
<tr>
<td>High Boilers, lb/hr</td>
<td>0.01</td>
<td>0.03</td>
<td>0.01</td>
<td>0.08</td>
</tr>
<tr>
<td>Total Low Boilers, lb/hr</td>
<td>234.13</td>
<td>44.01</td>
<td>234.13</td>
<td>45.37</td>
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<tr>
<td>Total Non-N2, lb/hr</td>
<td>235</td>
<td>45</td>
<td>235</td>
<td>46</td>
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</tbody>
</table>

**HTF Liquid Flow Rate, lb/hr**

<table>
<thead>
<tr>
<th></th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>45,000</td>
<td>45,312</td>
<td>45,000</td>
<td>45,228</td>
<td></td>
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**HTF Liquid Flow, GPM:**

<table>
<thead>
<tr>
<th></th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>87.3</td>
<td>88.3</td>
<td>87.3</td>
<td>88.3</td>
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</table>

**HTF Liquid Temperature, °F:**

<table>
<thead>
<tr>
<th></th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>121.8</td>
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</table>

**HTF Liquid Pressure, psia:**

<table>
<thead>
<tr>
<th></th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>174</td>
<td>171</td>
<td>174</td>
<td>170.89</td>
<td></td>
</tr>
</tbody>
</table>

**HTF Liquid Enthalpy, Btu/lb:**

<table>
<thead>
<tr>
<th></th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>-156</td>
<td>-187</td>
<td>-156</td>
<td>-187</td>
<td></td>
</tr>
</tbody>
</table>

**HTF / Liquid Flow Composition:**

<table>
<thead>
<tr>
<th></th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF, lb/hr</td>
<td>39,503</td>
<td>39,503</td>
<td>39,503</td>
<td>39,502.75</td>
</tr>
<tr>
<td>Benzene, lb/hr</td>
<td>1,148</td>
<td>1,331</td>
<td>1,148</td>
<td>1,330.85</td>
</tr>
<tr>
<td>Toluene, lb/hr</td>
<td>133</td>
<td>139</td>
<td>133</td>
<td>138.85</td>
</tr>
<tr>
<td>Phenol, lb/hr</td>
<td>1,177</td>
<td>1,178</td>
<td>1,177</td>
<td>1,177</td>
</tr>
<tr>
<td>Nitrogen, lb/hr</td>
<td>10</td>
<td>131</td>
<td>10</td>
<td>49.62</td>
</tr>
<tr>
<td>High Boilers, lb/hr</td>
<td>3,029</td>
<td>3,029</td>
<td>3,029</td>
<td>3,028.93</td>
</tr>
<tr>
<td>Total Low Boilers, lb/hr</td>
<td>2,459</td>
<td>2,649</td>
<td>2,459</td>
<td>2,646.78</td>
</tr>
<tr>
<td>Total Non-N2, lb/hr</td>
<td>44,990</td>
<td>45,180</td>
<td>44,990</td>
<td>45,262.38</td>
</tr>
</tbody>
</table>

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EC-94 (Rev. 05/2011)
## Data Sheets

**HTF EXPANSION VESSEL VENT SCRUBBERS A-MV-209, B-MV-209**

### PERFORMANCE

<table>
<thead>
<tr>
<th>Minimum Concentration at Normal Flowrate</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gas Flow Rate, lb/hr</td>
<td>5,724</td>
<td>5,651.40</td>
<td>5,724</td>
<td>5,571</td>
</tr>
<tr>
<td>Gas Flow, scfm</td>
<td>1,214</td>
<td>1,180</td>
<td>1,214</td>
<td>1,180</td>
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<tr>
<td>Gas Flow, acfm</td>
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<td>119</td>
<td>133.98</td>
<td>121.98</td>
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<tr>
<td>Operating Temperature, °F</td>
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<td>120</td>
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<td>119.9</td>
</tr>
<tr>
<td>Operating Pressure, psig</td>
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<td>156</td>
<td>157</td>
<td>156</td>
</tr>
<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>12.96</td>
<td>9.38</td>
<td>12.96</td>
<td>9.38</td>
</tr>
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</table>

Gas Flow Composition:

<table>
<thead>
<tr>
<th></th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF, lb/hr</td>
<td>0.58</td>
<td>0.54</td>
</tr>
<tr>
<td>Benzene, lb/hr</td>
<td>40.52</td>
<td>5.2</td>
</tr>
<tr>
<td>Toluene, lb/hr</td>
<td>1.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Phenol, lb/hr</td>
<td>0.14</td>
<td>0.03</td>
</tr>
<tr>
<td>Nitrogen, lb/hr</td>
<td>5,681</td>
<td>5,645.32</td>
</tr>
<tr>
<td>High Boilers, lb/hr</td>
<td>0.002</td>
<td>0.01</td>
</tr>
<tr>
<td>Total Low Boilers, lb/hr</td>
<td>41.83</td>
<td>5.47</td>
</tr>
<tr>
<td>Total Non-N₂, lb/hr</td>
<td>42.41</td>
<td>5.68</td>
</tr>
</tbody>
</table>

HTF Liquid Flow Rate, lb/hr: 45,000

### Vendor: The Clean Air Group - Croll Reynolds Company (CRC)

#### ABENER / TEYMA REQUIREMENT

<table>
<thead>
<tr>
<th></th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF Liquid Flow Rate, lb/hr</td>
<td>45,000</td>
<td>45,071</td>
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<tr>
<td>HTF Liquid Flow, GPM</td>
<td>87.1</td>
<td>87.3</td>
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<tr>
<td>HTF Liquid Temperature, °F</td>
<td>120</td>
<td>120.3</td>
</tr>
<tr>
<td>HTF Liquid Pressure, psig</td>
<td>159</td>
<td>156</td>
</tr>
<tr>
<td>HTF Liquid Enthalpy, Btu/lb</td>
<td>-163</td>
<td>-163</td>
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</tbody>
</table>

#### CRC INFORMATION

<table>
<thead>
<tr>
<th></th>
<th>Inlet Design</th>
<th>Outlet Design</th>
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<td>HTF Liquid Flow Rate, lb/hr</td>
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</tr>
<tr>
<td>HTF Liquid Temperature, °F</td>
<td>120</td>
<td>120.3</td>
</tr>
<tr>
<td>HTF Liquid Pressure, psig</td>
<td>159</td>
<td>156</td>
</tr>
<tr>
<td>HTF Liquid Enthalpy, Btu/lb</td>
<td>-163</td>
<td>-163</td>
</tr>
</tbody>
</table>

### HTF / Liquid Flow Composition

<table>
<thead>
<tr>
<th></th>
<th>Inlet Design</th>
<th>Outlet Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTF, lb/hr</td>
<td>44,169</td>
<td>44,169</td>
</tr>
<tr>
<td>Benzene, lb/hr</td>
<td>197</td>
<td>233</td>
</tr>
<tr>
<td>Toluene, lb/hr</td>
<td>19</td>
<td>20</td>
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<tr>
<td>Phenol, lb/hr</td>
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<td>165</td>
</tr>
<tr>
<td>Nitrogen, lb/hr</td>
<td>10</td>
<td>125</td>
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<tr>
<td>High Boilers, lb/hr</td>
<td>439</td>
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</tr>
<tr>
<td>Total Low Boilers, lb/hr</td>
<td>382</td>
<td>418</td>
</tr>
<tr>
<td>Total Non-N₂, lb/hr</td>
<td>44,990</td>
<td>45,027</td>
</tr>
</tbody>
</table>
### Specification For HTF Scrubbers

**Job No.:** 120010  **Spec. No.:** 6007-ESP-ATP-44-62-V208  
**Item No.:** See Spec  **No. Req’d.:** 4  
**Project:** Mojave  
**Ref.:**  **Issue:** 1  **Dated:** 11/13/12

#### Vendor: The Clean Air Group - Croll Reynolds Company (CRC)

**Data Sheets HTF EXPANSION VESSEL VENT SCRUBBERS A-MV-209, B-MV-209**

**ABENER / TEYMA REQUIREMENT**  
**CRC INFORMATION**

<table>
<thead>
<tr>
<th>PERFORMANCE</th>
<th>Inlet</th>
<th>Outlet</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Concentration at Normal Flowrate</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total Gas Flow Rate, lb/hr</td>
<td>5,111</td>
<td>4,871</td>
<td>5,111</td>
<td>4,955</td>
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<td>Gas Flow, scfm:</td>
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<td>1,069</td>
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<td>Gas Flow, acfm:</td>
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<td>107</td>
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<tr>
<td>Operating Temperature, °F:</td>
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<td>120</td>
<td>120</td>
<td>119.9</td>
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<tr>
<td>Operating Pressure, psig:</td>
<td>157</td>
<td>156</td>
<td>157</td>
<td>156</td>
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<tr>
<td>Gas Enthalpy, Btu/lb</td>
<td>22.03</td>
<td>11.04</td>
<td>22.03</td>
<td>11.04</td>
</tr>
</tbody>
</table>

**Gas Flow Composition:**

| HTF, lb/hr | 0.31 | 0.41 | 0.31 | 0.46 |
| Benzene, lb/hr | 137.20 | 22.20 | 137.20 | 23.60 |
| Toluene, lb/hr | 4.54 | 0.83 | 4.54 | 0.99 |
| Phenol, lb/hr | 0.60 | 0.20 | 0.60 | 0.53 |
| Nitrogen, lb/hr | 4,969 | 4,848 | 4,969 | 4,929.69 |
| High Boilers, lb/hr | 0.01 | 0.02 | 0.01 | 0.05 |
| Total Low Boilers, lb/hr | 142.34 | 23.23 | 142.34 | 25.12 |
| Total Non-N2, lb/hr | 142.66 | 23.65 | 142.66 | 25.31 |
| HTF Liquid Flow Rate, lb/hr | 45,000 | 45,240 | 45,000 | 45,157 |
| HTF Liquid Flow, GPM: | 87.3 | 88.1 | 87.3 | 87.8 |
| HTF Liquid Temperature, °F: | 120 | 120 | 120 | 121 |
| HTF Liquid Pressure, psig: | 159 | 156 | 159 | 156 |
| HTF Liquid Enthalpy, Btu/lb: | -156 | -188 | -156 | -188 |

**HTF / Liquid Flow Composition:**

| HTF, lb/hr | 39,601 | 39,601 | 39,601 | 39,601 |
| Benzene, lb/hr | 1,070 | 1,185 | 1,070 | 1,183.6 |
| Toluene, lb/hr | 125 | 129 | 125 | 128.55 |
| Phenol, lb/hr | 1,143 | 1,143 | 1,143 | 1143.07 |
| Nitrogen, lb/hr | 10 | 131 | 10 | 49.37 |
| High Boilers, lb/hr | 3,052 | 3,052 | 3,052 | 3,051.96 |
| Total Low Boilers, lb/hr | 2,337 | 2,456 | 2,337 | 2,455.26 |
| Total Non-N2, lb/hr | 44,990 | 45,109 | 44,990 | 45,108 |

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EC-94 (Rev. 05/2011)
Specifications For Item No.: See Spec No.

Project: Mojave

Ref.: Issue: 2 Dated: 6-March-12

Instructions:

1. Initialing (By/Chk’d/App’d) required on cover sheet only. All other title block information must be included on all pages.

2. Revisions are identified in the body of the Specification.

<table>
<thead>
<tr>
<th>Rev. No.</th>
<th>Date</th>
<th>By</th>
<th>Chk’d</th>
<th>App’d</th>
<th>Description of Revision Including Page Numbers</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>9 Sept 11</td>
<td>JOA</td>
<td>HED/MZA</td>
<td>TS/APF</td>
<td>For Bid</td>
</tr>
<tr>
<td>2</td>
<td>06 March 12</td>
<td>RGTD</td>
<td>MZA</td>
<td>APF</td>
<td>General revision. Pages 3, 4, 5, 6, 8, 9, 10, 12, 14, 18, 21, 22</td>
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EC-94 (Rev. 05/2011)
1. **Project description**

A new 280 MW solar power plant will be constructed at a “greenfield” site near Hinkley, California. Heat transfer fluid (HTF) will be circulated, transferring heat energy from the solar collection fields to the power generation system.

2. **General**

2.1 This specification covers the minimum requirements for furnishing drawings, design, all materials, equipment, tools, accessories, labor and supervision, necessary for fabrication, assembly, testing, inspections, and shipping of process pressure vessels, as specified herein.

2.2 Definitions: Vendor means “Vessel Design and Fabrication Vendor” for which this specification is intended. Purchaser shall mean “Abener Teyma Mojave General Partnership”. Owner shall mean “Mojave Solar LLC”.

2.3 The attachments identified are part of this specification. All specifications and attachments shall be met and followed by the Vendor in full.

3. **Function**

The HTF Expansion Vessels allow for the change in volume of the HTF due to the thermal expansion and contraction of the fluid. The vessels are pressurized with nitrogen to provide sufficient pressure throughout the HTF recirculation loop to both blanket the stored HTF and prevent the HTF from vaporizing/flash ing.

4. **Operation**

The vessels will be filled and emptied daily. The vessels will experience pressure and temperature cycles daily. The vessels and all associated components shall be designed to operate continuously, year round.

5. **Location**

The vessels will be located outdoors. The equipment shall meet all the design conditions including the seismic and climatic conditions in this specification. See attached specification 6007-ESP-ATP-00-60G100 Project Design Criteria for site specific information.
6. **Scope**

6.1 Vendor shall furnish four (4) vessels per Alpha Plant and four (4) vessels per Beta Plant, refer to 6007-ESP-ATP-58-62-V200D, HTF Expansion Vessels data sheets, attached to this package.

6.2 Vendor shall furnish all the vessels complete as shown on data sheets and as noted herein and shall included all necessary blind flanges, studs, nuts, bolts, clips, lifting lugs, davits, and gaskets.

6.3 All vessels, with physical dimensions within the allowable limits for shipping, shall be completely shop fabricated and tested before shipment. **Tests shall include, but not limited to, 100% radiographed welds, fully heat treated for stress relieving and test pressure.**

6.4 Shop fabricated vessels shall include lifting lugs and tailing lugs, designed by vendor to include the weight of the insulation and jacket, for use in loading, unloading, and field erection of vessel. Empty weight shall be marked on the vessel by using lettering no less than 6 inches high. **Vendor shall include 2 nameplates (one in the tank and one in the skirt) placed at a visible height indicating the following: Item tag number, design code, fabricated by, fabrication number and date, final client name, fluid inside, erection weight and capacity, design pressure and temperature, test pressure and periodic test pressure, inspect stamp, stress relieving, percentage of welds radiographed and purchase order or contract number. The nameplate placed in the tank shall be welded to a bracket which is welded to the tank with a projection of 8 inches (insulation thickness), the nameplate itself will be a 8x10” plate with a thickness of 3/25 inches in stainless steel. The nameplate placed in the skirt shall be welded to the skirt prior to painting.**

6.5 All welds in the tanks shall be 100% radiographed and fully heat treated for stress relieve.

6.6 Anchor bolt size and quantity shall be as specified by Vendor. **Vendor shall provide anchor bolt material, drawings and loading diagrams for foundation design. Anchor bolts shall be in galvanized steel and shall be provided by Vendor.**

6.7 Vendor shall provide support skirt for vertical vessels. **Support geometry shall be coordinated with the Abener Teyma to allow for pipe routing and skirt access. All internal supports (if needed) for the skirt itself shall also be provided by Vendor. The internal supports shall be placed to allow access and insulation of the tank bottom.**

6.8 Vendor shall include piping from bottom nozzle to skirt perimeter. **End of pipe shall extend minimum 6 inches past outside surface of skirt. Skirt openings for piping shall have a 1/2 in. minimum clearance between the pipe OD, including insulation, and the skirt. All other piping**
connections shall have, as minimum, a projection of 10 inches, to assure that the piping will protrude out of the 8 inches insulation.

6.9 Vendor shall provide supports to the piping from bottom nozzle to allow piping growth through the skirt perimeter as is shown in the data sheet 6007-ESP-ATP-58-62-V200D.

6.10 A single skirt access manway, of 24 in. diameter, shall be provided in each skirt. Bottom of access opening shall be 18 inches above skirt base. No piping shall pass through access openings. Access shall be a 24 in pipe opening. Vendor shall provide adequate top handle inside the skirt and appropriate ladder rungs.

6.11 Vendor shall provide a single 24 in manway placed in the tank shell, near to the bottom tangent. Access opening shall have a flanged cover with davit. Vendor shall provide adequate top handle inside the shell and appropriate ladder rungs. Vendor shall also provide exterior ladder and platform to assure a safety access to the manway.

6.12 At least six vents shall be provided in skirt. The vents shall be minimum NPS 6, Schedule 80 and shall be equally spaced at a maximum of 6 ft around the skirt circumference. Vents shall be fully open access.

6.13 Each vessel shall include four stainless steel grounding lugs. Grounding lugs shall be a minimum of 3” wide x 3” tall x ½” thick plate, and shall be made of 304 grade stainless steel. The grounding lugs shall be drilled to match “Burndy Qiklug” type “QA28-2N” which utilizes NEMA bolt spacing. Grounding lugs shall be welded to the skirt 12” above the base foundation flange.

6.14 Each vessel shall include insulation support rings. For each vessel, their shall be 7 rings, each extending 5 inches beyond the shell circumference, evenly spaced at maximum 9 feet, starting near the bottom tangent. Spacing should be in 3 foot increments. Top ring should be near the top tangent. Rings can be segmented and detachable for shipment. Any attachment brackets shall be continuously welded to the vessel.

6.15 Vessels shall be designed for 200 PSIG and full vacuum. Vendor shall provide vacuum rings. Vacuum rings shall be also used as an insulation support ring, however, an insulation support ring shall not be used as a vacuum ring.

6.16 Each vessel shall include insulation support pins welded to the heads. Pins are to be #10 ga. (3.6mm) weld pins on 12” centers. The companion 2-1/2” square speed clips shall be shipped with the vessel. The pins shall be carbon steel and shall be length compatible with the insulation thickness of 8”.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>RGTD</th>
<th>MZA</th>
<th>APF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9-Sept-2011</td>
<td>For Bid</td>
<td>JAO</td>
<td>HED/ MZA</td>
<td>APF</td>
</tr>
</tbody>
</table>

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EC-94 (Rev. 05/2011)
6.17 Each vessel shall include four welded reinforcing pads 12” x 12” on the vessel top head for attachment or pipe supports. Pads and clips shall be designed and reinforced to accommodate the following combined loads:

6.17.1 Downward Load: 10,000 lb.
6.17.2 Bending Moment (+/- radial to center of vessel): 100,000 ft*lb.
6.17.3 Bending Moment (+/- tangential): 100,000 ft*lb.

6.18 Vendor shall provide reinforcing pads and clips to support vertical piping attached to the vessel shell.

6.19 Vendor shall provide a vortex breaker for the connection located at the bottom of the HTF expansion vessels.

6.20 Vendor shall provide a foundation template that matches the anchor bolt pattern on vessel skirt. Template shall be sturdy steel construction. Template can be either one piece or multi piece bolted construction. For multi piece bolted assembly, the sections should include a pin and hole arrangement to assure proper alignment and tolerances. One template will be re-used for each of the vessel foundations. Template shall be delivered to job site within 6 weeks of anchor bolt arrangement approval.

6.21 For the HTF Expansion Vessels, refer to data sheets within this specification. For the HTF Flash Expansion Vessels, refer to data sheets within this specification. _Vendor should complete the data sheet at the end of this specification and submit it with the proposal._

6.22 Each Flash Expansion Vessel shall include an internal stand pipe. The stand pipe shall be fully welded to the inside of the bottom head. The stand pipe shall be designed to retain the static head if full of HTF with zero level of HTF outside the stand pipe. The stand pipe shall be designed to retain the static head if full of HTF outside the stand pipe and zero level of HTF inside the stand pipe. The stand pipe shall be designed to resist seismic loading when full of HTF with zero level of HTF outside of the stand pipe. The stand pipe shall include 2 times the corrosion allowance as specified on the data sheet. The stand pipe shall be provided with four (4) ½” diameter holes located 6” above the bottom of the stand pipe. These holes are for static leveling between the vessel and stand pipe. The stand pipe shall be provided with one (1) ½” diameter hole located at the bottom of the stand pipe next to the vessel head, to allow for complete drainage of the vessel. _See 6007-HDD-ATP-58-62-C103 Data sheet for Therminol VP-1 for the HTF properties._
6.23 Each Flash Expansion Vessel shall be provided with an internal spray shield. The spray shield is to prevent extreme thermal gradients in the shell where the HTF in the vessel is warmer than the HTF cooling spray injected into the vessel. The spray shield shall have an OD 4” smaller than the ID of the vessel. The spray shield shall be permanently attached to the top head via welding. The attachments shall be clips that allow open space (minimum 2” gap) between the top head and the spray shield. A 2” gap between the spray shield and vessel is to be maintained. The open space is to allow vapor to escape when the liquid level exceeds the bottom of the spray shield. The spray shield shall be a minimum of 5/16” thick.

6.24 On the Flash Expansion Vessel, the manway cover shall be provided with a nozzle pipe welded through the center of the cover. This pipe shall have prep welded ends inside and outside the vessel. The pipe shall extend 6” either side of the manway cover. Vendor shall weld a spray head to the inside end of the nozzle pipe and shall provide it according the following:

6.24.1 Supplier: BETE.
6.24.2 Model: TC1480W.
6.24.4 Characteristics: 8 inches, schedule 40, operating flow = 1,370,000 lb/h, BW, maximum recommended differential pressure = 60 PSI, design temperature = 750 ºF.

6.25 On nozzles with weld end prep, the thicker nozzle on the vessel will need to be taper bored by the vendor to match the mating field pipe inside diameter.

7. Codes and standards

7.1 The requirements of ASME Sec VIII Division 1 are to be fully adhered to by Vendor for the complete project. “Code” as referenced herein, shall mean ASME Sec VIII Division 1, unless indicated otherwise.

7.2 The building codes for the site are those approved by San Bernardino County, California, and the California Energy Commission, and include their local amendments and additions to the following:

7.2.1 CBC – California Building Standards Code – Title 24, California Code of Regulations
7.2.2 IMC – International Mechanical Code - 2006
7.3 The following codes, standards, regulations, and guides are to be referred to by Vendor as guidelines for this project. As deemed appropriate by the Vendor, additional codes and regulations not mentioned below shall be followed based on prudent design practice.

7.3.1 AISC – American Institute for Steel Construction
7.3.2 AISI – American Iron and Steel Institute
7.3.3 ANSI – American National Standards Institute
7.3.4 ASME – American Society of Mechanical Engineers
7.3.5 ASNT – American Society for Nondestructive Testing
7.3.6 ASTM – American Society for Testing and Materials
7.3.7 AWS – American Welding Society
7.3.8 IBC - International Building Code 2006
7.3.9 ISO - International Standardization Organization
7.3.10 NFPA – National Fire Protection Agency
7.3.11 SSPC – Society for Protective Coatings
7.3.12 Occupational Safety and Health Administration Federal laws, statutes, regulations, ordinances and inspections.
7.3.13 Codes, laws, statutes, and regulations, ordinances and inspections, for the State, County, and Local Governments.

7.4 Should there be any conflict between applicable codes, standards of practice, specifications, or vendor’s recommendations noted herein and those of the locality of the project, the more stringent code shall apply.

8. Engineering & Design

8.1 Vendor shall provide all engineering services required to fulfill the obligations of this contract.

8.2 Vendor shall provide engineering drawings and calculations for approval prior to the start of fabrication.

8.2.1 Refer to and comply with specification 6007-ESP-ATP-58-62-V200V, Vendor Data Requirements Heat Transfer Fluid Expansion Vessels, attached to this package.
8.2.2 Approval of Vendor’s drawings and calculations is limited to verifying general compliance with specifications and design drawings, and does not imply verification of dimensions, quantities, or calculations. Vendor is not relieved from responsibility for accurate dimensioning, equipment sizing, fabrication to required tolerances, and fabrication fit-up.

8.2.3 Engineering units indicated shall be U.S. customary. Volumes shall be indicated in gallons.

8.2.4 Drawings:

8.2.4.1 A general arrangement drawing shall be furnished for each vessel, and shall contain the data shown in 6007-ESP-ATP-58-62-V200D. The location of the vessel marking or nameplate, the size and orientation of all nozzles and connections, and the anchor bolt layout shall also be shown on this drawing. **Drawing shall include the insulation thickness (supplied by others) in order to show the appropriate projection of the nozzles.**

8.2.4.2 A separate outline drawing for each vessel shall be furnished with appropriate markings to cross-reference each component (shell plates, heads, nozzles, flanges, forgings, skirt plates, etc.) to the applicable mill test certificates for the steels used in the construction.

8.2.4.3 Vendor shall provide all drawings that are issued for fabrication, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

8.2.4.4 Fabrication drawings shall show weld details and shall reference applicable welding procedures. The drawings shall also include impact test requirements, showing (as applicable):

8.2.4.4.1 Component

8.2.4.4.2 Thickness for impact purposes

8.2.4.4.3 Material specification

8.2.4.4.4 Critical Exposure Temperature

8.2.4.4.5 Minimum Design Metal Temperature

8.2.4.4.6 Appropriate Charpy impact requirements (average/minimum values)
8.2.5 Data and Calculations

8.2.5.1 Design calculations (including lifting attachments and supports) made by the Vendor shall be furnished prior to or along with submission of drawings for approval. When calculations are made using a computer, all input data, assumptions, computer program version used, and a summary of the results shall be furnished.

8.2.5.2 Vendor shall provide their structural calculation package, sealed by a licensed Professional Engineer who is legally authorized to practice in the State of California.

8.3 Vessels shall be designed for a minimum 30 year life.

8.4 Vessels shall be designed to withstand internal or external pressure and mechanical loads induced by vessel dead load, process, contents, earthquake, wind and other specified loadings. Wind and earthquake loads shall be in accordance with the Project Design Criteria described in Specification 6007-ESP-ATP-00-62-G100. Load combinations must be appropriately considered. Record design calculations are required.

8.5 The minimum insulation design load shall be for 8" thickness on heads and shell using 8 lb / ft³ mineral wool insulation with aluminum jacket.

8.6 Materials of construction shall be per this specification and the attached data sheet. In the event of conflict between parts of this specification and the attached data sheet, the vessel data sheet shall govern the requirements. Where materials of construction are not specified, Vendor shall propose materials for each item as appropriate for the service conditions.

8.8 All materials purchased by Vendor shall meet nationally recognized standards unless otherwise approved by Abener Teyma.

8.9 All materials shall be compatible with the vessel contents and in accordance with all applicable welding procedures.

8.10 Copies of mill test reports for materials shall be provided to Abener Teyma by Vendor.

8.11 The design shall be such to avoid any contamination of the vessel contents once the vessel is put into service.

8.12 The layout of weld seams shall be such that it will allow full access for inspection. Circumferential seams shall not be located within a distance of 1-1/2" of any external...
compression ring, internal ring, support ring, etc. Nozzles and manholes shall not intersect any weld seams, unless approved by Abener Teyma.

8.13 All manway covers shall be equipped with davits.

8.14 Vendor shall provide corrosion allowances as specified by the data sheets.

8.15 The minimum required thickness of plate and other structural members shall be that which is necessary to satisfy tension and compression strength requirements for the specified design conditions, without inclusion of corrosion allowance.

8.16 All nozzles shall be flush with the inside surface of the vessel wall, unless otherwise specified.

8.17 Nozzle flanges and manway flanges shall be the material as indicated on the Data Sheet.

8.18 Internal bolting is not allowed.

8.19 Nozzles shall not be located in vessel plate weld seams, unless prior approval has been given by Abener Teyma.

8.20 Vessel shall be designed for daily cyclic operation, 450 cycles per year, 30 year life cycle.

8.20.1 Vendor shall include Cyclic Analysis in their design. Vendor shall provide Cyclic Analysis calculations with other design calculations for Abener Teyma approval.

8.20.2 Cyclic operating conditions are: Daily cycle of filling from low level at bottom tangent point (118 psig at 392°F) to level at 90% of straight side height (177 psig at 560°F), and back to low level (118 psig at 392°F).

8.21 Vessel design shall also be capable of a liquid level at the top tangent line operating with HTF at 100°F with nitrogen blanket at 15 psig.

8.22 Vendor to indicate on project drawings the maximum allowable loads on nozzles. Nozzles shall be designed for a minimum of the loads as indicated for the CL300 in the specification 6007-ESP-ATP-00-G130 and showed below:

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<th>Moments (foot pounds)</th>
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<td></td>
<td>Sum Force</td>
<td>Sum Force</td>
</tr>
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<td>750 428</td>
<td>1500 855</td>
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<tr>
<td>4</td>
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<td>8</td>
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<td>16000 9120</td>
</tr>
<tr>
<td>12</td>
<td>4600 2625</td>
<td>25000 14250</td>
</tr>
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</table>

No. Date Description RGTD MZA APF
0 9-Sept-2011 For Bid JAO HED/ MZA TS APF

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EC-94 (Rev. 05/2011)
9. **Fabrication**

9.1 Any fabrication shall not be sublet to others without the written approval of Abener Teyma.

9.2 All vessels must meet the latest edition of the code indicated on the data sheets for shop practices, welding, stress relieving, radiographing, and testing.

9.3 All plate and other material used in the execution of this work shall be new and clean stock, free from surface laminations and other physical imperfections.

9.4 All materials shall be identified throughout fabrication. Material certification shall be provided on request by the Abener Teyma inspector. Material certification test reports shall become a permanent record of the documentation package.

9.5 Machines surfaces which are warped or distorted due to welding, etc., shall be re-machined after these operations are finished, with minimum thickness maintained as specified. Machine surfaces shall be finished to the smoothness limit indicated on the design drawings.

9.6 The axes of any shell nozzle shall be radial and perpendicular to the longitudinal axis of the vessel. Flange face shall be perpendicular to the nozzle axis. All welds protruding beyond the flange face shall be ground flush.

9.7 Flange bolt holes of shell nozzles shall straddle the axial center line.

9.8 Vendor shall prepare the weld end nozzles end face in accordance with ASME B31.3 and ASME B16.25, to match the piping as indicated in the piping specification referenced in this specification. Abener Teyma shall review each weld end nozzle face prior to purging and protection for shipment. Vendor is to protect each weld end nozzle face against damage during handling and transporting.

9.9 All permanent attachments, stiffeners, clip angles, ring angles, etc., shall be joined to vessels by continuous welding, unless approved otherwise by Abener Teyma.
9.10 Remove all sharp edges and burrs.

9.11 All welds and surfaces exposed to vessel contents, its vapor or condensate shall be free of gouges, pits, cracks or other surface defects.

9.12 All welds and materials discovered to be non-compliant through inspection and/or testing shall be fully repaired at vendor’s cost.

9.13 Fabricated location and orientation of nozzles will be reviewed by Abener Teyma. If there are any discrepancies with project documents, the Vendor will make corrections.

9.14 Vendor shall notify Abener Teyma regarding any necessary repair work and have written approval before proceeding.

9.15 Vendor shall provide whatever additional treatment, such as preheat and/or post weld heating, as required for the material being used. Shop drawings must identify such treatments.

9.15.1 For any required heat treatment, Vendor shall provide written procedures for Abener Teyma review.

9.15.2 At completion, Vendor shall provide a Product Certification for PWHT, including a copy of time / temperature chart records.

9.16 To prevent contamination of the vessel contents, Vendor shall mechanically clean the interior surface of the vessel to remove all weld spatter, scale, rust, filings, dirt, etc., as well as all foreign materials.

9.16.1 Mechanical cleaning shall meet all requirements of NACE No. 3 (Commercial Blast Cleaning).

9.16.2 Vendor shall not commence mechanical cleaning until after all testing has been completed.

9.16.3 Vendor shall not commence mechanical cleaning until instructed by Abener Teyma to do so.

9.16.4 At the completion of mechanical cleaning, Vendor shall purge and seal the vessel with an inert gas.

9.16.4.1 Warning signs shall be placed by Vendor on the vessel and manway clearly indicating the vessel has an inert gas seal that must be purged before entry.

9.16.4.2 Warning signs shall be placed by Vendor on the vessel and manway clearly indicating the vessel has storage desiccant inside that must be removed.
9.16.4.3 An acceptable method for sealing weld end nozzles is with a flat plate welded to pipe end, in a manner that will minimize any damage to the weld end prep. We want to minimize any weld end prep required at the job site.

9.16.4.4 Sealing with inert gas shall include a pressure gauge that proves purge gas in the vessel. Pressure gauge is to stay with sealed vessel. Pressure gauge is to be protected from damage during shipment. Pressure gauge is to include shut off valve.

10. **Tolerances**

10.1 The vendor shall choose the more stringent between Code requirement and the following. For nozzle elevations and positions, the tolerance shall be as measured from the bottom tangent line or datum, and not accumulated by multiple dimensioning possibly shown on the design drawings.

11. **Inspection and testing**

11.1 Abener Teyma (or an inspector on their behalf) reserves the right to inspect the equipment at any time during the course of fabrication. Abener Teyma retains the right to provide personnel to observe all fabrication work within the scope of the contracted work (including testing and inspection). Such individuals shall be afforded full and free access for these purposes, subject to safety and schedule constraints.

11.2 Inspector means Abener Teyma (or an inspector on their behalf).

11.3 Inspector shall have free access, at all reasonable times, to the areas where the work on equipment is being performed. Vendor shall notify Abener Teyma purchasing department in advance (minimum one week) of scheduled vessel testing to allow time for the Inspector to arrange to be at the test site before testing begins.

11.4 Mill and shop inspection shall not release the Vendor from responsibility for replacing any defective material and for repairing any defective workmanship that may be discovered in the field.
11.5 Vendor’s currently qualified welders and procedures under ASME Sec. IX, must be submitted to Inspector for approval. Additional qualifications necessary are to be at vendor’s expense.

11.6 All vessels shall be inspected and tested according to the applicable code as listed in the vessel data sheets.

11.7 For any required radiographic examination, a certified copy of a written report confirming that the work was inspected as set forth herein shall be provided when specified. Refer to 6007-ESP-ATP-58-62-V200V Contractor Data Requirements. The report shall include the following:

11.7.1 A summary of inspection of radiographs.
11.7.2 Identification of unacceptable radiographs and a statement of the action taken to rectify unsatisfactory welds.

11.8 Tell-tale holes shall be used to pneumatically test all welded attachments prior to hydrostatic testing. Tell-tale holes shall not be plugged during hydrostatic testing of the vessel.

11.9 Vendor shall submit letters of completion to Abener Teyma at least twenty days prior to the requested final inspection date. The equipment must be ready for inspection and the tests run prior to this final inspection request.

11.10 The cost of all tests due to code requirements or manufacturer’s test requirements shall be fully borne by vendor.

11.11 A written certification of an acceptable hydrostatic test shall be completed by vendor. The certification shall be forwarded to the individual indicated on the Abener Teyma purchase order.

12. Paint

12.1 Vendor shall sand blast clean all the surfaces and prime coat (finish) the vessel skirt as follows:

12.1.1 The vessel skirt shall be shop prime coated, exterior and interior, in accordance with specification 6007-ESP-ATP-00-60-N102, Paint System for High Temp. Non-primed Steel.

12.1.2 All shop priming and painting shall be in accordance with specification 6007-ESP-ATP-00-60-N180 “Shop Applied Painting”.

12.1.3 No paint shall be applied until after all tests and examinations have been completed.

12.1.4 Flange faces and other machined areas shall not be painted unless specifically designated.
12.1.5 Davit arms and manways shall be shop painted (finish).

12.2 Vendor shall sand blast and prime coat the exterior of the vessels to avoid corrosion in the field while insulation is installed.

12.3 After cleaning and sand blasting the interior of the tanks, Vendor shall apply a corrosion inhibitor (Chempro Ferroxichem or equivalent).

13. Installation information

13.1 Vendor shall separately quote one set of any special tools and wrenches required for installation and maintenance.

13.2 Supply all spare parts necessary for system assembly, testing, start-up, and commissioning. Vendor shall provide Abener Teyma a list of suggested spare parts within 1 month after project award. Vendor shall supply one spare set of gaskets for each manyway, tagged with the item number and purchase order number.

14. Shipping

All parts shall be skidded, boxed, or otherwise suitably prepared for shipment to protect against damage while in transit per specification 6007-ESP-ATP-00-60-G121.

15. Additional requirements

15.1 A permanent stainless steel nameplate with standoff shall be fixed to the equipment that includes the information as indicated in ASME Code for the marking of nameplates. Dimensions are to be indicated in feet and inches. Volumes are to be indicated in gallons.

15.2 In addition to the ASME requirements a permanent stainless steel nameplate with standoff shall be fixed to all pressure vessels including, but is not limited to, the following information:

15.2.1 Customers Equipment Number
15.2.2 Customers Equipment Name
15.2.3 Customers PO number
15.2.4 Nominal Diameter
## Specification For HTF Expansion Vessels

### 15.2.5 Nominal Overall Height

### 15.2.6 Empty Weight

### 15.2.7 Internal Capacity

### 15.2.8 Design Specific Gravity

### 15.2.9 Material of Construction

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Description</th>
<th>RGTD</th>
<th>MZA</th>
<th>APF</th>
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<td>For Bid</td>
<td>JAO</td>
<td>HED/ MZA</td>
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EC-94 (Rev. 05/2011)
15.3 Data

15.3.1 A Manufacturer’s data report shall be furnished and shall contain the same information as required by form U-1 of ASME SEC VIII D1. Certified material test reports shall be furnished, and they shall represent the properties in the as fabricated condition. The data report shall be signed by the Vendor, by an Authorized Inspector as defined in Par. UG-91 of the ASME Code, or as otherwise required by the applicable code. Signed copies of data reports and other required documentation shall be submitted to Abener Teyma prior to shipment of each vessel.

15.3.2 Welding, PWHT, and weld repair procedures shall be submitted to Abener Teyma for review prior to the start of fabrication.

15.3.3 Upon completion of fabrication, the Vendor shall supply Abener Teyma with:

15.3.3.1 Copy of PWHT recording (if applicable)
15.3.3.2 Copy of hydrostatic test chart
15.3.3.3 Copy of NDE (RT, UT, MT, PT, WFMT, etc.) test records

16. Vendor proposal data

16.1 Vendor shall include with their proposal the data sheets found at the end of this specification, completed with all the information.

16.2 Vendor shall complete the Vendor Commitment column of 6007-ESP-ATP-58-62-V200V and submit with the proposal. Failure to submit these data sheets will result in an incomplete proposal that may not be considered.

17. Exceptions

17.1 Comments and exceptions to the specification shall be listed in a separate part of the proposal title “Exceptions to the Specification”. All Exceptions shall be listed in this section and shall reference the appropriate specification section. No other exceptions will be allowed.

18. Schedule
18.1 After issue of purchase order, Vendor shall provide a detailed schedule indicating dates for engineering, procurement, fabrication, testing, cleaning, painting, and shipping.
19. Attachments

- 6007-ESP-ATP -00-62-G100: Project Design Criteria
- 6007-ESP-ATP -00-60-G120: Equipment Modeling Vendor Data Requirements
- 6007-ESP-ATP -00-60-G121: Shipping Preparation
- 6007-ESP-ATP-00-60-G130: Required Allowable Nozzle Loads
- 6007-ESP-ATP -68-61-CS30: Class 300 Carbon Steel – Piping System - HTF Return
- 6007-ESP-ATP-00-60-N180: Shop Applied Painting

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## Specification For HTF Expansion Vessels

**Item No.:** See Spec No.  8  
**Project:** Mojave  
**Ref.:** Issue: 2  **Dated:** 6-March-12

### Data Sheets with Proposal

**VENDOR:**

<table>
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<tr>
<th>Vendor data required with proposal.</th>
<th>Vessel MV-205 A,B,C</th>
<th>Vessel MV-205 E</th>
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<tr>
<td>Shell thickness (course 1)</td>
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<td></td>
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<tr>
<td>Shell thickness (course 1)</td>
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<td>Head thickness (top)</td>
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<td>Head thickness (bottom)</td>
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<tr>
<td>Skirt thickness</td>
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<tr>
<td>Exceptions to Specification? (Y / N)</td>
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<td></td>
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<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
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EC-94 (Rev. 05/2011)
<table>
<thead>
<tr>
<th>Item</th>
<th>Abener</th>
<th>Vendor Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank (bottom, shell and roof).</td>
<td>Required (8 tanks)</td>
<td></td>
</tr>
<tr>
<td>Tank supports (skirt)</td>
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</tr>
<tr>
<td>Manways, including davit arms, bolts, gasket, blind flange, ladder rungs and handle inside.</td>
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</tr>
<tr>
<td>Nozzles with a projection of 10 inches</td>
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<tr>
<td>Equipment mounting flanges</td>
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<td></td>
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<tr>
<td>Internals</td>
<td>Required</td>
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</tr>
<tr>
<td>Electrical grounding lugs (SS)</td>
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<tr>
<td>Studs, nuts, bolts, clips, lifting lugs</td>
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<tr>
<td>Nondestructive testing. 100% X-ray in welds.</td>
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<tr>
<td>Hydrostatic and pneumatic testing</td>
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<tr>
<td>Name plates</td>
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<tr>
<td>Anchor bolts (design and material)</td>
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<tr>
<td>Piping from bottom nozzle to skirt, perimeter with supports</td>
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<tr>
<td>Open access to the skirt and vents</td>
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<tr>
<td>4 Grounding lugs (SS)</td>
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<tr>
<td>Vacuum rings</td>
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<tr>
<td>Insulation rings and insulation pins</td>
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<tr>
<td>4 welded reinforcing pads on top</td>
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<tr>
<td>Reinforcing pads and clips for vertical piping</td>
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<tr>
<td>Pipe clips for fire protection piping</td>
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<tr>
<td>Vortex breaker</td>
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<td>Foundation template</td>
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<td>Internal spray shield for the flash vessel</td>
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<td>Internal stand pipe for the flash vessels</td>
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<tr>
<td>Internal nozzle pipe for the flash vessels</td>
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<tr>
<td>Tank sealing with inert gas and desiccant</td>
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<tr>
<td>Tank interior surface: blast clean and corrosion inhibitor</td>
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</table>

**Scope of work**

Please, fill in the last column using the following:

**Included** = When the item specified is included in your base price

**Optional** = When the item is quoted like an option

**Not Provided** = When it is not included in your base price and is not either quoted as an option.

Use the "notes" blank to include all the clarifications you need.

---

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**EC-94 (Rev. 05/2011)**

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**2 06-Mar-2012**

**General revision**

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No. Date Description By Chk’d App’d App’d
**Specification For HTF Expansion Vessels**

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<tr>
<th>Item</th>
<th>Abener</th>
<th>Vendor name</th>
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<tbody>
<tr>
<td>Tank exterior surface: blast clean and prime coat</td>
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<tr>
<td>Skirt, davits and manways: Shop painted (finish)</td>
<td>Required</td>
<td></td>
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<tr>
<td>Access and platform to shell manway</td>
<td>Required</td>
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<tr>
<td>Insulation rings and pins</td>
<td>Required</td>
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<tr>
<td>Spares</td>
<td>2 gaskets per manway required</td>
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<tr>
<td>Thermowells</td>
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<tr>
<td>PE stamping / Stampping</td>
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<tr>
<td>Final documentation (2 electronic copies and 10 paper copies)</td>
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**Notes:**

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<tr>
<td>Item No.:</td>
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<tr>
<td>Project:</td>
<td>Mojave</td>
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<tr>
<td>Ref.:</td>
<td>Issue: 2</td>
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<td>Dated:</td>
<td>6-March-12</td>
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EC-94 (Rev. 05/2011)
CONSTRUCTION

CODE: ASME SEC VII, DIV 1 STAMP: ASME
PRESS.(PSIG) MAX. OP. 174 MIN. OP. FV DESIGN: 200/FV
TEMP. (OF) MAX. OP. 680 MIN. OP. 100 DESIGN: 750
WIND VELOCITY: SEE SPEC. MPH CORR. ALLOW: 0.0625" (1/16")
SEISMIC ZONE: SEE SPEC.
PHYS. & CHEM. TESTS: SEE SPEC. STRESS RELIEVE: SEE SPEC.

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<th>MATERIAL</th>
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<td>SA-516-70</td>
<td>INTERNALS</td>
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<td>LADDER (CAGED)</td>
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<td>MANWAY (A)</td>
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<td>CLIPS AND PADS (PIPE SUPPORT)</td>
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CONNECTION SCHEDULE

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<td>HTF INLET/OUTLET</td>
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ITEM NO: A-MV-205A,B,C; B-MV-205A,B,C
NUMBER REQUIRED: SIX (6) (3) 1/16"
TOTAL VOLUME (T/T): 5881 CUBIC FT

NOTES:
2. VENDOR TO PREPARE FACE OF WELL B31.3 AND ASME B16.25.
3. "PIPE SPEC" REFERS TO AEBNER TUBE 6007-ESP-ATP-68-61-CS30 AND
4. 0% OPERATING LEVEL AT LOWER TANGENT BASIS.
5. NOT USED.
6. NET WORKING VOLUME IS BASED ON TANGENT BASIS.
7. ALL VESSELS ARE INTERCONNECTED HEADER. THERE WILL BE A COMMON
8. VESSELS SHALL BE INSULATED.
9. VESSELS ARE NOT INTERNALLY COATED TO USE OF CORROSION INHIBITORS.
10. AT LEAST SIX (6) VENTS SHALL BE PROVIDED, EQUALLY-SPACED AT A MAXIMUM CIRCUMFERENCE.
11. VORTEX BREAKER REQUIRED.
# Construction

**Code:** ASME SEC VII, DIV 1  
**Stamp:** ASME  

**Press. (PSIG):** MAX. OP. 174  
**Min. Op. FV:** DESIGN: 200/FV  

**Temp. (OF):** MAX. OP. 680  
**Min. Op. 100**  
**Design:** 750  

**Wind Velocity:** See Spec.  
**Mph Corr. Allow:** 0.0625" (1/16")  

**Seismic Zone:** See Spec.  

**Stress Relieve:** See Spec.  

## Material

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ABENER TEYMA
MOJAVE

LETTER OF TRANSMITTAL

Date: May 23, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-26
Description: Calculation and Water Sample Testing Protocol
Submittal No.: AQ-26-00-00
To: Mr. Chris Anderson
Mojave Desert Air Quality Management District.

WE ARE SENDING YOU

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<td>Test Protocol for the Cooling Towers of the Mojave Solar Project</td>
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</table>

THESE ARE TRANSMITTED as checked below:

☒ For Approval

REMARKS

COPY TO: File SIGNED BY:

Vernon D. Leeming
Permitting Engineer
ABEINSA EPC
ABENER TEYMA
MOJAVE

Technical Memo

Date: May 23, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-26
Description: Calculation and Water Sample Testing Protocol
Submittal No.: AQ-26 -00-00

Mr. Chris Anderson
Mojave Desert Air Quality
Management District:
Permitting Department
14306 Park Ave
Victorville CA 92392
canderson@mdaqmd.ca.gov

Dear Mr. Anderson,

In compliance with AQ-26 we are submitting Test Protocol for the Cooling Towers of the Mojave Solar Project for your approval.

For your convenience, we are including the Compliance language below:

AQ-26: The project owner shall conduct all required cooling tower water tests in accordance with a District-approved test and emissions calculation protocol. Thirty (30) days prior to the first such test the project owner shall provide a written test and emissions calculation protocol for District review and approval.

Verification: The project owner shall provide an emissions calculation and water sample testing protocol to the District for approval and CPM for review at least 30 days prior to the first cooling tower water test.

Should you have any questions or comments, please don’t hesitate to contact me.

COPY TO: File SIGNED BY: Vernard D. Leeming
Permitting Engineer
ABEINSA EPC
**Client:** Mojave Solar LLC  
**Project:** Abener Teyma Mojave  
**Issue:** Test Protocol for Cooling Towers at the Mojave Solar Project

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<td>01</td>
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<td>Date:</td>
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**Prepared by:**  
Neha Singh. Process Engineer  
Electronic Signature

**Reviewed by:**  
Vernon Leeming. Permitting Engineer  
Electronic Signature

**Approved by:**  
Diego M. Rodríguez González, Engineering Director  
Electronic Signature

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1. **Purpose**

   The purpose of this test protocol is to provide a plan and a calculation methodology for the initial and subsequent compliance tests of the cooling towers at the Mojave Solar Project (MSP). The plant will be cooled by two sets of cooling towers, one each for the Alpha and Beta sections of the plant. This plan is developed in accordance with the Mojave Desert Air Quality Management District (MDAQMD) Compliance Test Procedural Manual and MDAQMD permits B011037 and B011038. The sources covered by District permits B011037 and B011038 are the cooling towers. B011037 is the permit for the system in Alpha, while B011038 is the system in Beta. Each system is composed of six cooling fans.

   The unique testing protocol number for this plan is MSP-CT-01.

   Where:

   MSP = Mojave Solar Project, the project indicator.
   CT = Cooling Tower, an indication that this is a test for the plant cooling systems.
   01 = The sequential number indicating the iteration of this test protocol.

   The MSP will maintain personnel appropriately certified with by one or more of the following agencies:

   - CDPH-California Department of Health Treatment and Distribution/ Treatment = T-1 thru T-5, Distribution = D-1 thru D-5
   - CWEA- California Water Environment Agency / for industrial waste G-1 thru G-4
   - SWRCB- State Water Resources Control Board / Grade's I, II, III, IV, and V

2. **Test Protocol**

   The MSP project shall provide an emissions calculation and water sample testing protocol to the District for approval and the California Energy Commission for review prior to the first cooling tower water test.

   **2.1. Pre-Testing Requirements**

   Per MDAQMD compliance test procedural manual, MSP may arrange a pre-test meeting with MDAQMD if necessary, at a mutually agreed upon time and place. The approved testing procedures will become the binding agreement between MSP and the District.

   **2.2. Purpose and Dates of the Tests**

   As discussed in Section 1, the purpose of the testing is to comply with District permits B011037 and B011038, specifically conditions 3 through 7. These conditions ensure that emissions of the particulate matter with a size of 10 micrometers or less (PM10) will remain below the limits identified in the permit conditions and repeated below in Section 2.3.
The initial testing to determine the relationship between the specific conductivity and the total dissolved solids (TDS) will occur prior to official startup of the plant. This conversion factor calculated experimentally will be programmed in DCS to show PM10 emissions on the DCS screen.

2.3. Emissions Testing and Method Requirements

The tests will verify the compliance of the cooling tower PM10 emissions rates through District approved methods, which are outlined in this plan. Initial testing is expected to show concentrations are near or below the permit limits. The current permit requirements per cooling tower set are:

- The drift rate will not exceed 0.0005%.
- The maximum circulation rate is 90,000 gallons per minute (gpm).
- PM10 emissions shall not exceed 2.24 pounds per hour (lb/hr).
- TDS shall not exceed 10,000 parts per million (ppm) on a calendar monthly basis.
- Operation of this equipment shall not exceed 5,840 hours per rolling 12 month period (hrs/yr).

The instantaneous reading of the specific conductivity will be converted to the TDS and TDS to PM10 using experimentally determined conversion factor. Thus obtained instantaneous value of PM10 will be displayed on the DCS screen as well. MSP will perform the quarterly testing to determine the relationship between TDS and specific conductivity on site.

Test Method for Quarterly Testing

Five samples of water from each cooling tower will be collected and tested for the relationship between the TDS and the specific conductivity. The samples will be caught when cooling tower is in its “normal operation” mode. The volume (ml) of the sample shall be determined by the qualified and trained technician. The conductivity of the sample is measured using a hand held probe. The experimental procedure described in ASTM D5907 is used to determine the total dissolved solid of cooling tower sample. A well-mixed sample is filtered through a weighted standard glass fiber filter. The suspended solids are retained on the filter. The filtered sample contains dissolved solid which is then heated to 180°C in a tared vessel/dish to a constant weight (i.e. heat the sample until the weight stops changing). The total dissolved solid is calculated using the following equation:

\[
TDS \left( \frac{mg}{L} \text{ or ppm} \right) = \frac{(\text{Increase in the weight of the tared dish (mg)}) \times 1000}{\text{Sample volume (ml)}}
\]

A spread sheet is developed to calculate the conversion constants and to keep a log of quarterly experiments. A power equation will be used to determine constants as shown below.
Once the relationship between TDS and conductivity is determined by the quarterly testing, the constants ("a" and "b") calculated above will be inserted into the DCS screen to calculate PM10 emissions. The DCS will be programmed to calculate PM10 automatically using the following equation in which all TDS is assumed to become PM10, per the U.S. Environmental Protection Agency (EPA) AP 42 Section 13.4. The DCS will show a plot of the PM10 value for each hour with maximum allowable also shown on the same plot.

\[ PM_{10} = C \times Drift \times \rho \times TDS \times \frac{60}{10^6} \]

Where:
- PM\(_{10}\) = Calculated PM\(_{10}\) emissions (lb/hr).
- C = Circulation Rate (gallons per minute [gpm]). The default value is the permitted maximum of 90,000 gpm.
- Drift = Drift rate (%). The default value is the permitted maximum of 0.0005%.
- \(\rho\) = Density of water (lbs/gal). The default value is 8.3 pounds per gallon.
- TDS = Total Dissolved Solids (ppm). This value is derived from the quarterly testing results.
- \(\frac{60}{10^6}\) = Conversion factor for minutes per hour.
- \(\frac{60}{10^6}\) = Conversion factor for ppm.

Using already known parameters, the equation above reduces to:

\[ PM_{10} \text{ (lb/hr)} = \frac{90,000 \text{ ppm} \times 0.0005 \times 8.3 \times \frac{50}{227} \times 60 \times TDS}{216 \text{ ppm}} \]

\[ PM_{10} \text{ (lb/hr)} = 0.0002241 \times \text{TDS ppm} \]

Results from each quarter will be saved in the “Quarterly Test Log” (see annex 3.3) spreadsheet and a hard copy of the previous quarter’s spreadsheet will be kept on-site for 5 years. All logs will be provided to the District upon request.

2.4. Operations during Testing

Operational conditions during the testing will continue normally unless otherwise required. The number of hours of operation of the cooling tower will be extracted from the data historian. During normal operation of the cooling tower, 3 main pumps will operate. The operating status of
all 3 main cooling water pumps will be utilized to determine the operating hours of the cooling itself. Digital and/or hard copies of logs will be provided to the District upon request.

### 2.5. Quality Assurance

The following quality assurance requirements will be met during the testing procedures.

2.5.1. Calibration

Equipment will be calibrated the day of testing. If it is not calibrated on the day of use, results will be considered invalid.

2.5.2. Other quality assurance methods

Other quality assurance methods, including standard operating procedures incorporating best management practices, will be followed.

### 2.6. Results and Recordkeeping

Digital and hard copies of the operations logs, test results, and calculation results will be kept on-site for a minimum of 5 years, and will be made available to the District upon request.

### 3. Appendix

3.1 Site plan

3.2 Quarterly Testing Calculation Sheet

3.3 Quarterly Testing Log
This document is electronically signed and filed in the Prolog Application.
### 3.2 Quarterly Testing Calculation Sheet

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<th>Sample Volume, ml</th>
<th>Weight of the tared dish</th>
<th>TDS (ppm or mg/L)</th>
<th>Conductivity of the sample, μS/cm</th>
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\[
TDS = \left( \frac{\text{increase in the weight of the tared dish (mg)} \times 1000}{\text{sample volume (ml)}} \right)
\]

The following equation shows the relation between the TDS and Conductivity:

\[TDS = aC^b\]

Where:
- TDS = Total Dissolved Solids (ppm)
- a = Multiplicative coefficient to fit quarterly data
- b = Power coefficient to fit quarterly data
- C = Conductivity (μS/cm)

### 3.3 Quarterly Testing log

#### TDS vs Conductivity

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</tbody>
</table>

The original of this document is electronically signed and filed in the Prolog Application.
Thank you Vernon.

Approve as submitted; a copy will be added to the file.

Regards

Chris A.

From: vernon.leeming@abeinsaepc.abengoa.com [mailto:vernon.leeming@abeinsaepc.abengoa.com]
Sent: Friday, May 23, 2014 10:24 AM
To: Chris Anderson
Cc: Rundquist, Dale@Energy; frances.sanchez@solar.abengoa.com; Frederick.Redell@solar.abengoa.com; holmes.bassette@solar.abengoa.com; Kathleen.Sullivan@solar.abengoa.com; nicholas.potrovitza@solar.abengoa.com; Steven.Pochmara@abeinsaepc.abengoa.com; william.grisolia@solar.abengoa.com
Subject: AQ-26-00-00

Dear Mr. Anderson:

In compliance with AQ-26, we are submitting Test Protocol for the Cooling Towers of the Mojave Solar Project for your approval. Should you have any questions or comments, please don’t hesitate to contact me.

Regards

Vernon Leeming -
Civil Engineering E.I.T.
Permitting

ABEINSA EPC
13911 Park Avenue, Suite 208 Victorville, California 92392
Cell: 661-754-6542 (BB)
vernon.leeming@abeinsaepc.abengoa.com
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LETTER OF TRANSMITTAL

Date: May 23, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-26
Description: Calculation and Water Sample Testing Protocol
Submittal No.: AQ-26-00-00
To: Mr. Dale Rundquist, CPM
   California Energy Commission

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</table>

THESE ARE TRANSMITTED as checked below:

☑ For Review

REMARKS

COPY TO: File

SIGNED BY: Vernone D. Leeming
Permitting Engineer
ABEINSA EPC
Mr. Dale Rundquist, CPM  
California Energy Commission  
1516 Ninth Street (MS-2000)  
Sacramento, CA 95814  
DRundquist@energy.state.ca.us

Dear Mr. Rundquist,

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COPY TO: File SIGNED BY: Vernon D. Leeming  
Permitting Engineer  
ABEINSA EPC
Manual

Client: Mojave Solar LLC

Project: Abener Teyma Mojave

Issue: Test Protocol for Cooling Towers at the Mojave Solar Project

Document Nº: 6007-MOM-ATM-00-00-0003

Revision: 01

Date: 05/23/2014

Prepared by:
Neha Singh. Process Engineer

Reviewed by:
Vernon Leeming. Permitting Engineer

Approved by:
Diego M. Rodríguez González, Engineering Director

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## Revision Control Sheet

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<th>Revision</th>
<th>Date</th>
<th>Cause for Revision</th>
<th>Prepared</th>
<th>Reviewed</th>
<th>Approved</th>
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<td>04-07-14</td>
<td></td>
<td>NS</td>
<td>VL</td>
<td>DRG</td>
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<td>01</td>
<td>05-23-14</td>
<td>Updated per Client’s comments</td>
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The original of this document is electronically signed and filed in the Prolog Application.
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1. **Purpose**

The purpose of this test protocol is to provide a plan and a calculation methodology for the initial and subsequent compliance tests of the cooling towers at the Mojave Solar Project (MSP). The plant will be cooled by two sets of cooling towers, one each for the Alpha and Beta sections of the plant. This plan is developed in accordance with the Mojave Desert Air Quality Management District (MDAQMD) Compliance Test Procedural Manual and MDAQMD permits B011037 and B011038. The sources covered by District permits B011037 and B011038 are the cooling towers. B011037 is the permit for the system in Alpha, while B011038 is the system in Beta. Each system is composed of six cooling fans.

The unique testing protocol number for this plan is MSP-CT-01.

Where:

- **MSP** = Mojave Solar Project, the project indicator.
- **CT** = Cooling Tower, an indication that this is a test for the plant cooling systems.
- **01** = The sequential number indicating the iteration of this test protocol.

The MSP will maintain personnel appropriately certified with by one or more of the following agencies:

- CDPH-California Department of Health Treatment and Distribution/ Treatment = T-1 thru T-5,
  Distribution = D-1 thru D-5
- CWEA- California Water Environment Agency / for industrial waste G-1 thru G-4
- SWRCB- State Water Resources Control Board / Grade's I, II, III, IV, and V

2. **Test Protocol**

The MSP project shall provide an emissions calculation and water sample testing protocol to the District for approval and the California Energy Commission for review prior to the first cooling tower water test.

### 2.1. Pre-Testing Requirements

Per MDAQMD compliance test procedural manual, MSP may arrange a pre-test meeting with MDAQMD if necessary, at a mutually agreed upon time and place. The approved testing procedures will become the binding agreement between MSP and the District.

### 2.2. Purpose and Dates of the Tests

As discussed in Section 1, the purpose of the testing is to comply with District permits B011037 and B011038, specifically conditions 3 through 7. These conditions ensure that emissions of the particulate matter with a size of 10 micrometers or less (PM10) will remain below the limits identified in the permit conditions and repeated below in Section 2.3.
The initial testing to determine the relationship between the specific conductivity and the total dissolved solids (TDS) will occur prior to official startup of the plant. This conversion factor calculated experimentally will be programmed in DCS to show PM10 emissions on the DCS screen.

### 2.3. Emissions Testing and Method Requirements

The tests will verify the compliance of the cooling tower PM10 emissions rates through District approved methods, which are outlined in this plan. Initial testing is expected to show concentrations are near or below the permit limits. The current permit requirements per cooling tower set are:

- The drift rate will not exceed 0.0005%.
- The maximum circulation rate is 90,000 gallons per minute (gpm).
- PM10 emissions shall not exceed 2.24 pounds per hour (lb/hr).
- TDS shall not exceed 10,000 parts per million (ppm) on a calendar monthly basis.
- Operation of this equipment shall not exceed 5,840 hours per rolling 12 month period (hrs/yr).

The instantaneous reading of the specific conductivity will be converted to the TDS and TDS to PM10 using experimentally determined conversion factor. Thus obtained instantaneous value of PM10 will be displayed on the DCS screen as well. MSP will perform the quarterly testing to determine the relationship between TDS and specific conductivity on site.

#### Test Method for Quarterly Testing

Five samples of water from each cooling tower will be collected and tested for the relationship between the TDS and the specific conductivity. The samples will be caught when cooling tower is in its "normal operation" mode. The volume (ml) of the sample shall be determined by the qualified and trained technician. The conductivity of the sample is measured using a hand held probe. The experimental procedure described in ASTM D5907 is used to determine the total dissolved solid of cooling tower sample. A well-mixed sample is filtered through a weighted standard glass fiber filter. The suspended solids are retained on the filter. The filtered sample contains dissolved solid which is then heated to 180°C in a tared vessel/dish to a constant weight (i.e. heat the sample until the weight stops changing). The total dissolved solid is calculated using the following equation:

\[
\text{TDS (}\frac{\text{mg}}{\text{L}} \text{ or ppm)} = \frac{\text{Increase in the weight of the tared dish (mg)} \times 1000}{\text{Sample volume (ml)}}
\]

A spread sheet is developed to calculate the conversion constants and to keep a log of quarterly experiments. A power equation will be used to determine constants as shown below.
Once the relationship between TDS and conductivity is determined by the quarterly testing, the constants ("a" and "b") calculated above will be inserted into the DCS screen to calculate PM10 emissions. The DCS will be programmed to calculate PM10 automatically using the following equation in which all TDS is assumed to become PM10, per the U.S. Environmental Protection Agency (EPA) AP 42 Section 13.4. The DCS will show a plot of the PM10 value for each hour with maximum allowable also shown on the same plot.

\[
PM_{10} = CIRC \times Drift \times \rho \times TDS \times \frac{60}{10^6}
\]

Where:
- \( PM_{10} \) = Calculated PM10 emissions (lb/hr).
- \( CIRC \) = Circulation Rate (gallons per minute [gpm]). The default value is the permitted maximum of 90,000 gpm.
- \( Drift \) = Drift rate (%). The default value is the permitted maximum of 0.0005%.
- \( \rho \) = Density of water (lbs/gal). The default value is 8.3 pounds per gallon.
- \( TDS \) = Total Dissolved Solids (ppm). This value is derived from the quarterly testing results.
- \( \frac{60}{10^6} \) = Conversion factor for minutes per hour.

Using already known parameters, the equation above reduces to:

\[
PM_{10} (lb/hr) = \frac{96,000 \ gpm \times 0.0005\% \times 8.3 \ \text{lbs/gal} \times 60 \ \text{min/hr} \times \text{TDS ppm}}{1\ \mu g}
\]

\[
PM_{10} (lb/hr) = 0.0002241 \times \text{TDS ppm}
\]

Results from each quarter will be saved in the “Quarterly Test Log” (see annex 3.3) spreadsheet and a hard copy of the previous quarter’s spreadsheet will be kept on-site for 5 years. All logs will be provided to the District upon request.

### 2.4. Operations during Testing

Operational conditions during the testing will continue normally unless otherwise required. The number of hours of operation of the cooling tower will be extracted from the data historian. During normal operation of the cooling tower, 3 main pumps will operate. The operating status of
all 3 main cooling water pumps will be utilized to determine the operating hours of the cooling itself. Digital and/or hard copies of logs will be provided to the District upon request.

2.5. Quality Assurance

The following quality assurance requirements will be met during the testing procedures.

2.5.1. Calibration

Equipment will be calibrated the day of testing. If it is not calibrated on the day of use, results will be considered invalid.

2.5.2. Other quality assurance methods

Other quality assurance methods, including standard operating procedures incorporating best management practices, will be followed.

2.6. Results and Recordkeeping

Digital and hard copies of the operations logs, test results, and calculation results will be kept on-site for a minimum of 5 years, and will be made available to the District upon request.

3. Appendix

3.1 Site plan
3.2 Quarterly Testing Calculation Sheet
3.3 Quarterly Testing Log
This document is electronically signed and filed in the Prolog Application.
3.2 Quarterly Testing Calculation Sheet

<table>
<thead>
<tr>
<th>Sample#</th>
<th>Time sample was caught</th>
<th>Sample Volume, ml</th>
<th>Weight of the tared dish</th>
<th>TDS (ppm or mg/L)</th>
<th>Conductivity of the sample, μS/cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

\[ TDS \left( \text{mg/L or ppm} \right) = \frac{\text{increase in the weight of the tared dish (mg) \times 1000}}{\text{sample volume (ml)}} \]

The following equation shows the relation between the TDS and Conductivity. The value of constants "a" and "b" can be found from the chart in the next tab called "TDS vs Conductivity chart".

\[ TDS = aC^b \]

Where:
- TDS = Total Dissolved Solids (ppm)
- a = Multiplicative coefficient to fit quarterly data
- b = Power coefficient to fit quarterly data
- C = Conductivity (μS/cm)

3.3 Quarterly Testing log

TDS vs Conductivity

<table>
<thead>
<tr>
<th>Plant (Alpha/Beta)</th>
<th>Date of the experiment</th>
<th>Sample collected by</th>
<th>Experiment run by</th>
<th>Value of Constants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>b</td>
</tr>
</tbody>
</table>
LETTER OF TRANSMITTAL

Date: April 20, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-32
Description: Non-resettable hour meter for the diesel fueled emergency generator.
Submittal No.: AQ-32 -00-00
To: Mr. Chris Anderson
Mojave Desert Air Quality Management District.

WE ARE SENDING YOU

<table>
<thead>
<tr>
<th>Document Name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>AQ-32-00-00 Technical Memo</td>
<td></td>
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</tr>
<tr>
<td>SPECIFICATIONS</td>
<td>Non-resettable hour meter for the diesel fueled emergency generator.</td>
<td>NA</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED as checked below:

☑ For Approval

REMARKS

________________________________________

________________________________________

________________________________________

________________________________________

COPY TO: File SIGNED BY: Vernon D. Leeming
Permitting Engineer
ABEINSA EPC
Mr. Chris Anderson  
Mojave Desert Air Quality Management District.  
Permitting Department  
14306 Park Ave  
Victorville CA 92392  
canderson@mdaqmd.ca.gov

Dear Mr. Anderson,

In compliance with AQ-32 we are submitting the specifications for the Non-resettable hour meter for the diesel fueled emergency generator.

For your convenience, we are including the Compliance language below:

EQUIPMENT DESCRIPTION
Two - 190 HP diesel fueled emergency generator engines, each driving a generator.

AQ-32 A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed and maintained on this unit to indicate elapsed engine operating time. (Title 17 CCR §93115.10(e)(1)).

Verification: At least thirty (30) days prior to the installation of the engine, the project owner shall provide the District and the CPM the specification of the hour meter.

Should you have any questions or comments, please don’t hesitate to contact me.

COPY TO: File
SIGNED BY: Vernon D. Leeming  
Permitting Engineer

ABEINSA EPC
INTRODUCTION

The AUT-MP12 automatic control panel is based on a programmable module with three microprocessors, each of them specialized in its respective task of electrical measurements, gen set operation logic and communications. This design philosophy ensures a high processing capability.

The design requirements include the operation in extreme ambient temperature conditions (from -30°C to +70°C) and a high level of protection against electrical disturbances. It is therefore a panel of a great reliability and toughness, that results from 60 years of experience of Electra Molins dedicated to the design and manufacture of automatic control modules.

A 5.7” colour TFT screen provides an easy display of the gen set operating status, electrical measurements, alarms, events and the harmonics analysis.

MAIN SCREEN

The main screen allows for complete control and monitoring of generator operation; the other screens provide more detailed information.

The main screen shows the voltage and frequency of the generating set, the load connected and the following diesel engine measurements:

- Working hours counter.
- Cooling liquid temperature.
- Fuel level.
- Battery voltage.
- Electronic battery charger current.
- Oil pressure.
- Diesel engine speed.
AUT-MP12DR for automatic generators triggered by an external start-up signal.

This external start-up signal normally comes from a switching control unit such as the CON-2000MP, which detects the mains failure. The switching control equipment is normally mounted in the switch cabinet. It can be used with any type of switching mechanism and must be used when switching is done by means of automatic motorized switches. This type of control panel should also be used when there is more than one switch and independent control of each one is desired.

Main screen of the AUT-MP12DR control panel
**DATASHEET FOR MP12 – CONXX12 SERIES HARDWARE**

**Supply:**

1 Input 12V / 24V – 700mA. Range 10 … 32Vdc.

**Analogue Inputs:**

2 Voltage inputs 3-Phase 400Vac. Galvanically isolated. Range 190 … 480 Vac. Consumption < 0,25VA.
2 Current inputs 3-Phase 5Aac. Galvanically isolated. Range 1 … 6 Vac. Consumption < 0,25VA .
   Overcurrent: 4xIn Constant. 20xIn 1 sec.
2 Voltage inputs 24Vdc. Range 10 … 32Vdc.
1 Current input 4Aac. Range 0,01 … 4 Adc.
3 Resistive inputs for VDO engine sensors. Range 30 … 220 Ω.
1 Resistive inputs for fuel sensor. Range 0 … 20 kΩ.

**Analogue outputs:**

1 Voltage output. Range 0 … 10V. Imax: 20mA.

**Digital inputs:**

14 Optocoupled inputs with 1 common. Range 8 … 32V. Internal resistance 3k3 Ω.
4 Optocoupled inputs with independent common. Range 8 … 32V. Internal resistance 3k3 Ω.

**Digital outputs:**

2 Optocoupled outputs. Range 10 … 32Vdc. Imax: 50mA.
8 Free voltage contact outputs. Rated current 12Aac / 0,3Adc. Rated voltage: 250Vac / 250Vdc.
8 Free voltage contact outputs. Rated current 6Aac / 0,3Adc. Rated voltage: 250Vac / 250Vdc.

**Communications:**

1 Serial port RS-485 protocol ModBus/Rtu. Slave.
1 Serial port RS-232 protocol ModBus/Rtu. Master /Slave.
1 Serial port CAN protocol J1939. Communication with diesel engines.
1 Serial port CAN protocol EM12. Communication between controllers.
1 Serial port Ethernet 10/100MB, Protocol SNMP, SNTP, TCP/IP.
1 Serial port USB type B. Controller programming.

**Event log:**

Event log referenced to internal clock and calendar. Not resetable by operator.

**Internal clock and calendar:**

Clock format: Hours-minutes-seconds. 24h.
Calendar format: Day-month-year.
Not resetable by operator.

**Genset operating hours counter (Only MP12 controllers):**

Range: 0 to 99999.9 h.
Accuracy: 0,1h.
Not resetable by operator.

**Enviromental conditions:**

Temperature: -30 .. 70°C.
Humity: 95% @ 40°C.

**Dimensions and weight:**

288x144x72mm (WxHxB). 1,95kg.
LETTER OF TRANSMITTAL

Date: April 20, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-32
Description: Non-resettable hour meter for the diesel fueled emergency generator.
Submittal No.: AQ-32 -00-00
To: Mr. Dale Rundquist, CPM
California Energy Commission

WE ARE SENDING YOU

<table>
<thead>
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<td>Non-resettable hour meter for the diesel fueled emergency generator.</td>
<td>NA</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED as checked below:

☒ For Approval

REMARKS

COPY TO: File SIGNED BY: Vernon D. Leeming
Permitting Engineer
ABEINSA EPC
Mr. Dale Rundquist, CPM  
California Energy Commission  
1516 Ninth Street (MS-2000)  
Sacramento, CA 95814  
DRundquist@energy.state.ca.us

Dear Mr. Rundquist,

In compliance with AQ-32 we are submitting the specifications for the Non-resettable hour meter for the diesel fueled emergency generator.

For your convenience, we are including the Compliance language below:

EQUIPMENT DESCRIPTION
Two - 190 HP diesel fueled emergency generator engines, each driving a generator.

AQ-32 A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed and maintained on this unit to indicate elapsed engine operating time. (Title 17 CCR §93115.10(e)(1)).

Verification: At least thirty (30) days prior to the installation of the engine, the project owner shall provide the District and the CPM the specification of the hour meter.

Should you have any questions or comments, please don’t hesitate to contact me.

COPY TO: File SIGNED BY:  
Vernon D. Leeming  
Permitting Engineer  
ABEINSA EPC
AUTOMATIC CONTROL PANEL AUT-MP12

INTRODUCTION

The AUT-MP12 automatic control panel is based on a programmable module with three microprocessors, each of them specialized in its respective task of electrical measurements, gen set operation logic and communications. This design philosophy ensures a high processing capability.

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A 5.7” colour TFT screen provides an easy display of the gen set operating status, electrical measurements, alarms, events and the harmonics analysis.

MAIN SCREEN

The main screen allows for complete control and monitoring of generator operation; the other screens provide more detailed information.

The main screen shows the voltage and frequency of the generating set, the load connected and the following diesel engine measurements:

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AUT-MP12DR for automatic generators triggered by an external start-up signal.

This external start-up signal normally comes from a switching control unit such as the CON-2000MP, which detects the mains failure. The switching control equipment is normally mounted in the switch cabinet. It can be used with any type of switching mechanism and must be used when switching is done by means of automatic motorized switches. This type of control panel should also be used when there is more than one switch and independent control of each one is desired.

Main screen of the AUT-MP12DR control panel
DATASHEET FOR MP12 – CONXX12 SERIES HARDWARE

Supply:
1 Input 12V / 24V – 700mA. Range 10 … 32Vdc.

Analogue Inputs:
2 Voltage inputs 3-Phase 400Vac. Galvanically isolated. Range 190 … 480 Vac. Consumption < 0,25VA.
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Communications:
1 Serial port RS-485 protocol ModBus/Rtu. Slave.
1 Serial port RS-232 protocol ModBus/Rtu. Master /Slave.
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1 Serial port CAN protocol EM12. Communication between controllers.
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Clock format: Hours-minutes-seconds. 24h.
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Accuracy: 0,1h.
Not resetable by operator.

Enviromental conditions:
Temperature: -30 … 70°C.
Humity: 95% @ 40°C.

Dimensions and weight:
288x144x72mm (WxHxB). 1,95kg.
LETTER OF TRANSMITTAL

Date: April 20, 2014
Subject: Mojave Solar Project (09-AFC-5C)
Condition Number: AQ-43
Description: Non-resettable hour meter for diesel fueled emergency generator engines, each driving a fire suppression water pump.
Submittal No.: AQ-43 -00-00

To: Mr. Chris Anderson
Mojave Desert Air Quality Management District.

WE ARE SENDING YOU

☒ Attached

<table>
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<td>AQ-43-00-00</td>
<td>Technical Memo</td>
<td></td>
</tr>
<tr>
<td>SPECIFICATIONS</td>
<td>Non-resettable hour meter for diesel fueled emergency generator engines, each driving a fire suppression water pump.</td>
<td>NA</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED as checked below:

☒ For Approval

REMARKS

COPY TO: File

SIGNED BY: Vernon D. Leeming
Permitting Engineer
ABEINSA EPC
Mr. Chris Anderson  
Mojave Desert Air Quality Management District.  
Permitting Department  
14306 Park Ave  
Victorville CA 92392  
canderson@mdaqmd.ca.gov

Dear Mr. Anderson,

In compliance with AQ-43 we are submitting the specifications for the Non-resettable hour meter for the diesel fueled emergency generator engines, each driving a fire suppression water pump.

For your convenience, we are including the Compliance language below:

EQUIPMENT DESCRIPTION  
Two - 346 HP diesel fueled emergency generator engines, each driving a fire suppression water pump.

AQ-43  A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed and maintained on this unit to indicate elapsed engine operating time. (Title 17 CCR §93115.10(e)(1)).

Verification: At least thirty (30) days prior to the installation of the engine, the project owner shall provide the District and the CPM the specification of the hour timer.

Should you have any questions or comments, please don’t hesitate to contact me.

COPY TO: File SIGNED BY: Vernon D. Leeming  
Permitting Engineer  
ABEINSA EPC
Specifications-Non-resettable hour meter for diesel fueled emergency generator engines, each driving a fire suppression water pump.

Non-Resettable Hour Meter

All Clarke UL Listed/FM Approved diesel fire pump drivers are provided with a non-resettable hour meter. The hour meter can be found or can be accessed from the engine instrument panel as detailed below.

For all JU4, JU6, and JW6 model mechanical engines, the non-resettable hour meter is integrated with the tachometer.
For all JU4H-UFAD, JU6H-UFAD, JW6H-UFAD and JX6H-UFAD model electronic engines the non-resettable hour meter is captured in both the primary and alternate engine ECM. To capture the total number of hours of operation, refer to the following steps to obtain the hours from each ECM and then combine them together.

1) Set the ECM Selector switch to the Primary ECM.

2) From the default “HOME” screen, press the MENU button.
3) Using the LEFT and RIGHT ARROW buttons, scroll until to reach GO TO 1-UP DISPLAY. Press the ENTER button.

4) Using the LEFT and RIGHT ARROW buttons, scroll until to reach ENG HOURS. Record this amount of operating hours for the Primary ECM.

5) Without changing the display screen, position the ECM Selector Switch to the Alternate ECM. The ENG HOURS value should update to reflect the operating hours for the Alternate ECM. Record this value and add it to the Primary ECM to reflect the total non-resetting operating hours.

In addition to the all the instructions above, the following considerations should be made:

- If a Tachometer/Hour Meter is replaced for any reason, the operating hours should be recorded to maintain a log of total operating hours.
- The MACHINE HOURS reading on the LCD display provided on all JU4H-UFAD, JU6H-UFAD, JW6H-UFAD and JX6H-UFAD model engines is a representation of total operating hours (including operating hours on both ECMs), however, it is possible to reset this value via the Utility menu.
- If an ECM is replaced or reprogrammed for any reason the operating hours should be recorded to maintain a log of total operating hours.
TO START ENGINE
1. Populate MODE SELECTOR switch to MANUAL RUN.
2. Lift and hold MANUAL CRANK #1 until engine starts or release after 15 seconds. If unit fails to start, wait for 15 seconds, use MANUAL CRANK #2 and repeat step.
3. If COOLING WATER is not flowing or engine TEMPERATURE is too high, open cooling system manual by-pass valve.

TO STOP ENGINE
1. Lift and hold MANUAL STOP until engine stops.
2. Return MODE SELECTOR switch to AUTOMATIC position.
3. Close cooling system manual by-pass valve, if opened.

IMPORTANT
DO NOT leave the MODE SELECTOR switch in the MANUAL RUN position during AUTOMATIC operation.

EMERGENCY FAILED TO START INSTRUCTIONS
SELECT ALTERNATE ECM
If a failed to start condition has occurred, move the ECM selector switch to the ALTERNATE ECM position, then follow manual operating instructions above.

CAUTION
DO NOT RUN ENGINE WITHOUT AIR FILTER INSTALLED.
PERSONAL INJURY OR ENGINE DAMAGE MAY RESULT

WARNING
THIS EQUIPMENT STARTS AUTOMATICALLY
USE EAR PROTECTION

WARNING
OPERATING ON ALTERNATE ECM
ALTERNATE ECM WARNING: DO NOT SWITCH WHILE THE ENGINE IS RUNNING

CLARKE
FIRE PUMP ENGINE - MANUAL OPERATING INSTRUCTIONS

DISPLAY ON
USE ONLY IF DISPLAY IS OFF

BATTERY #1
BATTERY #2

MODE SELECTOR
MANUAL RUN
AUTOMATIC
WARNING
MODE SELECTOR NOT IN AUTOMATIC

VOLTMETER

MANUAL CRANK #1
MANUAL CRANK #2
MANUAL STOP

ECM SELECTOR
PRIMARY ECM
ALTERNATE ECM
**LETTER OF TRANSMITTAL**

**Date:** April 20, 2014  
**Subject:** Mojave Solar Project (09-AFC-5C)  
**Condition Number:** AQ-43  
**Description:** Non-resettable hour meter for diesel fueled emergency generator engines, each driving a fire suppression water pump.  
**Submittal No.:** AQ-43 -00-00  
**To:** Mr. Dale Rundquist, CPM  
California Energy Commission

WE ARE SENDING YOU  
☑ Attached

<table>
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<tr>
<th>Document Name</th>
<th>Title</th>
<th>REV</th>
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<tbody>
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<td>AQ-43-00-00 Technical Memo</td>
<td>Non-resettable hour meter for diesel fueled emergency generator engines, each driving a fire suppression water pump.</td>
<td>NA</td>
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THESE ARE TRANSMITTED as checked below:  
☑ For Approval

REMARKS

COPY TO: File  
SIGNED BY: Vernon D. Leeming  
Permitting Engineer  
ABEINSA EPC
Mr. Dale Rundquist, CPM  
California Energy Commission  
1516 Ninth Street (MS-2000)  
Sacramento, CA 95814  
DRundquist@energy.state.ca.us

Dear Mr. Rundquist,

In compliance with AQ-43 we are submitting the specifications for the Non-resettable hour meter for the diesel fueled emergency generator engines, each driving a fire suppression water pump.

For your convenience, we are including the Compliance language below:

EQUIPMENT DESCRIPTION
Two - 346 HP diesel fueled emergency generator engines, each driving a fire suppression water pump.

AQ-43  A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed and maintained on this unit to indicate elapsed engine operating time. (Title 17 CCR §93115.10(e)(1)).

Verification: At least thirty (30) days prior to the installation of the engine, the project owner shall provide the District and the CPM the specification of the hour timer.

Should you have any questions or comments, please don’t hesitate to contact me.

Vernon D. Leeming  
Permitting Engineer  
ABEINSA EPC
Specifications-Non-resettable hour meter for diesel fueled emergency generator engines, each driving a fire suppression water pump.

Non-Resettable Hour Meter

All Clarke UL Listed/FM Approved diesel fire pump drivers are provided with a non-resettable hour meter. The hour meter can be found or can be accessed from the engine instrument panel as detailed below.

For all JU4, JU6, and JW6 model mechanical engines, the non-resettable hour meter is integrated with the tachometer.
For all JU4H-UFAD, JU6H-UFAD, JW6H-UFAD and JX6H-UFAD model electronic engines the non-resettable hour meter is captured in both the primary and alternate engine ECM. To capture the total number of hours of operation, refer to the following steps to obtain the hours from each ECM and then combine them together.

1) Set the ECM Selector switch to the Primary ECM.

2) From the default “HOME” screen, press the MENU button.
3) Using the LEFT and RIGHT ARROW buttons, scroll until to reach GO TO 1-UP DISPLAY. Press the ENTER button.

4) Using the LEFT and RIGHT ARROW buttons, scroll until to reach ENG HOURS. Record this amount of operating hours for the Primary ECM.

5) Without changing the display screen, position the ECM Selector Switch to the Alternate ECM. The ENG HOURS value should update to reflect the operating hours for the Alternate ECM. Record this value and add it to the Primary ECM to reflect the total non-resetting operating hours.

In addition to the all the instructions above, the following considerations should be made:

- If a Tachometer/ Hour Meter is replaced for any reason, the operating hours should be recorded to maintain a log of total operating hours.
- The MACHINE HOURS reading on the LCD display provided on all JU4H-UFAD, JU6H-UFAD, JW6H-UFAD and JX6H-UFAD model engines is a representation of total operating hours (including operating hours on both ECMs), however, it is possible to reset this value via the Utility menu.
- If an ECM is replaced or reprogrammed for any reason the operating hours should be recorded to maintain a log of total operating hours.
FIRE PUMP ENGINE - MANUAL OPERATING INSTRUCTIONS

TO START ENGINE
1. Position MODE SELECTOR switch to MANUAL RUN.
2. Lift and hold MANUAL CRANK #1 until engine starts or release after 15 seconds. If unit fails to start, wait for 15 seconds, use MANUAL CRANK #2, and repeat step.
3. If COOLING WATER is not flowing or engine TEMPERATURE is too high, open cooling system manual bypass valve.

TO STOP ENGINE
1. Lift and hold MANUAL STOP until engine stops.
2. Return MODE SELECTOR switch to AUTOMATIC position.
3. Close cooling system manual bypass valve, if opened.

IMPORTANT
Do not leave the MODE SELECTOR switch in the MANUAL RUN position during AUTOMATIC operation.

EMERGENCY FAILED TO START INSTRUCTIONS
SELECT ALTERNATE ECU
If a failure to start condition has occurred, move the ECM selector switch to the ALTERNATE ECM position, then follow manual operating instructions above.

WARNING
OPERATING ON ALTERNATE ECM
ALTERNATE ECM WARNING: DO NOT SWITCH WHILE THE ENGINE IS RUNNING

PRIMARY ECM ECM SELECTOR
<table>
<thead>
<tr>
<th>S No.</th>
<th>Application</th>
<th>Hazardous Characteristics</th>
<th>Maximum Quantity on Site</th>
<th>CERCLA SARA RQ</th>
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<td>-38-9</td>
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<td>9420 gallons</td>
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TOTAL DIESEL GALLONS: 904
REGULAR GAS GALLONS: 99

MASTER METER: START: FINISH: TOTAL:

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191

NOTE: BILLING BASED ON MASTER METER

JAMIE PAGE 02/03/12

Totalizer Diesel
Start 2905299
Finish 2574679

2:15 pm
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TOTAL DIESEL GALLONS: 4368.99
REGULAR GAS GALLONS: 268.00

MASTER METER:  START:  FINISH:  TOTAL:  

NOTE: BILLING BASED ON MASTER METER
CUSTOMER: ABENER / CONSTRUCTION  TRUCK #: 31
DATE: 5-20-14  DRIVER: Rhine

(CIRCLE ONE)

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MASTER METER: START: FINISH: TOTAL: 

NOTE: BILLING BASED ON MASTER METER

BECK OIL INC
16540 D STREET
VICTORVILLE, CA 92395
760) 245-4191

JAMIE PAGE 02/03/12
# BECK OIL, INC

## WETHOSE SHEET

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<th>ABENER / CONSTRUCTION</th>
<th>TRUCK #:</th>
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(CIRCLE ONE)

### PRODUCT:

- **RED DIESEL**
- **CLEAR DIESEL**
- **REGULAR GAS**

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**TOTAL DIESEL GALLONS:**

**REGULAR GAS GALLONS:**

**MASTER METER:**

**START:**

**FINISH:**

**TOTAL:**

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**BECK OIL INC**

16640 D STREET

VICTORVILLE, CA 92395

760) 245-4191

**NOTE: BILLING BASED ON MASTER METER**

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JAMIE PAGE 02/03/12
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TOTAL DIESEL GALLONS: 778
REGULAR GAS GALLONS: 778

MASTER METER: ___________ START: ___________ FINISH: ___________ TOTAL: ___________
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| TOTAL DIESEL GALLONS: | |
| REGULAR GAS GALLONS: | |

MASTER METER: START: FINISH: TOTAL: 

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191

NOTE: BILLING BASED ON MASTER METER
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TOTAL DIESEL GALLONS: 1123
REGULAR GAS GALLONS: 688

BECK OIL INC 16640 D STREET VICTORVILLE, CA 92395 760) 245-4191

NOTE: BILLING BASED ON MASTER METER
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MASTER METER: _______ START: _______ FINISH: _______ TOTAL: _______

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191

NOTE: BILLING BASED ON MASTER METER

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TOTAL DIESEL GALLONS: 1263
REGULAR GAS GALLONS: 85

MASTER METER: START: FINISH: TOTAL: ---

NOTE: BILLING BASED ON MASTER METER

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191
BECK OIL, INC  
WETHOSE SHEET

CUSTOMER: ABENER / CONSTRUCTION  TRUCK #: 

DATE: ________________________  DRIVER: ________________________

(CIRCLE ONE)

PRODUCT:                                    (RED DIESEL) CLEAR DIESEL  REGULAR GAS

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TOTAL DIESEL GALLONS: 
REGULAR GAS GALLONS: 

MASTER METER: START:.finish: TOTAL: 

BECK OIL INC  
15640 D STREET  
VICTORVILLE, CA 92395  
760) 245-4191

NOTE: BILLING BASED ON MASTER METER

JAMIE PAGE 02/03/12
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TOTAL DIESEL GALLONS: 1500
REGULAR GAS GALLONS: 102

MASTER METER: ___________ START: ___________ FINISH: ___________ TOTAL: ___________

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191

NOTE: BILLING BASED ON MASTER METER

JAMIE PAGE 02/03/12
BECK OIL, INC
WETHOSE SHEET

CUSTOMER: ABENER / CONSTRUCTION

DATE: 

TRUCK #: 

DRIVER: 

(CIRCLE ONE)

PRODUCT: RED DIESEL CLEAR DIESEL REGULAR GAS

UNIT NUMBER | DESCRIPTION | GALLONS
---|---|---
E37 1 | PETH 5TH FUEL CUP | 2.65
E37 3 | FUEL TRUCK 1 TRAVEL TANK | 12
E37 4 | PETH 4TH FUEL CUP | 32
E37 5 | PETH 4TH FUEL CUP Laynes Water Pump | 200

TOTAL DIESEL GALLONS: 
REGULAR GAS GALLONS: 

MASTER METER: START: FINISH: TOTAL:

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191

NOTE: BILLING BASED ON MASTER METER

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TOTAL DIESEL GALLONS: 753
REGULAR GAS GALLONS: 89

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TOTAL DIESEL GallONS: 7
REGULAR GAS GallONS: 

MASTER METER: START: FINISH: TOTAL: 

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191

NOTE: BILLING BASED ON MASTER METER

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TOTAL DIESEL GALLONS: 784
REGULAR GAS GALLONS: 107

MASTER METER:       START:       FINISH:       TOTAL:       

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191

NOTE: BILLING BASED ON MASTER METER

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TOTAL DIESEL GALLONS: 
REGULAR GAS GALLONS: 

MASTER METER: START: FINISH: TOTAL: 

BECK OIL INC
16640 D STREET
VICTORVILLE, CA 92395
760) 245-4191

NOTE: BILLING BASED ON MASTER METER

JAMIE PAGE 02/03/12
Hi Steven,
The Submittal for HAZ-1-01-00 (Revised Chemical List) has been reviewed and approved by staff. Thank you,
Dale R.

From: Steven.Pochmara@abeinsaepc.abengoa.com [mailto:Steven.Pochmara@abeinsaepc.abengoa.com]

Sent: Wednesday, April 30, 2014 2:35 PM
To: Rundquist, Dale@Energy; Rundquist, Dale@Energy
Cc: pablo.schenone@abeinsaepc.abengoa.com; mercedes.macias@abeinsaepc.abengoa.com; vernon.leeming@abeinsaepc.abengoa.com; andres.perez@abeinsaepc.abengoa.com; kirk.anderson@abeinsaepc.abengoa.com; holmes.bassette@solar.abengoa.com; william.grisolia@solar.abengoa.com; Kathleen.Sullivan@solar.abengoa.com; frances.sanchez@solar.abengoa.com

Subject: HAZ1-01-00

Good Afternoon Dale,
Please see attached for the revised chemical list for the Mojave Solar project. The list was revised to account for the chemicals to be used in the pipe cleaning process at the steam generator. Please contact if you have any questions.

Regards,

Steven Pochmara - Permit Manager

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Steve,

For the month of May,

Diesel- 8812 gallons  
Regular gas- 750 gallons

Thanks

Regards,

Manjunath Shivalingappa - Environmental Engineer

----- Forwarded by Manjunath Shivalingappa/AbeinsaEPC/Abengoa on 06/05/2014 11:16 AM -----
Manjunath Shivalingappa  Hello Juan and Donna, I am r...  06/03/2014 07:51:09 AM

ABEINSA EPC
Manjunath Shivalingappa
06/03/2014 07:51 AM

Send To:  Juan Loza/AbeinsaEPC/Abengoa@Abengoa, Donna Corey/AbeinsaEPC/Abengoa@Abengoa
cc: 
Subject:  Chemical tracking

Hello Juan and Donna,

I am replacing Kirk Anderson - Environmental Engineer. I would like to request you to copy me in the emails from now onwards which included Kirk. Commissioning process being started, please copy me in the emails which discusses/tracks chemicals, gasses, fuel that are being delivered to the site.

Also, for our monthly reporting,

Juan, please send me the tracking of Nitrogen that has been delivered to the site.

Donna, please send me the tracking of fuel delivered.

I would really appreciate your cooperation. Thank you.

Regards,

Manjunath Shivalingappa - Environmental Engineer

ABEINSA EPC
Abener Teyma Mojave General Partnership
42134 Harper Lake Rd.
Hinkley, CA 92347
Phone: (602) 282- 4103  Cell: (480) 768- 7793
manjunath.shivalingappa@abeinsaepc.abengoa.com

Eco-Tip: Printing e-mails is usually a waste.
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Alpha  4711740 lb  533002 gallons  
Beta  2555220 lb  289052 gallons  

TOTAL  7554136 lb  854540 gallons
## Nitrogen Deliveries

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<td>611823 Alpha &amp; Beta</td>
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<tr>
<td>2/18/14</td>
<td>633600 Alpha</td>
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<tr>
<td>2/21/14</td>
<td>576900 Beta</td>
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<td>3/11/14</td>
<td>326900 Alpha</td>
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<td>5/28/14</td>
<td>544900 Alpha</td>
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**Total**: 2694123 SCF
LETTER OF TRANSMITTAL

Date: May 1, 2014
Subject: Mojave Solar Project
Condition Number: HAZ-2
Reference: Mojave Hazardous Materials Business Plan (HMBP)
To: Mr. Dale Rundquist, CPM
California Energy Commission

WE ARE SENDING YOU

☒ Attached ☐ Under separate cover via ___________ the following items:
☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of Letter ☐ Change Order ☐

<table>
<thead>
<tr>
<th>COPIES</th>
<th>DATE</th>
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<th>DESCRIPTION</th>
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<td>Cover Letter to CEC</td>
</tr>
<tr>
<td>1</td>
<td>5/01/14</td>
<td>1</td>
<td>Technical Memo to CEC</td>
</tr>
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<td>1</td>
<td>5/01/14</td>
<td>1</td>
<td>Revised Hazardous Materials Business Plan</td>
</tr>
<tr>
<td>1</td>
<td>5/01/14</td>
<td>1</td>
<td>Annex 1 Inventory Forms and Maps</td>
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<td>5/01/14</td>
<td>1</td>
<td>Annex 2 MSDS Forms</td>
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<td>1</td>
<td>5/01/14</td>
<td>1</td>
<td>Annex 3 Mojave Health and Safety Emergency Plan</td>
</tr>
</tbody>
</table>

THESE ARE TRANSMITTED as checked below:

☒ For Approval ☐ Approved as submitted
☐ For your use ☐ Approved as noted
☐ As requested ☐ Returned for corrections
☐ For review ☐ For review and comment

REMARKS

COPY TO: File SIGNED BY: Steven Pochmara
ABEINSA EPC
Subject: Mojave Solar Project (09-AFC-5C)
Condition No.: HAZ-2
Description: Safety Management Plan for Commissioning
Submittal No.: HAZ2-04-00

May 1, 2014

Mr. Dale Rundquist, CPM
California Energy Commission
1516 Ninth Street (MS-2000)
Sacramento, CA 95814
drundqui@energy.state.ca.us

Dear Mr. Rundquist,

As required by the California Energy Commission and more specifically by Condition of Certification HAZ-2, attached please find the revised Hazardous Materials Business plan for your review and comment. The revised plan provides an update to the hazardous chemicals that will be on site during commissioning/operations.

Should you have any questions or need any additional information, please do not hesitate to contact me.

Sincerely,

Steven Pochmara
ABEINSA EPC
13911 Park Ave, Suite 208
Victorville, CA 92392
Cell: (480) 287-1419
Dear Mr. Rundquist,

In accordance to the CEC Commission decision report HAZ-2 compliance, we are submitting to your office the revised Hazardous Materials Business plan (HMBP) for the Mojave Solar Project, for your review and consideration. This revised plan provides an update for the chemicals that will be on site for commissioning/operations.

For your convenience, referenced below is the HAZ-2 CEC Compliance Condition:

**HAZ-2**
The project owner shall provide a Hazardous Materials Business Plan (HMBP), a Spill Prevention, Control, and Countermeasure Plan (SPCC), and a Process Safety Management Plan (PSMP) to the San Bernardino County Fire Department and the CPM for review. After receiving comments from the San Bernardino County Fire Department and the CPM, the project owner shall reflect all final recommendations in the final documents. Copies of the final HMBP, SPCC, and PSMP shall then be provided to the San Bernardino County Fire Department for information and to the CPM for approval.

**Verification:** At least 60 days prior to receiving any hazardous material on the site for commissioning or operations, the project owner shall provide a copy of a final Hazardous Materials Business Plan, Spill Prevention, Control, and Countermeasure Plan, and a Process Safety Management Plan to the CPM for approval.

Should you have any questions or comments, please don’t hesitate to contact me.
ABENER TEYMA
MOJAVE

Sincerely,

[Signature]

Steven Pochmara
ABEINSA EPC
13911 Park Ave., Suite 208
Victorville, CA 92392
Cell: (480) 287-1419
# Emergency Plan - HMBP

**Title:** Business Emergency Contingency Plan  
**Process:** Hazardous Material Business Plan  
**Project:** Mojave Solar Project

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<tr>
<th>Document No:</th>
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<td>Revision:</td>
<td>00</td>
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<tr>
<td>Date:</td>
<td>6/21/13</td>
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</table>

**Prepared by:**  
Kirk Anderson – Environmental Engineer  
Electronic Signature

**Reviewed by:**  
Efrain Perez – Quality Manager  
Electronic Signature  
Steven Pochmara – Permitting Manager  
Electronic Signature

**Approved by:**  
Nicolas Gallo – Project Sub Director  
Electronic Signature  
Rafael Sanchez Mendoza – Project Director  
Electronic Signature

This document belongs to the Abener Teyma Mojaves. Its total or partial reproduction, by any means, as well as distribution to third parties without the express written consent of the Abener Teyma Mojave is strictly forbidden.
### Revisions Control Sheet

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<th>Revision</th>
<th>Date</th>
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<td>KIA</td>
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2. Definitions...........................................................................................................4
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7. Annex ..................................................................................................................12
1 Objective
The primary purpose of this plan is to provide readily available information regarding the location, type, and health risks associated with hazardous materials at the Mojave Solar Project. Each business in San Bernardino County that handles, uses, generates or stores hazardous materials is required to comply with State and Federal community right to know laws, and to submit a Hazardous Materials Business Plan (HMBP). The Hazardous Materials Division of the San Bernardino County Fire Department is the Administering Agency and the Certified Unified Program Agency (CUPA) for San Bernardino County with responsibility for regulating hazardous materials handlers, hazardous waste generators, underground storage tank facilities, above ground storage tanks, and stationary sources handling regulated substances.

2 Definitions
N/A

3 Application Field
This plan applies to the entire Mojave Solar Project site for the construction and commissioning phases, which will overlap. The final phase, operations, will differ slightly from the commissioning phase, as there will be different staff operating the plant. Prior to operations, this plan will be updated with current personnel and emergency contacts.

4 Applicable Documentation
- California Health & Safety Code (CHSC), Division 20, Chapter 6.95
- California Code of Regulations (CCR), Title 19, Division 2
- Title 40, Code of Federal Regulations (CFR)
- California Energy Commission Decision – Hazardous Materials (HAZ 2)
- EPA (SARA, Title III)

5 Development
- General Facility Information

Mojave Solar LLC is a wholly owned subsidiary of Abengoa Solar Inc. The project will use established parabolic trough solar thermal technology to produce electrical power using a steam turbine generator fed from a solar steam generator. The solar steam generator receives heated heat transfer fluid (HTF) from solar thermal equipment comprised of arrays
of parabolic mirrors that collect energy from the sun. The California Energy Commission (CEC) has exclusive jurisdiction to license this project. The Mojave Solar site will occupy a 1,765-acre site in an unincorporated area of San Bernardino County near the community of Hinkley, California. The project site is accessed by Harper Lake Road, which is located approximately 20 miles west of Barstow along the Highway 58 corridor. The project site is approximately six miles north of where Harper Lake Road intersects with Highway 58. The existing Solar Generating Stations (SEGS) VIII and IX facilities owned by NextEra Energy Resources are immediately northwest of the project site.

The project will have a combined nominal electric output of 250 MW from twin, independently operable solar fields. Each field will feed a 125 MW power island. One site, known as the Alpha site, is in the northwest portion of the project site and will occupy 884 acres. The Beta site is in the southwest portion of the project site and will occupy 800 acres. The Alpha and Beta sites will share the remaining 81 acres of the project site for activities that include receiving and discharging offsite drainage improvements. The collector fields are comprised of single-axis-tracking parabolic trough solar collectors. These collectors are arranged to form many parallel rows aligned on a north-south axis. Each solar collector has a linear, parabolic-shaped reflector that focuses the sun’s radiation on a specially designed linear receiver known as a heat collection element (HCE). The collectors track the sun from east to west to ensure that the maximum amount of the sun’s radiation is continuously focused on the HCE. The HTF is heated to approximately 740° F as it circulates through the HCEs and returns to a series of heat exchangers where the fluid is used to generate steam in the solar steam generator system at the power island, thereby providing steam to the steam turbine generator.

The project will use a wet cooling tower for power plant cooling. Water for cooling and other plant purposes will come from Harper Valley Ground Basin groundwater obtained from onsite wells. A single treatment facility will be installed for each pair of wells to treat the groundwater to meet potable standards for employee use. A septic system and onsite leach field will be used to dispose of sanitary wastewater. The sun will provide 100 percent of the power supplied to the project through solar thermal collectors. No supplementary fossil-based energy source such as natural gas is proposed for electrical power production. However, each power island will have a natural-gas-fired auxiliary boiler to provide equipment freeze protection and HTF freeze protection.

The auxiliary boiler will supply steam to HTF heat exchangers as needed during offline hours to keep the HTF in a liquid state when ambient temperatures fall below its freezing point of 54° F. Each power island will also have a diesel engine-driven firewater pump for fire
protection and a diesel engine-driven backup generator for power plant essentials. The Mojave Solar electrical transmission lines will interconnect with the Southern California Edison (SCE) 230-kV Kramer-Cool Water #1 transmission, which is located adjacent to the southern border of the site. SCE is constructing the new Lockhart Substation and associated facilities (including fiber optic cable routes located outside the site), to interconnect the project to the Kramer–Coolwater 220-kV line.

6 Records

7 Annex

6007-INS-ATM-77-13-0003 Annex 01 HMBP Forms and Maps
6007-INS-ATM-77-13-0003 Annex 02 MSDS Forms
6007-INS-ATM-77-13-0003 Annex 03 Mojave Health and Safety Emergency Plan
San Bernardino County Fire Department • Hazardous Materials Division
INVENTORY SUMMARY FORM

I. FACILITY IDENTIFICATION

<table>
<thead>
<tr>
<th>FACILITY ID #</th>
<th>F</th>
<th>A</th>
<th></th>
<th>1</th>
<th>(This number is on your CUPA permit.)</th>
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</thead>
</table>

BUSINESS NAME (Same as FACILITY NAME or DBA)

Mojave Solar Project LLC – Chemical Inventory – (page 1)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Name of Hazardous Material or Waste</th>
<th>Maximum Quantity</th>
<th>Size of Largest Container</th>
<th>Unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Lubricating Oil (Example Only)</td>
<td>555</td>
<td>500</td>
<td>Gallon</td>
</tr>
<tr>
<td>1</td>
<td>Diesel Fuel</td>
<td>9700</td>
<td>4000</td>
<td>gallon</td>
</tr>
<tr>
<td>2</td>
<td>Gasoline</td>
<td>2000</td>
<td>2000</td>
<td>gallon</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulic Oil</td>
<td>5280</td>
<td>330</td>
<td>gallon</td>
</tr>
<tr>
<td>4</td>
<td>Paints/Solvents</td>
<td>550</td>
<td>55</td>
<td>gallon</td>
</tr>
<tr>
<td>5</td>
<td>Motor Oil</td>
<td>110</td>
<td>55</td>
<td>gallon</td>
</tr>
<tr>
<td>6</td>
<td>Propane Fuel</td>
<td>300</td>
<td>50</td>
<td>gallon</td>
</tr>
<tr>
<td>7</td>
<td>Acetylene Gas – (Welding)</td>
<td>3600</td>
<td>300</td>
<td>Cu ft</td>
</tr>
<tr>
<td>8</td>
<td>Oxygen Gas – (Welding)</td>
<td>3500</td>
<td>282</td>
<td>Cu ft</td>
</tr>
<tr>
<td>9</td>
<td>Aqueous Ammonia – 12.5%</td>
<td>660</td>
<td>330</td>
<td>Gallon</td>
</tr>
<tr>
<td>10</td>
<td>Carbohydrazide</td>
<td>1200</td>
<td>300</td>
<td>gallon</td>
</tr>
<tr>
<td>11</td>
<td>Tri-Sodium Phosphate Solution</td>
<td>250</td>
<td>200</td>
<td>gallon</td>
</tr>
<tr>
<td>12</td>
<td>Phosphoric Acid – 60 – 70%</td>
<td>660</td>
<td>330</td>
<td>gallon</td>
</tr>
</tbody>
</table>

Summarize the Business Plan inventory on this page. Place this summary in front of the inventory section of the Business Plan. Make copies of this sheet as necessary. Reminder: You need not report hazardous materials with a maximum quantity of less than 55 gallons, 500/5000 pounds, 200/1000 cubic feet, or the threshold planning quantity of an extremely hazardous substance. However, hazardous wastes, Category 1 and 2 pesticides, and explosives are reportable at any quantity.

III. SIGNATURE- EPCRA Facilities MUST sign the bottom of each individual attached inventory form.

SIGNATURE OF OWNER/OPERATOR | NAME OF SIGNER (print) | DATE
-----------------------------|------------------------|------
Kirk Anderson                | 04/30/2014             |     
San Bernardino County Fire Department • Hazardous Materials Division
INVENTORY SUMMARY FORM

I. FACILITY IDENTIFICATION

<table>
<thead>
<tr>
<th>FACILITY ID #</th>
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<tr>
<td>BUSINESS NAME</td>
<td>Mojave Solar Project LLC – Chemical Inventory – (page 2)</td>
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Mojave Solar Project LLC – Chemical Inventory – (page 2)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Name of Hazardous Material or Waste</th>
<th>Maximum Quantity</th>
<th>Size of Largest Container</th>
<th>Unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Lubricating Oil (Example Only)</td>
<td></td>
<td>555</td>
<td>500</td>
</tr>
<tr>
<td>13</td>
<td>Sodium Bisulfite – 38%</td>
<td>660</td>
<td>330</td>
<td>gallon</td>
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<tr>
<td>14</td>
<td>Sodium Hypochlorite – 12.5%</td>
<td>5280</td>
<td>2640</td>
<td>gallon</td>
</tr>
<tr>
<td>15</td>
<td>Magnesium Sulfate – 27%</td>
<td>15320</td>
<td>7660</td>
<td>gallon silo</td>
</tr>
<tr>
<td>16</td>
<td>Slacked Lime</td>
<td>21664</td>
<td>21664</td>
<td>gallon silo</td>
</tr>
<tr>
<td>17</td>
<td>Soda Ash - 95% Sodium Carbonate</td>
<td>15320</td>
<td>7660</td>
<td>gallon silo</td>
</tr>
<tr>
<td>18</td>
<td>Anionic Flocculant Polymer Powder</td>
<td>660</td>
<td>330</td>
<td>gallon</td>
</tr>
<tr>
<td>19</td>
<td>Ferric Chloride – 40%</td>
<td>660</td>
<td>330</td>
<td>gallon</td>
</tr>
<tr>
<td>20</td>
<td>Sodium Bisulfite – 35%</td>
<td>660</td>
<td>330</td>
<td>gallon</td>
</tr>
<tr>
<td>21</td>
<td>Phosphoric Acid</td>
<td>660</td>
<td>330</td>
<td>gallon</td>
</tr>
<tr>
<td>22</td>
<td>Liquid Carbon Dioxide</td>
<td>26000</td>
<td>13000</td>
<td>gallon tank</td>
</tr>
<tr>
<td>23</td>
<td>Sodium EDTA</td>
<td>600</td>
<td>100</td>
<td>Lb bags</td>
</tr>
<tr>
<td>24</td>
<td>Sulfuric Acid - 98%</td>
<td>660</td>
<td>330</td>
<td>gallon</td>
</tr>
</tbody>
</table>

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SIGNATURE OF OWNER/OPERATOR  NAME OF SIGNER (print)  DATE
Kirk Anderson 136 04/30/2014
San Bernardino County Fire Department · Hazardous Materials Division

INVENTORY SUMMARY FORM

I. FACILITY IDENTIFICATION

FACILITY ID #

BUSINESS NAME (Same as FACILITY NAME or DBA)
Mojave Solar Project LLC – Chemical Inventory – (page 3)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Name of Hazardous Material or Waste</th>
<th>Maximum Quantity</th>
<th>Size of Largest Container</th>
<th>Unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Sodium Hydroxide - 50%</td>
<td>3350</td>
<td>330</td>
<td>gallon</td>
</tr>
<tr>
<td>26</td>
<td>Heat Transfer Fluid – Biphenyl</td>
<td>2,300,000</td>
<td>57,000</td>
<td>gallon</td>
</tr>
<tr>
<td>27</td>
<td>Carbon Dioxide Gas</td>
<td>6272</td>
<td>196</td>
<td>Cu ft</td>
</tr>
<tr>
<td>28</td>
<td>Hydrogen Gas</td>
<td>3196</td>
<td>196</td>
<td>Cu ft</td>
</tr>
<tr>
<td>29</td>
<td>Nitrogen</td>
<td>26000</td>
<td>13000</td>
<td>gallon</td>
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<tr>
<td>30</td>
<td>Ammonium Hydroxide</td>
<td>8840</td>
<td>6900</td>
<td>gallon</td>
</tr>
<tr>
<td>31</td>
<td>Citric Acid</td>
<td>9420</td>
<td>6900</td>
<td>gallon</td>
</tr>
<tr>
<td>32</td>
<td>Bonderite</td>
<td>240</td>
<td>55</td>
<td>gallon</td>
</tr>
<tr>
<td>33</td>
<td>Sodium Nitrate</td>
<td>8200</td>
<td>50</td>
<td>Lb</td>
</tr>
<tr>
<td>34</td>
<td>Surfactant NP95</td>
<td>440</td>
<td>55</td>
<td>gallon</td>
</tr>
</tbody>
</table>

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<th>SIGNATURE OF OWNER/OPERATOR</th>
<th>NAME OF SIGNER (print)</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kirk Anderson</td>
<td></td>
<td>04/30/2014</td>
</tr>
</tbody>
</table>

Kirk Anderson
04/30/2014
### I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)

Mojave Solar Project LLC

**FACILITY ID #**

FA 1

**MAP #**

1-A

**GRID #**

F36,C20

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Diesel Fuel

**TRADE SECRET**

Yes ☐ No ☑

**COMMON NAME**

Diesel Fuel

**EHS**

Yes ☐ No ☑

**CAS #**

*If EHS is “Yes”, all amounts below must be in lbs.

**HAZARDOUS MATERIAL TYPE** (Check one item only)

a. PURE ☐ b. MIXTURE ☐ c. WASTE ☑

**PHYSICAL STATE** (Check one item only)

a. SOLID ☑ b. LIQUID ☐ c. GAS ☐

**FED HAZARD CATEGORIES** (Check all that apply)

a. FIRE ☐ b. REACTIVE ☐ c. PRESSURE RELEASE ☐

d. ACUTE HEALTH ☐ e. CHRONIC HEALTH ☐

**LARGEST CONTAINER**

4000 gallon tank

**AVERAGE DAILY AMOUNT**

5500

**MAXIMUM DAILY AMOUNT**

9700

**ANNUAL WASTE AMOUNT**


**UNITS**

a. GALLONS ☐ b. CUBIC FEET ☐ c. POUNDS ☐ d. TONS ☑

*If EHS, amount must be in pounds.

**STORAGE CONTAINER**

a. ABOVE GROUND TANK ☐ e. PLASTIC/NONMETALLIC DRUM ☑

b. UNDERGROUND TANK ☐ f. CAN ☐

c. TANK INSIDE BUILDING ☐ g. CARBOY ☐

d. STEEL DRUM ☐ h. SILO ☑

i. FIBER DRUM ☐ m. GLASS BOTTLE ☐ q. RAIL CAR ☐

j. BAG ☐ n. PLASTIC BOTTLE ☐ r. OTHER ☐

k. BOX ☐ e. TOTE BIN ☐

l. CYLINDER ☐ p. TANK WAGON ☐

**STORAGE PRESSURE**

a. AMBIENT ☐ b. ABOVE AMBIENT ☐ c. BELOW AMBIENT ☐

**STORAGE TEMPERATURE**

a. AMBIENT ☐ b. ABOVE AMBIENT ☐ c. BELOW AMBIENT ☐ d. CRYOGENIC ☐

**%WT**

1 100

**HAZARDOUS COMPONENT (For mixture or waste only)**

Petroleum Products

**EHS**

Yes ☐ No ☑

**CAS #**

226

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

### ADDITIONAL LOCALLY COLLECTED INFORMATION

Diesel fuel tanks are in various locations around project. Some are mobile.

If EPCRA, Please Sign Here
## I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)

Mojave Solar Project LLC

**FACILITY ID #** 1-03 A

**MAP#** 203 **GRID#** F30

## II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Gasoline

**COMMON NAME**

Gasoline

**CAS#**

Gasoline

**HAZARDOUS MATERIAL TYPE (Check one item only)**

- a. PURE
- b. MIXTURE
- c. WASTE

**PHYSICAL STATE (Check one item only)**

- a. SOLID
- b. LIQUID
- c. GAS

**FED HAZARD CATEGORIES (Check all that apply)**

- a. FIRE
- b. REACTIVE
- c. PRESSURE RELEASE
- d. ACUTE HEALTH
- e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

1500

**MAXIMUM DAILY AMOUNT**

2000

**UNITS** (Check one item only)

- a. GALLONS
- b. CUBIC FEET
- c. POUNDS
- d. TONS

**STORAGE CONTAINER**

- a. ABOVE GROUND TANK
- b. UNDERGROUND TANK
- c. TANK INSIDE BUILDING
- d. STEEL DRUM

**STORAGE PRESSURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT

**STORAGE TEMPERATURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT
- d. CRYOGENIC

**%WT**

1 100

**HAZARDOUS COMPONENT** (For mixture or waste only)

- Petroleum Distillates

**EHS**

- Yes
- No

**CAS #**

- 86290-81-5

---

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

---

**ADDITIONAL LOCALLY COLLECTED INFORMATION**
San Bernardino County Fire Department • Hazardous Materials Division

HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

| MATERIAL | WASTE | Page 3 of 35 |

I. FACILITY INFORMATION

BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)
Mojave Solar Project LLC

FACILITY ID # | MAP# | GRID# |
--- | --- | --- |
FA | 1-A | E26 |

II. CHEMICAL INFORMATION

CHEMICAL NAME
Hydraulic Oil

COMMON NAME
Hydraulic Oil

CAS# 209
*If EHS is “Yes”, all amounts below must be in lbs.

HAZARDOUS MATERIAL TYPE (Check one item only)
- a. PURE
- b. MIXTURE
- c. WASTE

RADIOACTIVE 211
- Yes
- No

CURIES

PHYSICAL STATE (Check one item only)
- a. SOLID
- b. LIQUID
- c. GAS

LARGEST CONTAINER 215
330 gallon tote/tank

FED HAZARD CATEGORIES (Check all that apply)
- a. FIRE
- b. REACTIVE
- c. PRESSURE RELEASE
- d. ACUTE HEALTH
- e. CHRONIC HEALTH

AVERAGE DAILY AMOUNT 217
3200

MAXIMUM DAILY AMOUNT 218
5280

ANNUAL WASTE AMOUNT 219

STATE WASTE CODE 220
3200 5280

UNITS* (Check one item only)
- a. GALLONS
- b. CUBIC FEET
- c. POUNDS
- d. TONS

DAYS ON SITE: 222
365

STORAGE CONTAINER
- a. ABOVE GROUND TANK
- b. UNDERGROUND TANK
- c. TANK INSIDE BUILDING
- d. STEEL DRUM

STORAGE PRESSURE
- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT

STORAGE TEMPERATURE
- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT
- d. CRYOGENIC

%WT HAZARDOUS COMPONENT (For mixture or waste only)

<table>
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<tr>
<th>%WT</th>
<th>PETROLEUM</th>
<th>YES</th>
<th>NO</th>
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<tr>
<td>1</td>
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If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

ADDITIONAL LOCALLY COLLECTED INFORMATION
San Bernardino County Fire Department • Hazardous Materials Division

HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

I. FACILITY INFORMATION

BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)
Mojave Solar Project LLC

FACILITY ID # FA
MAP# 203
GRID# 204

II. CHEMICAL INFORMATION

CHEMICAL NAME
Paints/Solvents

COMMON NAME
Paints/Solvents

CAS#

HAZARDOUS MATERIAL TYPE (Check one item only)
 a. PURE  b. MIXTURE  c. WASTE

RADIOACTIVE  Yes  No
CURIES

PHYSICAL STATE (Check one item only)
 a. SOLID  b. LIQUID  c. GAS

LARGEST CONTAINER

FED HAZARD CATEGORIES (Check all that apply)
 a. FIRE  b. REACTIVE  c. PRESSURE RELEASE  d. ACUTE HEALTH  e. CHRONIC HEALTH

AVERAGE DAILY AMOUNT
MAXIMUM DAILY AMOUNT
ANNUAL WASTE AMOUNT
STATE WASTE CODE

UNITS* (Check one item only)
 a. GALLONS  b. CUBIC FEET  c. POUNDS  d. TONS

DAYS ON SITE:

STORAGE CONTAINER
 a. ABOVE GROUND TANK  b. UNDERGROUND TANK  c. TANK INSIDE BUILDING  d. STEEL DRUM
 e. PLASTIC/NONMETALLIC DRUM  f. CAN  g. CARBOY  h. SILO
 i. FIBER DRUM  j. BAG  k. BOX  l. CYLINDER
 m. GLASS BOTTLE  n. PLASTIC BOTTLE  o. TOTE BIN  p. TANK WAGON

STORAGE PRESSURE
 a. AMBIENT  b. ABOVE AMBIENT  c. BELOW AMBIENT

STORAGE TEMPERATURE
 a. AMBIENT  b. ABOVE AMBIENT  c. BELOW AMBIENT  d. CRYOGENIC

%WT

HAZARDOUS COMPONENT (For mixture or waste only)

EHS
Yes  No

CAS #

1 50
Misc. paints
226
227
228
229

2 50
Organic solvents
230
231
232
233

3 234
235
236
237

4 238
239
240
241

5 242
243
244
245

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

ADDITIONAL LOCALLY COLLECTED INFORMATION

If EPCRA, Please Sign Here
San Bernardino County Fire Department • Hazardous Materials Division
HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

I. FACILITY INFORMATION

BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)

Mojave Solar Project LLC

FACILITY ID # FA 1
MAP# 203 GRID# F32, C21

II. CHEMICAL INFORMATION

CHEMICAL NAME  TRADE SECRET  COMMON NAME  EHS
Motor Oil  Yes  Motor Oil

CAS# *If EHS is “Yes”, all amounts below must be in lbs.

HAZARDOUS MATERIAL TYPE (Check one item only)
a. PURE  b. MIXTURE  c. WASTE  RADIOACTIVE  CURIES

PHYSICAL STATE (Check one item only)
a. SOLID  b. LIQUID  c. GAS  LARGEST CONTAINER 55 gallon drum

FED HAZARD CATEGORIES (Check all that apply)
a. FIRE  b. REACTIVE  c. PRESSURE RELEASE  d. ACUTE HEALTH  e. CHRONIC HEALTH

AVERAGE DAILY AMOUNT  MAXIMUM DAILY AMOUNT  ANNUAL WASTE AMOUNT  STATE WASTE CODE
85 110

UNITS* (Check one item only)
a. GALLONS  b. CUBIC FEET  c. POUNDS  d. TONS

STORAGE CONTAINER
b. ABOVE GROUND TANK  e. PLASTIC/NONMETALLIC DRUM  i. FIBER DRUM  m. GLASS BOTTLE
f. CAN  j. BAG  n. PLASTIC BOTTLE

STORAGE PRESSURE
a. AMBIENT  b. ABOVE AMBIENT  c. BELOW AMBIENT

STORAGE TEMPERATURE
a. AMBIENT  b. ABOVE AMBIENT  c. BELOW AMBIENT  d. CRYOGENIC

%WT  HAZARDOUS COMPONENT (For mixture or waste only)  EHS  CAS #
1 100 Petroleum based oils  Yes  64742-55-8
2 230
3 234
4 238
5 242

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

ADDITIONAL LOCALLY COLLECTED INFORMATION

If EPCRA, Please Sign Here
## HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)**

**Mojave Solar Project LLC**

**FACILITY ID # FA**

**MAP#** 203

**GRID#** 204

**II. CHEMICAL INFORMATION**

**CHEMICAL NAME**

**Propane**

**COMMON NAME**

**Propane**

**CAS#**

*If EHS is “Yes”, all amounts below must be in lbs.*

**HAZARDOUS MATERIAL TYPE (Check one item only)**

- [ ] a. PURE
- [ ] b. MIXTURE
- [x] c. WASTE

**PHYSICAL STATE (Check one item only)**

- [ ] a. SOLID
- [ ] b. LIQUID
- [x] c. GAS

**FED HAZARD CATEGORIES (Check all that apply)**

- [ ] a. FIRE
- [ ] b. REACTIVE
- [ ] c. PRESSURE RELEASE
- [ ] d. ACUTE HEALTH
- [ ] e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

<table>
<thead>
<tr>
<th>%WT</th>
<th>HAZARDOUS COMPONENT (For mixture or waste only)</th>
<th>EHS</th>
<th>CAS #</th>
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<td>Propane Gas</td>
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</tbody>
</table>

*If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.*

**ADDITIONAL LOCALLY COLLECTED INFORMATION**

**UNITS**

- [ ] a. GALLONS
- [ ] b. CUBIC FEET
- [ ] c. POUNDS
- [ ] d. TONS

**STORAGE CONTAINER**

- [ ] a. ABOVE GROUND TANK
- [ ] b. UNDERGROUND TANK
- [ ] c. TANK INSIDE BUILDING
- [ ] d. STEEL DRUM

**STORAGE PRESSURE**

- [ ] a. AMBIENT
- [x] b. ABOVE AMBIENT
- [ ] c. BELOW AMBIENT

**STORAGE TEMPERATURE**

- [ ] a. AMBIENT
- [ ] b. ABOVE AMBIENT
- [x] c. BELOW AMBIENT
- [ ] d. CRYOGENIC

**ADDITIONAL LOCALLY COLLECTED INFORMATION**

**If EPCRA, Please Sign Here**
## II. CHEMICAL INFORMATION

### CHEMICAL NAME
- Acetylene

### COMMON NAME
- Acetylene

### CAS# (Check one item only)
- 74-86-2

### HAZARDOUS MATERIAL TYPE (Check one item only)
- Pure

### PHYSICAL STATE (Check one item only)
- Gas

### FED HAZARD CATEGORIES (Check all that apply)
- Fire

### AVERAGE DAILY AMOUNT
- 2000 units

### UNITS* (Check one item only)
- Gallons

### STORAGE CONTAINER
- Above ground tank

### STORAGE PRESSURE
- Above ambient

### STORAGE TEMPERATURE
- Ambient

### % WT HAZARDOUS COMPONENT (For mixture or waste only)

<table>
<thead>
<tr>
<th>% WT</th>
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<th>EHS</th>
<th>HAZARDOUS COMPONENT</th>
<th>CAS #</th>
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If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

### ADDITIONAL LOCALLY COLLECTED INFORMATION

If EPCRA, Please Sign Here
### I. FACILITY INFORMATION

**Business Name (Same as Facility Name or DBA – Doing Business As)**

Mojave Solar Project LLC

**Facility ID #**

FA

**Map#**

203

**Grid#**

204

**Facility Location**

E35, F31, C22

### II. CHEMICAL INFORMATION

**Chemical Name**

Oxygen

**Trade Secret**

Yes

**Common Name**

Oxygen

**CAS#**

7782-44-7

**Hazardous Material Type**

- Pure
- Mixture
- Waste

- Radioactive

**Physical State**

- Solid
- Liquid
- Gas

- Largest Container

**Federal Hazard Categories**

- Fire
- Reactive
- Pressure Release
- Acute Health
- Chronic Health

**Average Daily Amount**

2400

**Maximum Daily Amount**

3500

**Annual Waste Amount**

217

**State Waste Code**

218

**Units**

- Gallons
- Cubic Feet
- Pounds
- Tons

**Storage Container**

- Above Ground Tank
- Underground Tank
- Tank Inside Building
- Steel Drum

**Storage Pressure**

- Ambient
- Above Ambient
- Below Ambient

**Storage Temperature**

- Ambient

**Hazardous Component**

1. **Oxygen Gas**

   - % WT
   - HAZARDOUS COMPONENT
   - EHS
   - CAS #

   - Yes
   - No

   - 7782-44-7

---

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San Bernardino County Fire Department • Hazardous Materials Division
HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

<table>
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<th>MATERIAL</th>
<th>WASTE</th>
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**I. FACILITY INFORMATION**

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)**

Mojave Solar Project LLC

**FACILITY ID #** FA

**MAP#** 203

**GRID#** 204

**II. CHEMICAL INFORMATION**

**CHEMICAL NAME**

Aqueous Ammonia

**COMMON NAME**

Aqueous Ammonia

**CAS#**

*If EHS is “Yes”, all amounts below must be in lbs.

**HAZARDOUS MATERIAL TYPE (Check one item only)**

- a. PURE
- b. MIXTURE
- c. WASTE

**PHYSICAL STATE (Check one item only)**

- a. SOLID
- b. LIQUID
- c. GAS

**FED HAZARD CATEGORIES (Check all that apply)**

- a. FIRE
- b. REACTIVE
- c. PRESSURE RELEASE
- d. ACUTE HEALTH
- e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

350

**MAXIMUM DAILY AMOUNT**

660

**UNITS**

- a. GALLONS
- b. CUBIC FEET
- c. POUNDS
- d. TONS

**STORAGE CONTAINER**

- a. ABOVE GROUND TANK
- b. UNDERGROUND TANK
- c. TANK INSIDE BUILDING
- d. STEEL DRUM
- e. PLASTIC/NONMETALLIC DRUM
- f. CAN
- g. CARBOY
- h. SILO
- i. FIBER DRUM
- j. BAG
- k. BOX
- l. CYLINDER
- m. GLASS BOTTLE
- n. PLASTIC BOTTLE
- o. TOTE BIN
- p. TANK WAGON

**STORAGE PRESSURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT

**STORAGE TEMPERATURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT
- d. CRYOGENIC

**%WT**

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</table>

**HAZARDOUS COMPONENT (For mixture or waste only)**

Aqueous Ammonia

**EHS**

- Yes
- No

**CAS #**

- 226
- 230
- 234
- 238
- 242

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**ADDITIONAL LOCALLY COLLECTED INFORMATION**

If EPCRA, Please Sign Here
<table>
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<tr>
<th>MATERIAL</th>
<th>WASTE</th>
<th>Page 10 of 35</th>
</tr>
</thead>
</table>

### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)**

Mojave Solar Project LLC

**FACILITY ID #**

F A

**MAP#**

1-A

**GRID#**

E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Carbohydrazide

**COMMON NAME**

Carbohydrazide

**CAS#**

497-18-7

**HAZARDOUS MATERIAL TYPE** (Check one item only)

- a. PURE
- b. MIXTURE
- c. WASTE

**PHYSICAL STATE** (Check one item only)

- a. SOLID
- b. LIQUID
- c. GAS

**FED HAZARD CATEGORIES** (Check all that apply)

- a. FIRE
- b. REACTIVE
- c. PRESSURE RELEASE
- d. ACUTE HEALTH
- e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

- 600
- 1200

**MAXIMUM DAILY AMOUNT**

**ANNUAL WASTE AMOUNT**

**STATE WASTE CODE**

**UNITS** (Check one item only)

- a. GALLONS
- b. CUBIC FEET
- c. POUNDS
- d. TONS

**STORAGE CONTAINER**

- a. ABOVE GROUND TANK
- b. UNDERGROUND TANK
- c. TANK INSIDE BUILDING
- d. STEEL DRUM

**STORAGE PRESSURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT

**STORAGE TEMPERATURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT
- d. CRYOGENIC

**%WT**

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<th>HAZARDOUS COMPONENT (For mixture or waste only)</th>
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<th>CAS #</th>
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<tr>
<td>Carbohydrazide</td>
<td>Yes</td>
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If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.
## San Bernardino County Fire Department • Hazardous Materials Division

HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

| MATERIAL | WASTE | Page _11_ of _35_
|----------|-------|------------------------

### I. FACILITY INFORMATION

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<th>BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)</th>
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### II. CHEMICAL INFORMATION

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<th>CHEMICAL NAME</th>
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<th>COMMON NAME</th>
<th>EHS*</th>
<th>CAS#</th>
<th>UNITS*</th>
<th>PHYSICAL STATE</th>
<th>FED HAZARD CATEGORIES</th>
<th>AVERAGE DAILY AMOUNT</th>
<th>MAXIMUM DAILY AMOUNT</th>
<th>ANNUAL WASTE AMOUNT</th>
<th>STATE WASTE CODE</th>
<th>DAYS ON SITE</th>
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<td>Trisodium Phosphate Solution</td>
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<th>CURIES</th>
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<th>FED HAZARD CATEGORIES</th>
<th>LARGEST CONTAINER</th>
<th>STORAGE PRESSURE</th>
<th>STORAGE TEMPERATURE</th>
<th>%WT</th>
<th>HAZARDOUS COMPONENT (For mixture or waste only)</th>
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<td>Tri Sodium Phosphate</td>
<td>Yes</td>
<td>7601-54-9</td>
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</table>

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

ADDITIONAL LOCALLY COLLECTED INFORMATION

---

If EPCRA, Please Sign Here

ABEINSA EPC
MOJAVE

Document: PEM-0002-01 Annex 01
Revision: 00
Date: 04/30/14
Page: 11 of 35
## I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)

Mojave Solar Project LLC

**FACILITY ID #** F A 

**MAP#** 203 **GRID#** 204 1-A E35, F31, C22

## II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Phosphoric Acid – 60 - 70%

**COMMON NAME**

Phosphoric Acid

**CAS#** 7664-38-2

**HAZARDOUS MATERIAL TYPE** (Check one item only)

- [ ] a. PURE
- [ ] b. MIXTURE
- [x] c. WASTE

**PHYSICAL STATE** (Check one item only)

- [ ] a. SOLID
- [ ] b. LIQUID
- [ ] c. GAS

**FED HAZARD CATEGORIES** (Check all that apply)

- [x] a. FIRE
- [ ] b. REACTIVE
- [ ] c. PRESSURE RELEASE
- [ ] d. ACUTE HEALTH
- [ ] e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT** 450

**MAXIMUM DAILY AMOUNT** 660

**UNITS** (Check one item only)

- [x] a. GALLONS
- [ ] b. CUBIC FEET
- [ ] c. POUNDS
- [ ] d. TONS

**STORAGE CONTAINER**

- [ ] a. ABOVE GROUND TANK
- [ ] b. UNDERGROUND TANK
- [ ] c. TANK INSIDE BUILDING
- [ ] d. STEEL DRUM

**STORAGE PRESSURE**

- [ ] a. AMBIENT
- [ ] b. ABOVE AMBIENT
- [ ] c. BELOW AMBIENT

**STORAGE TEMPERATURE**

- [ ] a. AMBIENT
- [ ] b. ABOVE AMBIENT
- [ ] c. BELOW AMBIENT
- [ ] d. CRYOGENIC

**% WT**

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**HAZARDOUS COMPONENT (For mixture or waste only)**

- [ ] Phosphoric Acid

**% WT**

- [ ] Yes
- [ ] No

**CAS #** 7664-38-2

**ADDITIONAL LOCALLY COLLECTED INFORMATION**

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.
### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As):** Mojave Solar Project LLC

**FACILITY ID #** 3

**MAP#** 203

**GRID#** 204

**1-A E35, F31, C22**

### II. CHEMICAL INFORMATION

**CHEMICAL NAME:** Sodium Bisulfite – 38%

**COMMON NAME:** Sodium Bisulfite

**CAS# 7631-90-5**

*If EHS is “Yes”, all amounts below must be in lbs.*

**HAZARDOUS MATERIAL TYPE (Check one item only):**
- [ ] a. PURE
- [ ] b. MIXTURE
- [ ] c. WASTE

**PHYSICAL STATE (Check one item only):**
- [ ] a. SOLID
- [ ] b. LIQUID
- [ ] c. GAS

**FED HAZARD CATEGORIES (Check all that apply):**
- [ ] a. FIRE
- [ ] b. REACTIVE
- [ ] c. PRESSURE RELEASE
- [ ] d. ACUTE HEALTH
- [ ] e. CHRONIC HEALTH

**Hazardous Material Type:**

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**ADDITIONAL LOCALLY COLLECTED INFORMATION**
San Bernardino County Fire Department • Hazardous Materials Division
HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

I.  FACILITY INFORMATION

BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As):
Mojave Solar Project LLC

FACILITY ID # FA                                           MAP# 203 GRID# 204
1-A E35, F31, C22

II. CHEMICAL INFORMATION

CHEMICAL NAME 205 TRADE SECRET □ Yes □ No 206
Sodium Hypochlorite – 12.5%

COMMON NAME 207 EHS* □ Yes □ No
Sodium Hypochlorite

CAS# 7681-52-9

“*If EHS is “Yes”, all amounts below must be in lbs.

HAZARDOUS MATERIAL TYPE (Check one item only)
□ a. PURE □ b. MIXTURE □ c. WASTE 211 RADIOACTIVE □ Yes □ No 212 CURIES

PHYSICAL STATE (Check one item only)
□ a. SOLID □ b. LIQUID □ c. GAS 214 LARGEST CONTAINER 330

FED HAZARD CATEGORIES (Check all that apply)
□ a. FIRE □ b. REACTIVE □ c. PRESSURE RELEASE □ d. ACUTE HEALTH □ e. CHRONIC HEALTH

AVERAGE DAILY AMOUNT 217 MAXIMUM DAILY AMOUNT 218 ANNUAL WASTE AMOUNT 219 STATE WASTE CODE 220
4000 5280

UNITS* (Check one item only)
□ a. GALLONS □ b. CUBIC FEET □ c. POUNDS □ d. TONS 221 DAYS ON SITE: 365

STORAGE CONTAINER □ a. ABOVE GROUND TANK □ e. PLASTIC/NONMETALLIC DRUM □ i. FIBER DRUM □ m. GLASS BOTTLE □ q. RAIL CAR
□ b. UNDERGROUND TANK □ f. CAN □ j. BAG □ n. PLASTIC BOTTLE □ r. OTHER
□ c. TANK INSIDE BUILDING □ g. CARBOY □ k. BOX □ o. TOTE BIN
□ d. STEEL DRUM □ h. SILO □ l. CYLINDER □ p. TANK WAGON

STORAGE PRESSURE □ a. AMBIENT □ b. ABOVE AMBIENT □ c. BELOW AMBIENT 224

STORAGE TEMPERATURE □ a. AMBIENT □ b. ABOVE AMBIENT □ c. BELOW AMBIENT □ d. CRYOGENIC 225

%WT HAZARDOUS COMPONENT (For mixture or waste only)

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EHS CAS #

□ Yes □ No 228 7681-52-9

□ Yes □ No 232

□ Yes □ No 236

□ Yes □ No 240

□ Yes □ No 244

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

ADDITIONAL LOCALLY COLLECTED INFORMATION

If EPCRA, Please Sign Here

Page 14 of 35
### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)**

Mojave Solar Project LLC

**FACILITY ID #**

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**GRID#**

E35, F31, C22

**MAP#**

1-A

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Magnesium Sulfate – 27%

**TRADE SECRET**

Yes ☑ No ☐

If Subject to EPCRA, refer to instructions

**COMMON NAME**

Magnesium Sulfate

**EHS**

Yes ☑ No ☐

**CAS#**

7487-88-9

*If EHS is “Yes”, all amounts below must be in lbs.

**HAZARDOUS MATERIAL TYPE**

- a. PURE ☐
- b. MIXTURE ☑
- c. WASTE ☐

**RADIOACTIVE**

Yes ☑ No ☐

**CURIES**

212

**PHYSICAL STATE**

- a. SOLID ☑
- b. LIQUID ☐
- c. GAS ☐

**LARGEST CONTAINER**

7660 gallon silo

**FED HAZARD CATEGORIES**

- a. FIRE ☐
- b. REACTIVE ☐
- c. PRESSURE RELEASE ☐
- d. ACUTE HEALTH ☐
- e. CHRONIC HEALTH ☐

**AVERAGE DAILY AMOUNT**

10000

**MAXIMUM DAILY AMOUNT**

15320

**ANNUAL WASTE AMOUNT**


**UNITS**

- a. GALLONS ☑
- b. CUBIC FEET ☐
- c. POUNDS ☐
- d. TONS ☐

**DAYS ON SITE:**

365

**STORAGE CONTAINER**

- a. ABOVE GROUND TANK ☐
- b. UNDERGROUND TANK ☐
- c. TANK INSIDE BUILDING ☐
- d. STEEL DRUM ☐
- e. PLASTIC/NONMETALLIC DRUM ☐
- f. CAN ☐
- g. CARBOY ☐
- h. SILO ☐
- i. FIBER DRUM ☐
- j. BAG ☐
- k. BOX ☐
- l. CYLINDER ☐
- m. GLASS BOTTLE ☐
- n. PLASTIC BOTTLE ☐
- o. TOTE BIN ☐
- p. TANK WAGON ☐
- q. RAIL CAR ☐
- r. OTHER ☐

**STORAGE PRESSURE**

- a. AMBIENT ☑
- b. ABOVE AMBIENT ☐
- c. BELOW AMBIENT ☐

**STORAGE TEMPERATURE**

- a. AMBIENT ☑
- b. ABOVE AMBIENT ☐
- c. BELOW AMBIENT ☐
- d. CRYOGENIC ☐

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**ADDITIONAL LOCALLY COLLECTED INFORMATION**

If EPCRA, Please Sign Here
## I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)

Mojave Solar Project LLC

**FACILITY ID #** FA

1-A

**MAP#** 203

**GRID#** 204

E35, F31, C22

## II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Calcium Hydroxide - Slaked Lime

**COMMON NAME**

Lime

**CAS#** 1305-62-0

*If EHS is “Yes”, all amounts below must be in lbs.

**HAZARDOUS MATERIAL TYPE**

- a. PURE
- b. MIXTURE
- c. WASTE

- a. PURE
- b. MIXTURE
- c. WASTE

**PHYSICAL STATE**

- a. SOLID
- b. LIQUID
- c. GAS

**FED HAZARD CATEGORIES**

- a. FIRE
- b. REACTIVE
- c. PRESSURE RELEASE
- d. ACUTE HEALTH
- e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

35000

**MAXIMUM DAILY AMOUNT**

43328

**ANNUAL WASTE AMOUNT**

- a. GALLONS
- b. CUBIC FEET
- c. POUNDS
- d. TONS

**STORAGE CONTAINER**

- a. ABOVE GROUND TANK
- b. UNDERGROUND TANK
- c. TANK INSIDE BUILDING
- d. STEEL DRUM

**STORAGE PRESSURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT

**STORAGE TEMPERATURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT
- d. CRYOGENIC

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ADDITIONAL LOCALLY COLLECTED INFORMATION

If EPCRA, Please Sign Here
# HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

## I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)  
Mojave Solar Project LLC

<table>
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<td>E35, F31, C22</td>
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## II. CHEMICAL INFORMATION

### CHEMICAL NAME

- **Sodium Carbonate** (if subject to EPCRA, refer to instructions)
- **Soda Ash**

| CAS# | 16482-55-6 |

### CHEMICAL INFORMATION

- **TRADE SECRET**: Yes  
- **EHS**: Yes  
- **Hazardous Material Type**: a. PURE  
- **RADIOACTIVE**: Yes  
- **CURIES**:  
- **Physical State**: a. SOLID  
- **LARGEST CONTAINER**: 7660 gallon silo  
- **FED HAZARD CATEGORIES**: a. FIRE  
- **PRESSURE RELEASE**:  
- **ACUTE HEALTH**:  
- **CHRONIC HEALTH**:  
- **AVERAGE DAILY AMOUNT**: 10000 gallons  
- **MAXIMUM DAILY AMOUNT**: 15320 gallons  
- **UNITS**: a. GALLONS  
- **STORAGE CONTAINER**:  
- **STORAGE PRESSURE**:  
- **STORAGE TEMPERATURE**:  
- **% WT**:  
- **HAZARDOUS COMPONENT** (For mixture or waste only):  
  - Sodium Carbonate  
  - **EHS**: Yes  
  - **CAS #**: 16482-55-6

---

**If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.**

---

**ADDITIONAL LOCALLY COLLECTED INFORMATION**

---

**If EPCRA, Please Sign Here**
### I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)

*Mojave Solar Project LLC*

**FACILITY ID #** FA

**MAP#** 203

**GRID#** E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

*Anionic Flocculant*

**COMMON NAME**

*Flocculant*

**CAS#**

*If EHS is “Yes”, all amounts below must be in lbs.*

**HAZARDOUS MATERIAL TYPE**

- a. PURE
- b. MIXTURE
- c. WASTE

**PHYSICAL STATE**

- a. SOLID
- b. LIQUID
- c. GAS

**FED HAZARD CATEGORIES**

- a. FIRE
- b. REACTIVE
- c. PRESSURE RELEASE
- d. ACUTE HEALTH
- e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

- 450

**MAXIMUM DAILY AMOUNT**

- 660

**UNITS**

- a. GALLONS
- b. CUBIC FEET
- c. POUNDS
- d. TONS

**STORAGE CONTAINER**

- a. ABOVE GROUND TANK
- b. UNDERGROUND TANK
- c. TANK INSIDE BUILDING
- d. STEEL DRUM
- e. PLASTIC/NONMETALLIC DRUM
- f. CAN
- g. CARBOY
- h. SILO
- i. FIBER DRUM
- j. BAG
- k. BOX
- l. CYLINDER
- m. GLASS BOTTLE
- n. PLASTIC BOTTLE
- o. TOTE BIN
- p. TANK WAGON

**STORAGE PRESSURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT

**STORAGE TEMPERATURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT
- d. CRYOGENIC

**%WT**

1

**HAZARDOUS COMPONENT**

*Anionic Flocculant*

**EHS**

- a. Yes
- b. No

**CAS #**

- 226

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**ADDITIONAL LOCALLY COLLECTED INFORMATION**

If EPCRA, Please Sign Here
### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)**

Mojave Solar Project LLC

**FACILITY ID #**

F A 1

**MAP#**

203

**GRID#**

E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Ferric Chloride – 40%

**TRADING NAME**

EHS* Yes No

**COMMON NAME**

Ferric Chloride

**CAS#** 7705-08-0

*If EHS is “Yes”, all amounts below must be in lbs.

**HAZARDOUS MATERIAL TYPE** (Check one item only)

a. PURE  b. MIXTURE  c. WASTE

**RADIOACTIVE** Yes No

**PHYSICAL STATE**

a. SOLID  b. LIQUID  c. GAS

**LARGEST CONTAINER**

330 gal

**FED HAZARD CATEGORIES**

a. FIRE  b. REACTIVE  c. PRESSURE RELEASE  d. ACUTE HEALTH  e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

450

**MAXIMUM DAILY AMOUNT**

660

**ANNUAL WASTE AMOUNT**


**UNITS**

a. GALLONS  b. CUBIC FEET  c. POUNDS  d. TONS

**STATE WASTE CODE**


**STORAGE CONTAINER**

a. ABOVE GROUND TANK  e. PLASTIC/NONMETALLIC DRUM  i. FIBER DRUM  m. GLASS BOTTLE  q. RAIL CAR

b. UNDERGROUND TANK  f. CAN  j. BAG  n. PLASTIC BOTTLE  r. OTHER

c. TANK INSIDE BUILDING  g. CARBOY  k. BOX  o. TOTE BIN

d. STEEL DRUM  h. SILO  l. CYLINDER  p. TANK WAGON

**STORAGE PRESSURE**

a. AMBIENT  b. ABOVE AMBIENT  c. BELOW AMBIENT

**STORAGE TEMPERATURE**

a. AMBIENT  b. ABOVE AMBIENT  c. BELOW AMBIENT  d. CRYOGENIC

**%WT HAZARDOUS COMPONENT (For mixture or waste only)**

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**ADDITIONAL LOCALLY COLLECTED INFORMATION**

If EPCRA, Please Sign Here
San Bernardino County Fire Department • Hazardous Materials Division
HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

**I. FACILITY INFORMATION**

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<th>BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)</th>
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**II. CHEMICAL INFORMATION**

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<th>COMMON NAME</th>
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<td>Sodium Bisulfite – 35%</td>
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<th>HAZARDOUS MATERIAL TYPE</th>
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<td>a. PURE</td>
<td>b. MIXTURE</td>
<td>c. WASTE</td>
<td>a. SOLID</td>
<td>b. LIQUID</td>
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<td>Sodium Bisulfite</td>
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<td>7631-90-5</td>
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*If EHS is “Yes”, all amounts below must be in lbs.*

---

**ADDITIONAL LOCALLY COLLECTED INFORMATION**

If EPCRA, Please Sign Here
# San Bernardino County Fire Department • Hazardous Materials Division

## HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As):**

Mojave Solar Project LLC

**FACILITY ID #**

FA 1

**MAP#** 203

**GRID#** E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Phosphoric Acid

**COMMON NAME**

Phosphoric Acid

**CAS#** 7664-38-2

**HAZARDOUS MATERIAL TYPE**

- a. PURE
- b. MIXTURE
- c. WASTE

**RADIOACTIVE**

- Yes
- No

**CURIES**

- Yes
- No

**PHYSICAL STATE**

- a. SOLID
- b. LIQUID
- c. GAS

**LARGEST CONTAINER**

330 gallon

**FED HAZARD CATEGORIES**

- a. FIRE
- b. REACTIVE
- c. PRESSURE RELEASE
- d. ACUTE HEALTH
- e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

330

**MAXIMUM DAILY AMOUNT**

660

**ANNUAL WASTE AMOUNT**

**STATE WASTE CODE**

**UNITS**

- a. GALLONS
- b. CUBIC FEET
- c. POUNDS
- d. TONS

**STORAGE CONTAINER**

- a. ABOVE GROUND TANK
- b. UNDERGROUND TANK
- c. TANK INSIDE BUILDING
- d. STEEL DRUM

**STORAGE PRESSURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT

**STORAGE TEMPERATURE**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT
- d. CRYOGENIC

### %WT HAZARDOUS COMPONENT (For mixture or waste only)

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### ADDITIONAL LOCALLY COLLECTED INFORMATION

If EPCRA, Please Sign Here
# San Bernardino County Fire Department • Hazardous Materials Division

## HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

### I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)

**Mojave Solar Project LLC**

**FACILITY ID #** FA  
**MAP#** 1-A  
**GRID#** E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Liquid Carbon Dioxide

**COMMON NAME**

Liquid CO2

**CAS#** 124-38-9

**TRADE SECRET**

Yes  
No

**PHYSICAL STATE**

*a. SOLID  
b. LIQUID  
c. GAS*

**LARGEST CONTAINER**

13000 gallon

**FED HAZARD CATEGORIES**

*a. FIRE  
b. REACTIVE  
c. PRESSURE RELEASE  
d. ACUTE HEALTH  
e. CHRONIC HEALTH*

**AVERAGE DAILY AMOUNT**

20000  
26000

**MAXIMUM DAILY AMOUNT**

217

**ANNUAL WASTE AMOUNT**

218

**STORAGE CONTAINER**

*a. ABOVE GROUND TANK  
b. UNDERGROUND TANK  
c. TANK INSIDE BUILDING  
d. STEEL DRUM*

**STORAGE PRESSURE**

*a. AMBIENT  
b. ABOVE AMBIENT  
c. BELOW AMBIENT*

**STORAGE TEMPERATURE**

*a. AMBIENT  
b. ABOVE AMBIENT  
c. BELOW AMBIENT  
d. CRYOGENIC*

**%WT**

1  
2  
3  
4  
5

**HAZARDOUS COMPONENT** (For mixture or waste only)

Carbon Dioxide

**EHS**

Yes  
No

**CAS #**

124-38-9

---

**ADDITIONAL LOCALLY COLLECTED INFORMATION**

If EPCRA, Please Sign Here

UPCF (Rev. 12/2007)
I. FACILITY INFORMATION

BUSINESS NAME (Same as FACILITY NAME or DBA - Doing Business As)
Mojave Solar Project LLC

II. CHEMICAL INFORMATION

CHEMICAL NAME
Sodium EDTA

COMMON NAME
Sodium EDTA

CAS# 8013-51-2

HAZARDOUS MATERIAL TYPE (Check one item only)
- Pure
- Mixture
- Waste

PHYSICAL STATE (Check one item only)
- Solid
- Liquid
- Gas

FED HAZARD CATEGORIES (Check all that apply)
- Fire
- Reactive
- Pressure Release
- Acute Health
- Chronic Health

AVERAGE DAILY AMOUNT
350

MAXIMUM DAILY AMOUNT
600

UNITS (Check one item only)
- Gallons
- Cubic Feet
- Pounds
- Tons

STORAGE CONTAINER
- Above Ground Tank
- Underground Tank
- Tank Inside Building
- Steel Drum

STORAGE PRESSURE
- Ambient
- Above Ambient
- Below Ambient

STORAGE TEMPERATURE
- Ambient
- Above Ambient
- Below Ambient

% WT

<table>
<thead>
<tr>
<th>HAZARDOUS COMPONENT (For mixture or waste only)</th>
<th>EHS</th>
<th>CAS #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium EDTA</td>
<td>Yes</td>
<td>8013-51-2</td>
</tr>
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</table>

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

ADDITIONAL LOCALLY COLLECTED INFORMATION

UPCF (Rev. 12/2007)
### I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)  
Mojave Solar Project LLC

**FACILITY ID #** FA  
**MAP#** 1  
**GRID#** E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**  
Sulfuric Acid – 98%

**COMMON NAME**  
Sulfuric Acid

**CAS#** 7664-93-9

<table>
<thead>
<tr>
<th>HAZARDOUS MATERIAL TYPE</th>
<th>a. PURE</th>
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<th>c. WASTE</th>
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<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>PHYSICAL STATE</th>
<th>a. SOLID</th>
<th>b. LIQUID</th>
<th>c. GAS</th>
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<tbody>
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<td></td>
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<table>
<thead>
<tr>
<th>FED HAZARD CATEGORIES</th>
<th>a. FIRE</th>
<th>b. REACTIVE</th>
<th>c. PRESSURE RELEASE</th>
<th>d. ACUTE HEALTH</th>
<th>e. CHRONIC HEALTH</th>
</tr>
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<tbody>
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</table>

<table>
<thead>
<tr>
<th>AVERAGE DAILY AMOUNT</th>
<th>MAXIMUM DAILY AMOUNT</th>
<th>ANNUAL WASTE AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>660</td>
<td></td>
</tr>
</tbody>
</table>

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

If EPCRA, Please Sign Here
## HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

### I. FACILITY INFORMATION

**Business Name** (Same as FACILITY NAME or DBA – Doing Business As)  
Mojave Solar Project LLC

**Facility ID #**  
MAP# 203  
GRID# 204 E35, F31, C22

### II. CHEMICAL INFORMATION

**Chemical Name**  
Sodium Hydroxide

**Common Name**  
Sodium Hydroxide

**CAS#**  
1310-73-2

**Hazardous Material Type**  
- a. Pure  
- b. Mixture  
- c. Waste  

**Physical State**  
- a. Solid  
- b. Liquid  
- c. Gas  

**FED HAZARD CATEGORIES**  
- a. Fire  
- b. Reactive  
- c. Pressure Release  
- d. Acute Health  
- e. Chronic Health

**Average Daily Amount**  
2500

**Maximum Daily Amount**  
3350

**Annual Waste Amount**  

**Units**  
- a. Gallons  
- b. Cubic Feet  
- c. Pounds  
- d. Tons

**Storage Container**  
- a. Above Ground Tank  
- b. Underground Tank  
- c. Tank Inside Building  
- d. Steel Drum

**Storage Pressure**  
- a. Ambient  
- b. Above Ambient  
- c. Below Ambient

**Storage Temperature**  
- a. Ambient  
- b. Above Ambient  
- c. Below Ambient  
- d. Cryogenic

**% WT**  
1 50 226  
2 230  
3 234  
4 238  
5 242

**Hazardous Component** (For mixture or waste only)  
Sodium Hydroxide

**EHS**  
- a. Yes  
- b. No

**CAS #**  
1310-73-2

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

**Additional Locally Collected Information**  
If EPCRA, Please Sign Here
### Hazardous Materials Inventory – Chemical Description

#### I. Facility Information

**Business Name:** Mojave Solar Project LLC  
**Facility ID #:** FA  
**Map #:** E35, F31, C22

#### II. Chemical Information

**Chemical Name:** Diphenyl Ether, Biphenyl  
**Common Name:** Heat Transfer Fluid  
**CAS #:** 101-84-8, 92-52-4

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<thead>
<tr>
<th>Hazardous Material Type</th>
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<th>Mixture</th>
<th>Waste</th>
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</thead>
<tbody>
<tr>
<td>Radioactive</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Physical State</td>
<td>Solid</td>
<td>Liquid</td>
<td>Gas</td>
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<tr>
<td>Fed Hazard Categories</td>
<td>Fire</td>
<td>Reactive</td>
<td>Pressure Release</td>
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<table>
<thead>
<tr>
<th>Average Daily Amount</th>
<th>2,000,000</th>
<th>Maximum Daily Amount</th>
<th>2,300,000</th>
<th>Annual Waste Amount</th>
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<table>
<thead>
<tr>
<th>Units</th>
<th>Gallons</th>
<th>Cubic Feet</th>
<th>Pounds</th>
<th>Tons</th>
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<tr>
<td>Days on Site:</td>
<td>365</td>
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<table>
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<tr>
<th>Storage Container</th>
<th>Above Ground Tank</th>
<th>Underground Tank</th>
<th>Tank Inside Building</th>
<th>Steel Drum</th>
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</thead>
<tbody>
<tr>
<td>Storage Pressure</td>
<td>AMBIENT</td>
<td>ABOVE AMBIENT</td>
<td>BELOW AMBIENT</td>
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</table>

<table>
<thead>
<tr>
<th>Storage Temperature</th>
<th>AMBIENT</th>
<th>ABOVE AMBIENT</th>
<th>BELOW AMBIENT</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>%WT</th>
<th>Hazardous Component</th>
<th>EHS</th>
<th>CAS #</th>
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<tr>
<td>73.5</td>
<td>Diphenyl Ether</td>
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<tr>
<td>26.5</td>
<td>Biphenyl</td>
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<td>No</td>
</tr>
<tr>
<td>23.4</td>
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</tr>
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<td>23.8</td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>24.2</td>
<td></td>
<td>Yes</td>
<td>No</td>
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</tbody>
</table>

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.

**Additional Locally Collected Information:**

If EPCRA, Please Sign Here
### I. FACILITY INFORMATION

**BUSINESS NAME** (Same as FACILITY NAME or DBA – Doing Business As)

Mojave Solar Project LLC

**FACILITY ID #** 1-A

**MAP#** E35, F31, C22

**GRID#**

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Carbon Dioxide

**COMMON NAME**

EHS*

**CAS#**

*If EHS is "Yes", all amounts below must be in lbs.

<table>
<thead>
<tr>
<th>HAZARDOUS MATERIAL TYPE</th>
<th>a. PURE</th>
<th>b. MIXTURE</th>
<th>c. WASTE</th>
<th>a. SOLID</th>
<th>b. LIQUID</th>
<th>c. GAS</th>
<th>a. FIRE</th>
<th>b. REACTIVE</th>
<th>c. PRESSURE RELEASE</th>
<th>d. ACUTE HEALTH</th>
<th>e. CHRONIC HEALTH</th>
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<tbody>
<tr>
<td>a. PURE</td>
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<td>b. MIXTURE</td>
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<tr>
<td>c. WASTE</td>
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**PHYSICAL STATE**

<table>
<thead>
<tr>
<th>PHYSICAL STATE</th>
<th>a. SOLID</th>
<th>b. LIQUID</th>
<th>c. GAS</th>
<th>a. FIRE</th>
<th>b. REACTIVE</th>
<th>c. PRESSURE RELEASE</th>
<th>d. ACUTE HEALTH</th>
<th>e. CHRONIC HEALTH</th>
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<tbody>
<tr>
<td>a. SOLID</td>
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<td>b. LIQUID</td>
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<td>c. GAS</td>
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**FED HAZARD CATEGORIES**

<table>
<thead>
<tr>
<th>FED HAZARD CATEGORIES</th>
<th>a. FIRE</th>
<th>b. REACTIVE</th>
<th>c. PRESSURE RELEASE</th>
<th>d. ACUTE HEALTH</th>
<th>e. CHRONIC HEALTH</th>
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<tbody>
<tr>
<td>a. FIRE</td>
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<td></td>
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<tr>
<td>b. REACTIVE</td>
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<tr>
<td>c. PRESSURE RELEASE</td>
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<td>d. ACUTE HEALTH</td>
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<td>e. CHRONIC HEALTH</td>
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</table>

**AVERAGE DAILY AMOUNT**

4800

**MAXIMUM DAILY AMOUNT**

6272

**ANNUAL WASTE AMOUNT**

<table>
<thead>
<tr>
<th>UNITS* (Check one only)</th>
<th>a. GALLONS</th>
<th>b. CUBIC FEET</th>
<th>c. POUNDS</th>
<th>d. TONS</th>
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<tr>
<td>a. GALLONS</td>
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<td></td>
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<tr>
<td>b. CUBIC FEET</td>
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<tr>
<td>c. POUNDS</td>
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<tr>
<td>d. TONS</td>
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<table>
<thead>
<tr>
<th>STORAGE CONTAINER</th>
<th>a. ABOVE GROUND TANK</th>
<th>b. UNDERGROUND TANK</th>
<th>c. TANK INSIDE BUILDING</th>
<th>d. STEEL DRUM</th>
<th>e. PLASTIC/NONMETALLIC DRUM</th>
<th>f. CAN</th>
<th>g. CARBOY</th>
<th>h. SILO</th>
<th>i. FIBER DRUM</th>
<th>m. GLASS BOTTLE</th>
<th>n. PLASTIC BOTTLE</th>
<th>q. RAIL CAR</th>
<th>r. OTHER</th>
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<tbody>
<tr>
<td>a. ABOVE GROUND TANK</td>
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<td>b. UNDERGROUND TANK</td>
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<tr>
<td>c. TANK INSIDE BUILDING</td>
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<tr>
<td>d. STEEL DRUM</td>
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<table>
<thead>
<tr>
<th>STORAGE PRESSURE</th>
<th>a. AMBIENT</th>
<th>b. ABOVE AMBIENT</th>
<th>c. BELOW AMBIENT</th>
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<tbody>
<tr>
<td>a. AMBIENT</td>
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<td></td>
<td></td>
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<tr>
<td>b. ABOVE AMBIENT</td>
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<td>c. BELOW AMBIENT</td>
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<table>
<thead>
<tr>
<th>STORAGE TEMPERATURE</th>
<th>a. AMBIENT</th>
<th>b. ABOVE AMBIENT</th>
<th>c. BELOW AMBIENT</th>
<th>d. CRYOGENIC</th>
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<tbody>
<tr>
<td>a. AMBIENT</td>
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<td></td>
<td></td>
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<tr>
<td>b. ABOVE AMBIENT</td>
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<tr>
<td>c. BELOW AMBIENT</td>
<td></td>
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<td></td>
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<tr>
<td>d. CRYOGENIC</td>
<td></td>
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**%WT**

<table>
<thead>
<tr>
<th>HAZARDOUS COMPONENT (For mixture or waste only)</th>
<th>EHS</th>
<th>CAS #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td></td>
<td></td>
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</tbody>
</table>

If more hazardous components are present at greater than 1% by weight if non-carcinogenic, or > 0.1% by weight if carcinogenic, attach additional sheets of paper capturing the required information.
### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As):**

Mojave Solar Project LLC

**FACILITY ID # FA:**

1

**MAP# 203 GRID# 204:**

1-A E35, F31, C22

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### II. CHEMICAL INFORMATION

**CHEMICAL NAME:**

Hydrogen Gas

**COMMON NAME:**

Hydrogen Gas

**CAS# 101-84-8**

*If EHS is “Yes”, all amounts below must be in lbs.

**HAZARDOUS MATERIAL TYPE (Check one item only):**

- a. PURE
- b. MIXTURE
- c. WASTE

**PHYSICAL STATE (Check one item only):**

- a. SOLID
- b. LIQUID
- c. GAS

**FED HAZARD CATEGORIES (Check all that apply):**

- a. FIRE
- b. REACTIVE
- c. PRESSURE RELEASE
- d. ACUTE HEALTH
- e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT:**

1800

**MAXIMUM DAILY AMOUNT:**

3196

**UNITS**

- a. GALLONS
- b. CUBIC FEET
- c. POUNDS
- d. TONS

**STORAGE CONTAINER:**

- a. ABOVE GROUND TANK
- b. UNDERGROUND TANK
- c. TANK INSIDE BUILDING
- d. STEEL DRUM

**STORAGE PRESSURE:**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT

**STORAGE TEMPERATURE:**

- a. AMBIENT
- b. ABOVE AMBIENT
- c. BELOW AMBIENT
- d. CRYOGENIC

---

<table>
<thead>
<tr>
<th>%WT</th>
<th>HAZARDOUS COMPONENT</th>
<th>EHS</th>
<th>CAS #</th>
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<tbody>
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<td>1</td>
<td>Hydrogen</td>
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<td>226</td>
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<td>230</td>
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<td>3</td>
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<td>4</td>
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<td>239</td>
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<tr>
<td>5</td>
<td></td>
<td>Yes</td>
<td>243</td>
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</tbody>
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---

*If EHS, amount must be in pounds.*
### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)**

Mojave Solar Project LLC

**FACILITY ID #**

F A

**MAP#**

1-A

**GRID#**

E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Nitrogen

**COMMON NAME**

Nitrogen

**CAS#** 101-84-8

**TRADE SECRET**

Yes ☑ No ☐

If Subject to EPCRA, refer to instructions

**EHS**

Yes ☑ No ☐

*If EHS is “Yes”, all amounts below must be in lbs.

**HAZARDOUS MATERIAL TYPE (Check one item only)**

☑ a. PURE ☐ b. MIXTURE ☐ c. WASTE

**PHYSICAL STATE (Check one item only)**

☐ a. SOLID ☐ b. LIQUID ☑ c. GAS

**LARGEST CONTAINER**

13000 gallon

**FED HAZARD CATEGORIES (Check all that apply)**

☐ a. FIRE ☐ b. REACTIVE ☐ c. PRESSURE RELEASE ☐ d. ACUTE HEALTH ☐ e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

18000

**MAXIMUM DAILY AMOUNT**

26000

**UNITS**

☑ a. GALLONS ☐ b. CUBIC FEET ☐ c. POUNDS ☐ d. TONS

If EHS, amount must be in pounds.

**STORAGE CONTAINER**

☐ a. ABOVE GROUND TANK ☐ b. UNDERGROUND TANK ☐ c. TANK INSIDE BUILDING ☐ d. STEEL DRUM ☐ e. PLASTIC/NONMETALLIC DRUM ☐ f. CAN ☐ g. CARBOY ☐ h. SILO

**STORAGE PRESSURE**

☐ a. AMBIENT ☐ b. ABOVE AMBIENT ☐ c. BELOW AMBIENT

**STORAGE TEMPERATURE**

☑ a. AMBIENT ☐ b. ABOVE AMBIENT ☐ c. BELOW AMBIENT ☐ d. CRYOGENIC

**%WT**

1 100

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<th>HAZARDOUS COMPONENT (For mixture or waste only)</th>
<th>EHS</th>
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</table>
### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)**

Mojave Solar Project LLC

**FACILITY ID #**

FA 1

**MAP#** 1-A

**GRID#** E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Ammonium Hydroxide

**TRADE SECRET**

Yes ☐ No ☒

If Subject to EPCRA, refer to instructions

**COMMON NAME**

Ammonium Hydroxide

**EHS**

Yes ☐ No ☒

*If EHS is “Yes”, all amounts below must be in lbs.

**CAS# 1336-21-6**

**HAZARDOUS MATERIAL TYPE**

- a. PURE ☐
- b. MIXTURE ☒
- c. WASTE ☐

**PHYSICAL STATE**

- a. SOLID ☐
- b. LIQUID ☐
- c. GAS ☐

**FED HAZARD CATEGORIES**

- a. FIRE ☐
- b. REACTIVE ☐
- c. PRESSURE RELEASE ☒
- d. ACUTE HEALTH ☐
- e. CHRONIC HEALTH ☐

**LARGEST CONTAINER**

6900 gallon

**AVERAGE DAILY AMOUNT**

6400

**MAXIMUM DAILY AMOUNT**

8840

**ANNUAL WASTE AMOUNT**

**UNITS**

- a. GALLONS ☐
- b. CUBIC FEET ☐
- c. POUNDS ☒
- d. TONS ☐

If EHS, amount must be in pounds.

**STORAGE CONTAINER**

- a. ABOVE GROUND TANK ☐
- b. UNDERGROUND TANK ☐
- c. TANK INSIDE BUILDING ☐
- d. STEEL DRUM ☒
- e. PLASTIC/NONMETALLIC DRUM ☒
- f. CAN ☐
- g. CARBOY ☐
- h. SILO ☐
- i. FIBER DRUM ☐
- j. BAG ☐
- k. BOX ☐
- l. CYLINDER ☐
- m. GLASS BOTTLE ☐
- n. PLASTIC BOTTLE ☐
- o. TOTE BIN ☐
- p. TANK WAGON ☐
- q. RAIL CAR ☐
- r. OTHER ☐

**STORAGE PRESSURE**

- a. AMBIENT ☐
- b. ABOVE AMBIENT ☐
- c. BELOW AMBIENT ☐

**STORAGE TEMPERATURE**

- a. AMBIENT ☐
- b. ABOVE AMBIENT ☐
- c. BELOW AMBIENT ☐
- d. CRYOGENIC ☐

**%WT HAZARDOUS COMPONENT**

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<th>EHS</th>
<th>CAS #</th>
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</table>
### I. FACILITY INFORMATION

**Business Name:** Mojave Solar Project LLC

**Facility ID #:** FA

**MAP #:** 1-A

**GRID #:** E35, F31, C22

### II. CHEMICAL INFORMATION

**Chemical Name:** Citric Acid  
**Trade Secret:** Yes  
**Common Name:** Citric Acid  
**Cas #:** 77-92-9

**Hazardous Material Type:** Mixure  
**Radioactive:** No  
**Curies:**

**Physical State:** Liquid  
**Largest Container:** 6900 gallon

**FED Hazard Categories:**  
- **Fire:** Yes  
- **Reactive:** No  
- **Pressure Release:** No  
- **Acute Health:** Yes  
- **Chronic Health:** No

**Average Daily Amount:** 9420 gallons  
**Maximum Daily Amount:**

**Units:** Gallons  
**Days on Site:** 365

**Storage Container:**  
- Above Ground Tank  
- UnderGround Tank  
- Tank Inside Building  
- Steel Drum  
- Plastic/NonMetallic Drum  
- Fiber Drum  
- Glass Bottle  
- Rail Car  
- Plastic Bottle  
- Other  
- Cylinder  
- Tote Bin  
- Tank Wagon

**Storage Pressure:** Above Ambient  
**Storage Temperature:** Above Ambient  
**% WT:** 100  
**EHS:** Yes  
**CAS #:** 77-92-9
## I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)**

Mojave Solar Project LLC

**FACILITY ID #**

FACILITY ID # FA

**MAP#**

1 MAP# 203

**GRID#**

1-A E35, F31, C22

## II. CHEMICAL INFORMATION

**CHEMICAL NAME**

Bonderite

**TRADE SECRET**

Yes No

If Subject to EPCRA, refer to instructions

**COMMON NAME**

Bonderite

**EHS**

Yes No

**CAS#** 107-21-1

*If EHS is “Yes”, all amounts below must be in lbs.

**HAZARDOUS MATERIAL TYPE**

a. PURE  b. MIXTURE  c. WASTE

**RADIOACTIVE**

Yes No

**CURIES**

**PHYSICAL STATE**

a. SOLID  b. LIQUID  c. GAS

**LARGEST CONTAINER**

55 gallon

**FED HAZARD CATEGORIES**

a. FIRE  b. REACTIVE  c. PRESSURE RELEASE  d. ACUTE HEALTH  e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT**

**MAXIMUM DAILY AMOUNT**

**ANNUAL WASTE AMOUNT**

**STATE WASTE CODE**

**UNITS**

a. GALLONS  b. CUBIC FEET  c. POUNDS  d. TONS

*If EHS, amount must be in pounds.

**STORAGE CONTAINER**

a. ABOVE GROUND TANK  e. PLASTIC/NONMETALLIC DRUM  i. FIBER DRUM  m. GLASS BOTTLE  q. RAIL CAR

b. UNDERGROUND TANK  f. CAN  j. BAG  n. PLASTIC BOTTLE  r. OTHER

c. TANK INSIDE BUILDING  g. CARBOY  k. BOX  o. TOTE BIN

d. STEEL DRUM  h. SILO  l. CYLINDER  p. TANK WAGON

**STORAGE PRESSURE**

a. AMBIENT  b. ABOVE AMBIENT  c. BELOW AMBIENT

**STORAGE TEMPERATURE**

a. AMBIENT  b. ABOVE AMBIENT  c. BELOW AMBIENT  d. CRYOGENIC

### %WT HAZARDOUS COMPONENT (For mixture or waste only)

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<th>HAZARDOUS COMPONENT</th>
<th>EHS</th>
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San Bernardino County Fire Department • Hazardous Materials Division
HAZARDOUS MATERIALS INVENTORY – CHEMICAL DESCRIPTION

I. FACILITY INFORMATION

BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As)

Mojave Solar Project LLC

FACILITY ID # FA
MAP# 1
GRID# 1-A

II. CHEMICAL INFORMATION

CHEMICAL NAME
Sodium Nitrite

TRADE SECRET
Yes
No

If Subject to EPCRA, refer to instructions

COMMON NAME
Sodium Nitrite

EHS*
Yes
No

*If EHS is “Yes”, all amounts below must be in lbs.

HAZARDOUS MATERIAL TYPE (Check one item only)
□ a. PURE
□ b. MIXTURE
□ c. WASTE

RADIOACTIVE
Yes
No

CURIES

PHYSICAL STATE (Check one item only)
□ a. SOLID
□ b. LIQUID
□ c. GAS

LARGEST CONTAINER
50 lb bag

FED HAZARD CATEGORIES (Check all that apply)
□ a. FIRE
□ b. REACTIVE
□ c. PRESSURE RELEASE
□ d. ACUTE HEALTH
□ e. CHRONIC HEALTH

AVERAGE DAILY AMOUNT

MAXIMUM DAILY AMOUNT

ANNUAL WASTE AMOUNT

UNITS* (Check one item only)
□ a. GALLONS
□ b. CUBIC FEET
□ c. POUNDS
□ d. TONS

DAYS ON SITE:
365

STORAGE CONTAINER
□ a. ABOVE GROUND TANK
□ b. UNDERGROUND TANK
□ c. TANK INSIDE BUILDING
□ d. STEEL DRUM

□ e. PLASTIC/NONMETALLIC DRUM
□ f. CAN
□ g. CARBOY
□ h. SILO

□ i. FIBER DRUM
□ j. BAG
□ k. BOX
□ l. CYLINDER

□ m. GLASS BOTTLE
□ n. PLASTIC BOTTLE
□ o. TOTE BIN
□ p. TANK WAGON

□ q. RAIL CAR
□ r. OTHER

STORAGE PRESSURE
□ a. AMBIENT
□ b. ABOVE AMBIENT
□ c. BELOW AMBIENT

STORAGE TEMPERATURE
□ a. AMBIENT
□ b. ABOVE AMBIENT
□ c. BELOW AMBIENT
□ d. CRYOGENIC

%WT HAZARDOUS COMPONENT (For mixture or waste only)

EHS
□ Yes □ No

CAS #

Sodium Nitrate

7632-00-0
### I. FACILITY INFORMATION

**BUSINESS NAME (Same as FACILITY NAME or DBA – Doing Business As):**

Mojave Solar Project LLC

**FACILITY ID #:**

MAP#: 203  GRID#: 204

1-A  E35, F31, C22

### II. CHEMICAL INFORMATION

**CHEMICAL NAME:** Surfactant NP95

**COMMON NAME:** Surfactant

**CAS#:** 9016-45-9

**TRADE SECRET:** Yes

**EHS**

**Hazardous Material Type:**

- [ ] a. PURE
- [ ] b. MIXTURE
- [ ] c. WASTE

**Physical State:**

- [ ] a. SOLID
- [ ] b. LIQUID
- [ ] c. GAS

**FED HAZARD CATEGORIES:**

- [ ] a. FIRE
- [ ] b. REACTIVE
- [ ] c. PRESSURE RELEASE
- [ ] d. ACUTE HEALTH
- [ ] e. CHRONIC HEALTH

**AVERAGE DAILY AMOUNT:** 300

**MAXIMUM DAILY AMOUNT:** 440

**UNITS**

- [ ] a. GALLONS
- [ ] b. CUBIC FEET
- [ ] c. POUNDS
- [ ] d. TONS

**STORAGE CONTAINER:**

- [ ] a. ABOVE GROUND TANK
- [ ] b. UNDERGROUND TANK
- [ ] c. TANK INSIDE BUILDING
- [ ] d. STEEL DRUM

**STORAGE PRESSURE:**

- [ ] a. AMBIENT
- [ ] b. ABOVE AMBIENT
- [ ] c. BELOW AMBIENT

**STORAGE TEMPERATURE:**

- [ ] a. AMBIENT
- [ ] b. ABOVE AMBIENT
- [ ] c. BELOW AMBIENT
- [ ] d. CRYOGENIC

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## I. FACILITY / STATIONARY SOURCE IDENTIFICATION

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## II. OWNER/OPERATOR IDENTIFICATION

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## III. REGULATED SUBSTANCES LIST

### A. Name of Each Regulated Substance:

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<th>Name of Each Regulated Substance</th>
<th>Percent by Weight</th>
<th>Process Maximum Quantity (lbs.)</th>
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### B. Name of Each Regulated Substance in a Mixture:

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<th>Percent by Weight</th>
<th>Process Maximum Quantity (lbs.)</th>
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<td>2c.</td>
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### NOTES

Notes (Conversion Factors, Calculation Notes, Mixture Information, etc. Note which substance or mixture the note applies to): 2223

## IV. CERTIFICATION

I, as the owner or operator of the aforementioned business, hereby certify that the registration information provided above is true, accurate and complete to the best of my knowledge, based upon reasonable inquiry. I am fully aware that this certification, executed on the date indicated below, is made under penalty of perjury under the laws of the State of California.

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<th>NAME OF OWNER/OPERATOR</th>
<th>TITLE OF OWNER/OPERATOR</th>
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# Emergency Plan - HMBP

**Title:** Annex 02 Material Safety Data Sheets  

**Process:** Business Emergency Contingency Plan  

**Project:** Mojave Solar Project  

<table>
<thead>
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<th>Document No:</th>
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<tr>
<td>Revision:</td>
<td>01</td>
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<td>Date:</td>
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**Prepared by:**  
Kirk Anderson – Environmental Engineer  

**Reviewed by:**  
Efrain Perez – Quality Manager  
Steven Pochmara – Permitting Manager  

**Approved by:**  
Nicolas Gallo – Project Sub Director  
Rafael Sanchez Mendoza – Project Director

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Sodium hypochlorite, 10-25% chlorine

MSDS Name: Sodium hypochlorite, 10-25% chlorine
Catalog Numbers: 1932, 1933
7881-52-9 Sodium hypochlorite 10-25%
291-688-3 Hazard Symbols: C Risk Phrases: 31 34

EMERGENCY OVERVIEW
Contact with acids liberates toxic gas. Causes burns. Light sensitive.

POTENTIAL HEALTH EFFECTS
Eye: Causes eye burns. Causes redness and pain.
Skin: Causes skin burns. Causes redness and pain.
Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea.
Causes gastrointestinal tract burns.
Inhalation: May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. Causes chemical burns to the respiratory tract.

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure demand,
MSHA/NIOSH (approved or equivalent), and full protective gear. Substance is noncombustible.
Oxidizer: Greatly increases the burning rate of combustible materials.

Extinguishing Media:
Use water spray, dry chemical, carbon dioxide, or chemical foam.

General Information:
Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container.

Handling: Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Use only in a chemical fume hood.
Storage: Store in a tightly closed container. Store in a dry area. Keep refrigerated. (Store below 4°C/39°F.)

Engineering Controls
Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

PERSONAL PROTECTIVE EQUIPMENT
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Physical State: Clear liquid
Color: yellow
Odor: disagreeable odor - sweatish odor
pH: Not available
Vapor Pressure: 17.5 mm Hg @ 20 deg C
Viscosity: Not available
Boiling Point: Not available
Freezing/Melting Point: -16 deg C (3.20° F)
Autoignition Temperature: Not available
Flash Point: Not available
Explosion Limits: Lower: Not available
Explosion Limits: Upper: Not available
Decomposition Temperature: Not available
Solubility in water: Soluble
Specific Gravity/Density: 1.2090g/cm3
Molecular Formula: NaOCl
Molecular Weight: 74.44

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, light, combustible materials, temperatures
above 40°C.
Incompatibilities: Metals, reducing agents, strong acids, amines, ammonia, acids with Other Materials (organic, e.g. acetic
acid, benzoic acid, formic acid, methanoic acid, oxalic acid), methanol, ammonium salts.

Hazardous
Decomposition
Products
Hydrogen chloride, chlorine, sodium oxide.
Hazardous
Polymerization
Will not occur.

RTECS#: CAS# 7681-52-9: NH3486300
LD50/LC50: RTECS
CAS# 7681-52-9: Draize test, rabbit, eye: 10 mg Moderate;
Draize test, rabbit, eye: 1.31 mg Mild;
Oral, mouse: LD50 = 5800 mg/kg;

Carcinogenicity: Sodium hypochlorite - IARC, Group 3 (not classifiable)
Other: See actual entry in RTECS for complete information.

Ecotoxicity: Fish: Rainbow trout: 0.07 mg/l; 48h;
Fish: Fathead Minnow: 5.9 mg/l; 96h;

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information
HS Code 2828 90 00 Storage class (VCI) 8 B Non-flammable
Corrosive materials
GGVS Packing
category
A WGM 2 (polluting
substance)
Storage Store below +15°C.
Domestic (Land, ADR.)

Proper Shipping Name: HYPOCHLORITE SOLUTION
Hazard Class: 8
Hazard Code: C9
UN No.: 1791
Packing Group: III
GGVS 8/C 9 III GBVE 8/C 9 III
ADR 8/C 9 III RID 8/C 9 III
International (Water, I.M.O.)

Proper Shipping Name: HYPOCHLORITE SOLUTION
Hazard Class: 8
Hazard Code: C9
UN No.: 1791
Packing Group: III
IMDG Code 8 UN number
(transport by sea)
1791
International (Air, I.C.A.O.)

Proper Shipping Name: HYPOCHLORITE SOLUTION
Hazard Class: 8
Hazard Code: C9
UN No.: 1791
Packing Group: III
UN number
(transport by air)
1791 CAO CARGO
Packing
instructions
821
PAX Packing
instructions
819
Section 15 - Regulatory Information
European/International Regulations
WGK (Water Danger/Protection)
CAS# 7681-52-9: 2
Canada
CAS# 7681-52-9 is listed on Canada’s DSL List
US Federal
European Labeling in Accordance with EC Directives
Hazard Symbols: C
Risk Phrases:
R 31 Contact with acids liberates toxic gas.
R 34 Causes burns.
Safety Phrases:
S 28A After contact with skin, wash immediately with plenty of water.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 50A Do not mix with acids.
TSCA
CAS# 7681-52-9 is listed on the TSCA Inventory.
Section 16 - Additional Information
The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty, and assume no liability resulting from its use. Users should make their own inquiry to determine the suitability of the information for their particular purposes. In no way the company or any of it employees will be liable for any kind of damages, howsoever arising, even if the company has been advised of the possibility of such damages.
Date of issue 01.08.08
SODIUM BISULPHITE SOLUTION 35% P/V PRS

SODIUM BISULPHITE SOLUTION 35% P/V PRS
Material Safety Data Sheets (MSDS)
Revision date: 20/3/2008
Página 1 de 5
SODIUM BISULPHITE SOLUTION 35% P/V PRS MSDS (MATERIAL SAFETY DATA SHEETS)

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING.
   1.1 Identification of the substance or preparation.
   Name: SODIUM BISULPHITE SOLUTION 35% P/V PRS
   Code: B1100

   1.2 Use of the substance/preparation.

2. HAZARDS IDENTIFICATION.
   Harmful if swallowed.
   Contact with acids liberates toxic gas.

3. COMPOSITION/INFORMATION ABOUT THE COMPONENTS.
   Substances presenting a health or environmental hazard within the meaning of Directive 67/548/EEC:
   Index No CAS No. EC No Registration
   number Name Concentrate % Symbols R phrases *
   016-064-00-8 7631-90-5 231-548-0 sodium bisulphite
   35% 25 - 50 % Xn R22 R31
   *
   * The complete text of the R phrases is given in section 16 of this Safety Data Sheet.

4. FIRST AID.
   In case of doubt or when symptoms of feeling unwell persist, get medical attention. Never administer anything orally to
   persons who are unconscious.
   Inhalation.
   Take the victim into open air; keep them warm and calm. If breathing is irregular or stops, perform artificial respiration. Do not
   administer anything orally. If unconscious, place them in a suitable position and seek medical assistance.
   Eye contact.
   If wearing contact lenses, remove them. Wash eyes with plenty of clean and cool water for at least 10 minutes while pulling
   eyelids up, and seek medical assistance.
   Skin contact.
   Remove contaminated clothing. Wash skin vigorously with water and soap or a suitable skin cleaner. NEVER use solvents or
   thinners.
   Ingestion.
   If accidentally ingested, seek immediate medical attention. Keep calm. NEVER induce vomiting.

5. FIRE FIGHTING MEASURES.
   Recommended extinguishing methods.
   Extinguisher powder or CO2. In case of more serious fires, also alcohol-resistant foam and water spray. Do not use a direct
   stream of water to extinguish.
   Special risks.
   Fire can cause thick, black smoke. As a result of thermal decomposition, dangerous products can form: carbon monoxide,
   carbon dioxide. Exposure to decomposition products can be harmful to your health.
   Fire protection equipment.
   According to the size of the fire, it may be necessary to use protective suits against the heat, individual breathing
   equipment, gloves, protective goggles or facemasks, and gloves.
   Other recommendations.
   Use water to cool tanks, cisterns, or containers close to the heat source or fire. Take wind direction into account.
   Prevent the products used to fight the fire from going into drains, sewers, or waterways.

6. MEASURES TO TAKE IN CASE OF ACCIDENTAL SPILL.
   Individual precautions.
   Eliminate possible ignition points and ventilate the area. Avoid breathing fumes. For exposure control and individual
   protection measures, see section 8.
   Cleaning methods.
   Pick up the spill with non-combustible absorbent materials (soil, sand, vermiculite, diatomite, etc.). Pour the product and the
   absorbent in an appropriate container. The contaminated area should be immediately cleaned with an appropriate de-
contaminator. Pour the decontaminator on the remains in an opened container and let it act various days until no further reaction is produced. For later elimination of waste, follow the recommendations under section 13.

Environmental protection precautions.
Prevent the contamination of drains, surface or subterranean waters, and the ground. In case of large spills or if the product contaminates lakes, rivers, or sewers, inform the responsible authorities according to local legislation.

7. HANDLING AND STORAGE.
7.1 Handling.
The fumes are heavier than air and can spread across the ground. They can form explosive mixtures with air. Prevent the creation of flammable or explosive fume concentrations in the air; prevent fume concentrations above work exposure limits. The preparation must only be used in areas where all unprotected flames and other ignition points have been eliminated. Electrical equipment has to be protected according to applicable standards. The preparation can be electrostatically charged; always use earth grounds when transferring the product. Operators must use anti-static footwear and clothing, and floors must be conductors. Keep the container tightly closed and isolated from heat sources, sparks, and fire. Do not use tools that can cause sparks. Prevent the preparation from contacting the skin or eyes. Avoid the inhalation of fumes and mists that form when spraying. For personal protection, see section 8. Never use pressure to empty the containers. They are not pressure-resistant containers. In the application area, smoking, eating, and drinking must be prohibited. Follow legislation on occupational health and safety. Keep the product in containers made of a material identical to the original.

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SODIUM BISULPHITE SOLUTION 35% P/V PRS MSDS (MATERIAL SAFETY DATA SHEETS)

7.2 Storage.
Store according to local legislation. Observe indications on the label. Store the containers between 5 and 35°C, in a dry and well-ventilated place, far from sources of heat and direct solar light. Keep far away from ignition points. Keep away from oxidising agents and from highly acidic or alkaline materials. Do not smoke. Prevent the entry of non-authorized persons. Once the containers are open, they must be carefully closed and placed vertically to prevent spills.

7.3 Specific use(s).

8. EXPOSURE CONTROL/PERSOmal PROTECTION.
8.1 Exposure limits.
Work exposure limit for:
Name VLA-ED * VLA-EC *
ppm mg/m³ ppm mg/m³
* According to the list of Limit Environmental Professional Exposure Values adopted by the National Institute for Safety and Hygiene at Work for the year 2007.

8.2 Exposure controls
Measures of a technical nature: provide adequate ventilation, which can be achieved by using good local exhaust ventilation and a good general exhaust system. If this were not enough to keep the particulate and fume concentrations of the solvent below the work exposure limit, suitable breathing equipment must be used. Breathing protection: when workers are subjected to concentrations above the exposure limit, they must use suitable and officially approved equipment. Use active carbon masks. Hand protection: for prolonged or repeated contact, use polyvinyl alcohol or nitrile rubber types of gloves. Protective creams can help to protect exposed areas of the skin. These creams must NEVER be applied once exposure has occurred. Eye protection: use protective goggles especially designed to protect against liquid splatters. Install emergency eyewashes near the use area. Skin protection: personnel must wear anti-static clothing made of natural fibre or synthetic fibres resistant to high temperatures. All body parts that have been in contact with the preparation must be washed.

9. PHYSICAL AND CHEMICAL PROPERTIES.
Aspect: Liquid with characteristic odour and colour
Smell:

9.2. Important health, safety and environmental information.
pH:
Boiling Point: °C
Flash point: °C
Inflammability (solid, gas):
Explosive properties:
Combustive properties:
Vapour pressure:
10. STABILITY AND REACTIVITY.
Stable under the recommended handling and storage conditions (see section 7). In case of fire, dangerous decomposition products can be generated, such as carbon monoxide and dioxide and nitrogen fumes and oxides. Keep away from oxidising agents and from highly alkaline or acidic materials in order to prevent exothermic reactions.

11. TOXICOLOGICAL INFORMATION.
There are no tested data available on the product. Exposure to concentrations of solvent fumes above the work exposure limit can have negative effects (for example, irritation of the mucous membranes and respiratory system, adverse effects on the kidneys, liver, and the central nervous system). Among the symptoms are headaches, vertigo, fatigue, muscular weakness, drowsiness, and in extreme cases, unconsciousness. Repeated or prolonged contact with the preparation can cause the elimination of oil from the skin, giving rise to nonallergic contact dermatitis and absorption of the preparation through the skin. Splatters in the eyes can cause irritation and irreversible damage.

12. ECOLOGICAL INFORMATION.
There are no tested data available on the preparation. The product must not be allowed to go into sewers or waterways.
Prevent penetration into the ground. Prevent the emission of solvents into the atmosphere.

13. ELIMINATION CONSIDERATIONS.
Dumping into sewers or waterways is prohibited. Waste and empty containers must be handled and eliminated according to current, local/national legislation.

14. INFORMATION PERTAINING TO TRANSPORT.
Transport following ADR/TPC rules for highway transport, RID rules for railway, IMDG for sea, and ICAO/IATA for air transport.
Transport method
14.1 Land: Transport by road: ADR 2007, Transport by rail: RID
UN no.: 2693 Class: 8 Packaging group: III
Labels: 8 Hazard number: 80
Transport documentation: Consignment note and written instructions
14.2 Sea: Transport by ship: IMDG 33-06
UN no.: 2693 Class: 8 Packaging group: III
Labels: 8
Transport documentation: Bill of lading
14.3 Air: Transport by plane: IATA/ICAO
UN no.: 2693 Class: 8 Packaging group: III
Labels: 8
Transport document: Airway bill

15. REGULATORY INFORMATION.
R22 Harmful if swallowed.
R31 Contact with acids liberates toxic gas.
S2 Keep out of the reach of children.
S25 Avoid contact with eyes.
S46 If swallowed, seek medical advice immediately and show this container or label.
Contains: sodium bisulphite 35%

16. OTHER INFORMATION.
Complete text of the R phrases that appear in section 3:
R22 Harmful if swallowed.
R31 Contact with acids liberates toxic gas.
The information given in this Safety Data Sheet has been drafted in accordance with REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation,

The information in this Safety Data Sheet on the Preparation is based on current knowledge and on current EC and national laws, as far as the working conditions of the users is beyond our knowledge and control. The product must not be used for purposes other than those that are specified without first having written instructions on how to handle. It is always the responsibility of the user to take the appropriate measures in order to comply with the requirements established by current legislation. The information contained in this Safety Sheet only states a description of the safety requirements for the preparation, and it must not be considered as a guarantee of its properties.
Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification
Product Name: Sulfuric acid
Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793
CAS#: 7664-93-9
RTECS: W5560000
TSCA: TSCA 8(b) inventory: Sulfuric acid
CIF#: Not applicable.
Synonym: Oil of Vitriol; Sulfuric Acid
Chemical Name: Hydrogen sulfate
Chemical Formula: H2SO4

Section 2: Composition and Information on Ingredients
Composition:
Name CAS # % by Weight
Sulfuric acid 7664-93-9 95 - 98

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]; VAPOR (LC50): Acute: 510 mg/m2 hours [Rat.]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification
Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeant), of eye contact (irritant, corrosive), of ingestion, or inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth, and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA, Classified A2 (Suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged exposure to the spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures
Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.
Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.
Auto-Ignition Temperature: Not applicable.
Flash Points: Not applicable.
Flammable Limits: Not applicable.

Products of Combustion:
Products of combustion are not available since material is non-flammable. However, products of decomposition include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxide, nitroaryl amines, hexafluorohydride, phosphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:
Mixtures of sulfuric acid and any of the following can explode: pentanes, trihydroxaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxycromate, mercuric nitrate, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbonates, phosphorous, iodides, picrates, fulminates, diones, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Tintritothexahydro-1,3,5-triazine + sulfuric acid causes explosive decomposition.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapor. Prevent entry into sewers, basements or confined areas; ditch if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up. Keep container dry. Do not ingest. Do not breathe gas/fumes/vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots. Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m3) from NIOSH [United States] Inhalation TWA: 1 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.
Section 9: Physical and Chemical Properties
Physical state and appearance: Liquid. (Thick oily liquid.)
Odor: Odorless, but has a choking odor when hot.
Taste: Marked acid taste. (Strong.)
Molecular Weight: 98.08 g/mole
Color: Colorless.
pH (1% solution): Acidic.
Boiling Point:
270°C (518°F) - 340 deg. C Decomposes at 340 deg. C
Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)
Critical Temperature: Not available.
Specific Gravity: 1.84 (Water = 1)
Vapor Pressure: Not available.
Vapor Density: 3.4 (Air = 1)
Volatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicty (in Water): Not available.
Dispersion Properties: See solubility in water.
Solubility:
Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data
Stability: The product is stable.
Instability Temperature: Not available.
Conditions of Instability:
Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.
Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.
Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, hydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone-nitrile acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile + water, Alcohols + hydrogen peroxide, alky compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium tripelchromate, Aniline, Bromate + metals, Bromine pentfluoride, n-Butyraldehyde, Carbides, Cesium acetylène carbide, Chlorates, Cyclicpentanone oxime, chlorates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitroanilinethione + sulfur, Disobutylene, p-dimethylaminobenzaldheyde, 1,3-Diazobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorhydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, Ethylenimine.
Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptfluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesyl chloride, Mercury nitride, Metals (powdered). Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasler trihydroxidiminoalphosphate, Perchlorates, Peroxidic acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Phosphorus pentoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + water, Propionamide (beta)-. Pyridine, Rubidium acetylène carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thallium (I) azidotrichloroformate, Zinc chloride, Zinc iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetelides,
Hydrogen gas is generated in the action on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.).
Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:
Non-corrosive to lead and mild steel, but dilute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.
Polymerization: Will not occur.
Section 11: Toxicological Information
Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.
Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2,140 mg/kg [Rat]. Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs. (RTCS). Teratogenicity: neither embryotoxic, fetotoxic, nor teratogenic in mice or rabbits at inhaled doses producing some maternal toxicity.

Special Remarks on other Toxic Effects on Humans:
Acute Potency: Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse (similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and distant urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth/changes in teeth and supporting structures - erosion, discoloration. Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart lesions), and respiration/lungs/pulmonary edema, lung damage), teeth (dental discoloration, erosion.) Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information
Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].
BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations
Waste Disposal:
Sulfuric acid may be placed in sealed container or absorbed in vermicuile, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information
DOT Classification: Class 8. Corrosive material
Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information
Federal and State Regulations:

Other Regulations:

Other Classifications:
WHMIS (Canada):
CLASS D-1A. Material causing immediate and serious toxic effects (VERY TOXIC), CLASS E. Corrosive liquid.

DSCL (EEC):
R35- Causes severe burns. S2- Keep out of the reach of children. S28- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
| HMIS (U.S.A.): |  |
| Health Hazard: 3 |  |
| Fire Hazard: 0 |  |
| Reactivity: 2 |  |
| Personal Protection: |  |
| National Fire Protection Association (U.S.A.): |  |
| Health: 3 |  |
| Flammability: 0 |  |
| Reactivity: 2 |  |
| Specific hazard: |  |
| Protective Equipment: |  |
| Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield. |  |
| Section 16: Other Information |  |
| References: |  |
| Other Special Considerations: Not available. |  |
| Created: 10/09/2005 11:58 PM |  |
| Last Updated: 06/09/2012 12:00 PM |  |
Sodium Hydroxide, 50% MSDS

Section 1: Chemical Product and Company Identification
Product Name: Sodium Hydroxide, 50%
Catalog Codes: SLS3127, SLS4549
CAS#: Mixture.
RTECS: Not applicable.
TSCA: TSCA (8(b) inventory: Sodium hydroxide; Water
Cf: Not applicable.
Synonym: Sodium Hydroxide, 50% Solution
Chemical Name: Not applicable.
Chemical Formula: Not applicable.

Section 2: Composition and Information on Ingredients
Composition:
Name CAS # % by Weight
Sodium hydroxide 1310-73-2 50
Water 7732-18-5 50

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification
Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion.
Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures
Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention immediately. Finish by rinsing thoroughly with running water to avoid a possible infection.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data
Flammability of the Product: Non-flammable.
Auto-Ignition Temperature: Not applicable.
Flash Points: Not applicable.
Flammable Limits: Not applicable.
Products of Combustion: Not available.
Fire Hazards in Presence of Various Substances: Not applicable.
Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.
Fire Fighting Media and Instructions: Not applicable.
Special Remarks on Fire Hazards: Not available.
Special Remarks on Explosion Hazards:
Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzene sulfonate prepared from allyl alcohol, and benzene sulfonil chloride in presence of aqueous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxide + impure tetrahydrofuran, which can contain peroxides, can cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion. (Sodium hydroxide)

Section 6: Accidental Release Measures
Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary, Neutralize the residue with a dilute solution of acetic acid.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage
Precautions:
Do not ingest. Do not breathe gas/fumes/vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection
Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Sodium hydroxide STEL: 2 (mg/m³) from ACGIH (TLV) [United States] TWA: 2 (mg/m³) from OSHA (PEL) [United States] CEIL: 2 (mg/m³) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties
Physical state and appearance: Liquid.
Odor: Odorless.
Taste: Alkaline. Bitter. (Strong.)
Molecular Weight: Not applicable.
Color: Clear Colorless.

pH (1% soln/water): Basic.
Boiling Point: 140°C (284°F)
Melting Point: 12°C (53.6°F)
Critical Temperature: Not available.
Specific Gravity: 1.53 (Water = 1)
Vapor Pressure: The highest known value is 2.3 kPa (\text{20°C}) (Water).
Vapor Density: The highest known value is 0.62 (Air = 1) (Water).
Volatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.
Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data
Stability: The product is stable.
Instability Temperature: Not available.
Conditions of Instability: Excess heat, incompatible materials, water/moisture.
Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, metals, acids, alkalies. Slightly reactive with water.

Corrosivity:
Extremely corrosive in presence of aluminum, brass. Corrosive in presence of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process. Generates considerable heat when a sodium hydroxide solution is mixed with an acid. Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahydrofuran is very exothermic, a mild explosion being noted on one occasion. Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanico acid, oxalic acid), aldehydes (e.g. acetaldheyde, acrolein, chloral hydrate, foraldehyde), carbanates (e.g. carbonat, carbouren), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetonophene, MEK, MBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e. aluminum, tin, zinc, hafnium, rare metal), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. beryllium, lead acetate, nickel carbonyl, tetraethyl lead), nitrates (e.g. potassium nitrate, sodium nitrate), nitrates (e.g. acetanilide, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, hydroquinone, chlorohydrin, chlorosulfonic acid, ethylene cyanhydrin, glyoxal, hydroxysulfuric acid, oleum, propolactone, acylonitrile, phosorous pentoxide, chloroform, and other substances dissolved, tetrahydrofuran, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde. Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen. (Sodium hydroxide)

Special Remarks on Corrosivity:
Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information
Routes of Entry: Absorbed through skin, Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Investigation as a mutagen (cytogenetic analysis), but no data available. (Sodium hydroxide)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May be harmful if absorbed through skin. Causes severe skin irritation and burns. May cause deep penetrating ulcers of the skin. Eyes: Causes severe eye irritation and burns. May cause chemical conjunctivitis and corneal damage. Inhalation: Harmful if inhaled. Causes severe irritation of the respiratory tract and mucous membranes with coughing, burns, breathing difficulty, and possible coma. Irritation may lead the chemical pneumonitis and pulmonary edema. Causes chemical burns to the respiratory tract and mucous membranes. Ingestion: May be fatal if swallowed. May cause severe and permanent damage to the digestive tract. Causes

Section 12: Ecological Information
Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations
Waste Disposal:
Waste must be disposed in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information
DOT Classification: Class 8: Corrosive material
Identification: Sodium hydroxide, solution (Sodium hydroxide) UNNA: UN1824 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information
Federal and State Regulations:

Other Classifications:
WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
HMIS (U.S.A.):
Health Hazard: 3
Fire Hazard: 0
Reactivity: 1

Personal Protection:
National Fire Protection Association (U.S.A.):
Health: 3
Flammability: 0
Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information
References: Not available.
Other Special Considerations: Not available.
Created: 10/09/2005 08:32 PM
Last Updated: 06/09/2012 12:00 PM
# Ferric Chloride, 41 Be' (40% w/v) MSDS

**Section 1: Chemical Product and Company Identification**

- **Product Name:** Ferric Chloride, 41 Be' (40% w/v)
- **Catalog Codes:** SLF1105
- **CAS #:** Mixture.
- **RTECS:** Not applicable.
- **TSCA:** TSCA 8(b) inventory: Ferric chloride; Water
- **CT#:** Not available.
- **Synonym:**
- **Chemical Name:** Not applicable.
- **Chemical Formula:** Not applicable.

**Section 2: Composition and Information on Ingredients**

- **Composition:**
  - Name CAS % by Weight
  - Ferric chloride 7705-06-0 40
  - Water 7732-18-5 60

- **Toxicological Data on Ingredients:** Ferric chloride: ORAL (LD50): Acute: 500 mg/kg [Rat], 1278 mg/kg [Mouse].

**Section 3: Hazards Identification**

- **Potential Acute Health Effects:**
  - Extremely hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (corrosive). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.
  - Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

- **Potential Chronic Health Effects:**
  - Extremely hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (corrosive). Non-sensitizer for skin. Non-permeator by skin. CARCINOGENIC EFFECTS: Not available.
  - MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce physical damage to organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

**Section 4: First Aid Measures**

- **Eye Contact:** Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an ointment. Seek medical attention.

- **Skin Contact:** If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groins. Cold water may be used. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

- **Serious Skin Contact:** Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

- **Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

- **Serious Inhalation:**
  - Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation, WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

- **Ingestion:**
  - Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Section 5: Fire and Explosion Data**

- **Flammability of the Product:** Non-flammable.
- **Auto-Ignition Temperature:** Not applicable.
- **Flash Points:** Not applicable.
- **Flammable Limits:** Not applicable.
- **Products of Combustion:** Not available.
- **Fire Hazards in Presence of Various Substances:** Not applicable.
Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures
Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary, neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use either spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage
Precautions:
Keep container dry. Do not ingest. Do not breathe gas/fumes/vapour/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage:
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection
Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Ferric chloride TWA: 1 CEIL: 2 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties
Physical state and appearance: Liquid.
Odor: Not available.
Taste: Not available.

Molecular Weight: Not applicable.
Color: Yellowish-brown. (Dark.)

pH (1% soln/water): Acidic.
Boiling Point: The lowest known value is 100°C (212°F) (Water).

Melting Point: Not available.

Critical Temperature: Not available.
Specific Gravity: 1.394 (Water = 1)

Vapor Pressure: The highest known value is 17.535 mm of Hg (@ 20°C) (Water).
Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Vapor Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Vincenti (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data
Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:
Highly corrosive in presence of copper. Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.
Polymerization: No.

Section 11: Toxicological Information
Routes of Entry: Eye contact, Inhalation, Ingestion.
Toxicity to Animals: Acute oral toxicity (LD50): 2250 mg/kg (Rat) (Calculated value for the mixture).
Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.
Other Toxic Effects on Humans:
Extremely hazardous in case of skin contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (corrosive).
Special Remarks on Toxicity to Animals: Not available.
Special Remarks on Chronic Effects on Humans: Not available.
Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information
Ecotoxicity: Not available.
BOD5 and COD: Not available.
Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.
Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.
Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations
Waste Disposal:

Section 14: Transport Information
DOT Classification: CLASS 8: Corrosive liquid.
Identification: Ferric chloride, Solution (Ferric chloride) : UN2582 PG: III
Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information
Federal and State Regulations:
Pennsylvania RTK: Ferric chloride Massachusetts RTK: Ferric chloride TSCA 8(b) inventory: Ferric chloride; Water CERCLA: Hazardous substances: Ferric chloride;
Other Classifications:
WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.
HMIS (U.S.A.): Health Hazard: 3 Fire Hazard: 0 Reactivity: 0

Personal Protection:
National Fire Protection Association (U.S.A.):
Health: 3

Other Special Considerations: Not available.

References: Not available.

Other Special Considerations: Not available.
Created: 10/09/2005 06:32 PM
Last Updated: 06/09/2012 12:00 PM
Magnesium Sulfate Anhydrous MSDS

Section 1: Chemical Product and Company Identification
Product Name: Magnesium sulfate anhydrous
Catalog Codes: SLM2992, SLM2227
CAS#: 7487-88-9
RTECS: OM4500000
TSCA: TSCA 8(b) inventory: Magnesium sulfate anhydrous
CFR: Not available.
Synonym:
Chemical Formula: MgSO4
Contact Information:
Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396
US Sales: 1-800-901-7247
International Sales: 1-281-441-4400
Order Online: Sciencelab.com
CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300
International CHEMTREC, call: 1-703-527-3887
For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients
Composition:
Name CAS % by Weight
Magnesium sulfate anhydrous 7487-88-9 100
Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification
Potential Acute Health Effects:
Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation.
Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures
Eye Contact: Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used.
Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention.
Serious Skin Contact: Not available.
Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.
Serious Inhalation: Not available.
Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.
Serious Ingestion: Not available.

Section 5: Fire and Explosion Data
Flammability of the Product: Non-flammable.
Auto-ignition Temperature: Not applicable.
Flash Points: Not applicable.
Flammable Limits: Not applicable.
Products of Combustion: Not available.
Fire Hazards in Presence of Various Substances: Not applicable.
Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Section 6: Accidental Release Measures
Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evaporate through the sanitary system.

Section 7: Handling and Storage
Precautions: No specific safety phrase has been found applicable for this product.

Storage:
No specific storage is required. Use shelves or cabinets sturdy enough to bear the weight of the chemicals. Be sure that it is not necessary to strain to reach materials, and that shelves are not overstocked.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties
Physical state and appearance: Solid.
Odor: Not available.
Taste: Not available.
Molecular Weight: 120.38 g/mole
Color: Not available.
pH (1% soln/water): Not available.
Boiling Point: Not available.
Melting Point: Not available.
Critical Temperature: Not available.
Specific Gravity: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Vatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: See solubility in water.
Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data
Stability: The product is stable.
Instability Temperature: Not available.
Conditions of Instability: Not available.
Incompatibility with various substances: Not available.
Corrosivity: Non-corrosive in presence of glass.
Special Remarks on Reactivity: Not available.
Special Remarks on Corrosivity: Not available.
Polymerization: No.

Section 11: Toxicological Information
Routes of Entry: Ingestion.
Toxicity to Animals:
LD50: Not available. LC50: Not available.
Chronic Effects on Humans: Not available.
Other Toxic Effects on Humans:
Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant). of inhalation.
Special Remarks on Toxicity to Animals: Not available.
Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.
Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information
Ecotoxicity: Not available.
BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA, 8(b) inventory. Magnesium sulfate anhydrous

Other Regulations: Not available.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

This product is not classified according to the EU regulations.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves, Lab coat, Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:22 PM

Last Updated: 06/09/2012 12:00 PM
Dihydroxyaluminum Sodium Carbonate MSDS

Section 1: Chemical Product and Company Identification
Product Name: Dihydroxyaluminum Sodium Carbonate
Catalog Codes: SLD2883
CAS#: 16482-55-6
RTECS: Not available.
TSCA: TSCA 8(b) inventory: No products were found.
Cf#: Not available.
Synonym: Rolaid; Aluminum sodium carbonate hydroxide; Sodium aluminum, hydroxycarbonate; Aluminate(1-), (carbonato)dihydroxy-, sodium
Chemical Name: Dihydroxyaluminum Sodium Carbonate
Chemical Formula: NaAl(OH)2CO3

Section 2: Composition and Information on Ingredients
Composition:
Name CAS % by Weight
Dihydroxyaluminum Sodium Carbonate 16482-55-6 100
Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification
Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, or inhalation.
Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 4 (No evidence) by NTP, None by OSHA, None by NIOSH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures
Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.
Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.
Serious Skin Contact: Not available.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Serious Inhalation: Not available.
Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.
Serious Ingestion: Not available.

Section 5: Fire and Explosion Data
Flammability of the Product: Non-flammable.
Auto-Ignition Temperature: Not applicable.
Flash Points: Not applicable.
Flammable Limits: Not applicable.
Products of Combustion: Not available.
Fire Hazards in Presence of Various Substances: Not applicable.
Fire Fighting Media and Instructions: Not applicable.
Special Remarks on Fire Hazards: Not available.
Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures
Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.
Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage
Precautions: Do not breathe dust. Keep away from incompatibles such as acids.
Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent.

Gloves:
Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Powdered solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 144 g/mole

Color: White.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: 0.8 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

 Ionicity (in Water): Not available.

Dispersion Properties: Is not dispersed in cold water, hot water.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with acids.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified 4 (no evidence) by NTP, None. by OSHA, None. By NIOSH.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health Effects: May cause skin irritation and dry skin. Eyes: Causes eye irritation. Inhalation: Excess inhalation may cause local irritation of the throat and respiratory tract. Ingestion: Low toxicity. Low hazard. Approved by FDA for use as an antacid.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations
Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information
DOT Classification: Not a DOT controlled material (United States).
Identification: Not applicable.
Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information
Federal and State Regulations: No products were found.
Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.
Other Classifications:
WHMIS (Canada): Not controlled under WHMIS (Canada).
OSHL (EEC):
This product is not classified according to the EU regulations. Not applicable.
HMIS (U.S.A.):
Health Hazard: 1
Fire Hazard: 0
Reactivity: 0
Personal Protection: E
National Fire Protection Association (U.S.A.):
Health: 1
Flammability: 0
Reactivity: 0
Specific hazard:
Protective Equipment:
Gloves, Lab coat, Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information
References: Not available.
Other Special Considerations: Not available.
Created: 10/10/2005 01:03 AM
Last Updated: 06/09/2012 12:00 PM
Hydrated lime

MATERIAL SAFETY DATA SHEET
(Prepared in accordance with Annex II of the REACH Regulation (EC) 1907/2006)
1: Identification of the substance / preparation and of the company / undertaking
1.1: Identification of the substance or preparation
Substance Name Hydrated lime
Synonyms
Slaked lime, Air slaked lime, Building lime, Fat lime, Chemical lime, Coarse Lime, Finishing lime, Mason's lime, Calcium
hydroxide, Calcium hydroxide, Calcium hydrate, Lime, Lime water, Bulk Hydrate, Hydrated Lime, Milk of Lime, Thick Lime
Please note that this list may not be exhaustive.
Chemical Name and Formula Calcium hydroxide – Ca(OH)\textsubscript{2}
Trade Name Hydropure, White Rhino Hydrated Lime
CAS N° 1305-62-0
ENECs N° 216-137-3
Molecular Weight 74.09
1.2: Use of the substance
Building material industry
Chemical industry
Agriculture
Biocidal use
Environmental protection (e.g. flue gas treatment, waste water treatment, sludge treatment)
Drinking water treatment
Feed, food and pharmaceutical industry
Civil engineering
Paper and paint industry
Glass industry
Hydrated Lime MSDS – Page 2/7
2: Hazard identification
2.1: Indication of hazard
Xi Irritant
2.2: Human health
Risk phrases
R37 Irritating to respiratory system
R36 Irritating to skin
R41 Risk of serious damage to eyes
Warning phrase
In contrast to the powder itself, the product, when diluted with water, can produce severe skin damage in humans, (alkaline
burns), especially if prolonged skin contacts takes place.
3: Composition / Information on ingredients
3.1: Composition
Calcium hydroxide, and minor constituents of geological origin, varying from source to source.
4: First-aid measures
4.1: Eyes
Irrigate eyes immediately with plenty of water and seek medical advice.
4.2: Inhalation
Move source of dust or move person to fresh air.
Obtain medical attention immediately.
4.3: Ingestion
Wash mouth with water and drink copious quantities of water. Do not induce vomiting. Seek medical
advice immediately.
4.4: Skin
Carefully and gently brush the contaminated body surfaces in order to remove all traces of product.
Wash affected area immediately with plenty of water. Remove contaminated clothing. If necessary
seek medical advice.
4.5: General advice
No known delayed effects. Consult a physician for all exposures except for minor instances.
5: Fire-fighting measures
5.1: Flammability
The substance is not flammable, and noncombustible,
It inhibits the spread of flame.

Hydrated Lime MSDS – Page 3/7

5.2: Extinguishing media
The product does not burn. Use a dry powder, foam or CO2 type of fire extinguishers to fight the surrounding fire.

5.3: Combustion products
When heated above 580°C, calcium hydroxide decomposes to produce calcium oxide (CaO) and water (H2O). Calcium oxide reacts with water and generates heat. This may cause risk to flammable material.

6: Accidental release measures
6.1: Personal precautions
Avoid contact with skin and eyes, keep dust levels to a minimum, and ensure that sufficient ventilation or suitable respiratory protective equipment is used (section 8).

6.2: Environmental precautions
Contain the spillage. Keep the material dry if possible. Cover area if possible to avoid unnecessary dust hazard. Avoid uncontrolled spills to watercourses and drains (pH rising). Any large spillage into watercourses must be alerted to the Environment Agency or other regulatory body.

6.3: Methods for cleaning up
Keep the material dry if possible. Pick up the product mechanically in a dry way. Use vacuum suction unit, or shovel into bags.

7: Handling and storage
7.1: Handling
7.1.1: Precautions for safe handling
Avoid contact with skin and eyes. Wear protective equipment (see section 8). Keep dust levels to a minimum. Minimize dust generation. Enclose dust sources, use exhaust ventilation (dust collector at handling points). Handling systems should preferably be enclosed. When handling bags usual precautions should be paid to the risks outlined in the Council Directive 90/269/EEC.

7.2: Storage
7.2.1: Precautions for safe storage
Store under dry conditions. Minimise contact with air and moisture. Bulk storage should be in purpose-designed silos. Keep away from acids, significant quantities of paper, straw, and nitro compounds. Keep out of reach of children. Do not use aluminium for transport or storage if there is a risk of contact with water.

Hydrated Lime MSDS – Page 4/7

8: Exposure controls / personal protection
8.1: Exposure limit values
8.1.1: CAS N° / EINECS N° 1305-62-0 / 215-137-3
8.1.2: Chemical name Calcium dihydroxide
8.1.3: Occupational exposure standard (OES) (OEL) 5mg/m3, (8hr TWA)

8.2: Exposure controls
8.2.1: Occupational exposure controls
Handling systems should preferably be enclosed or suitable ventilation installed to maintain atmospheric dust below the OES, if not wear suitable protective equipment.

8.2.1.1: Respiratory protection
Use appropriate respiratory protection against particles according to the risk level.

8.2.1.2: Hand protection
Use approved nitrile impregnated gloves having CE marks.

8.2.1.3: Eye protection
Tight fitting goggles with side shields, or wide vision
full goggles. Do not wear contact lenses when handling this product.
It is also advisable to have individual pocket eyewash.

8.2.1.4: Skin protection
Use clothing fully covering skin, full length pants, long sleeved overalls, with close fittings at openings.
Footwear resistant to caustics, and avoiding dust penetration.

8.2.1.5: General safety and hygiene measure
Wear clean, dry personal protective equipment. Barrier cream can be used if necessary. If heavily exposed daily, employees must shower, and if necessary use a barrier cream to protect exposed skin, particularly neck, face and wrists.

8.2.2: Environmental exposure controls. All ventilation systems should be filtered before discharge to atmosphere.

9: Physical and chemical properties

9.1: General information
9.1.1: Appearance White or off white (beige) fine powder.
9.1.2: Odor Slight earthy odor.

9.2: Important health, safety and environmental information
pH 12.4 Ca(OH)2 saturated solution at 25°C
Solubility in water
1850 mg/l at 0°C
1850 mg/l at 20°C
770 mg/l at 100°C

Hydrated Lime MSDS – Page 5/7
9.3: Other information
Melting point Decomposition at 580°C, to form CaO and H2O
Boiling point Not applicable
Specific gravity 2.24 g/cm³ at 20°C
Bulk density 200 – 800 kg/m³ at 20°C
Vapour pressure Non volatile
Partition coefficient Not applicable
Flash point Not applicable
Flammability Not flammable
Explosive properties Not flammable
10: Stability and reactivity
10.1: Conditions to avoid
Minimise exposure to air and moisture to avoid degradation.
When heated above 580°C, calcium hydroxide decomposes to produce calcium oxide (CaO) and
water (H₂O): Ca(OH)₂ → CaO + H₂O
10.2: Materials to avoid
Calcium hydroxide reacts with carbon dioxide to form Calcium carbonate:
Ca(OH)₂ + CO₂ → CaCO₃ + H₂O Calcium hydroxide reacts with acids to form
calcium salts. Calcium hydroxide reacts with aluminium and brass in the presence of moisture, under formation (or release) of
hydrogen gas: Ca(OH)₂ + 2 Al + 6 H₂O → Ca(Al(OH)₄)₂ + 3 H₂
10.3: Additional remarks
Calcium hydroxide absorbs carbon dioxide from air to form calcium carbonate, which is a common
material in the nature.
11: Toxicological information
11.1: Acute effect
Eye contact Risk of serious damage to eyes. Inhalation Inhalation of dust causes discomfort to the upper respiratory tract.
Irritant to the respiratory tract in high concentration of dust.
Ingestion: Calcium hydroxide is not toxic, a large amount may cause irritation to the gastrointestinal tract. Skin contact
Irritating to skin in the presence of moisture.
11.2: Long term exposure
Eye contact Risk of serious damage to eyes.
Inhalation: Prolonged and repeated inhalation of dust may affect the respiratory tract.

Skin contact
In case of prolonged skin contact, product may cause serious damage to skin in combination with moisture.

Hydrated Lime MSDS – Page 6/7
12: Ecological information
12.1: Ecotoxicity
12.1.1: Acute/Prolonged toxicity to fish
On Gambusia affinis LC50 = 160 mg/l for 96 hours, the substance is non-toxic, because LC50-value is > 100 mg/l.
12.1.2: Acute/Prolonged toxicity to aquatic invertebrates
No test data
12.1.3: Acute/Prolonged toxicity to aquatic plants
No test data
12.1.4: Toxicity to micro-organisms e.g. bacteria
At high concentration, through the rise of pH, calcium hydroxide is used for disinfection of
sewage sludges.
12.1.5: Chronic toxicity to aquatic organisms No data
12.1.6: Toxicity to soil dwelling organisms No data
12.1.7: Toxicity to terrestrial plants
No data, but calcium hydroxide is used as a
fertilizer.
12.1.8: General effect
Acute pH-effect. Although this product is useful to correct water acidity, an excess of more than 1 g/l may be harmful to
aquatic life. pH-value of > 12 will rapidly decrease as result of dilution and carbonation.
12.2: Mobility
Calcium dihydroxide reacts and/or carbon dioxide to form calcium carbonate, which is sparingly soluble, and so presents a low mobility in most ground. Moreover this product is used as fertilisers.

12.3: Persistence and degradability
Not relevant for inorganic substances.
12.4: Bioaccumulative potential
Not relevant for inorganic substances.

13: Disposal considerations
Disposal should be in accordance with local and national legislation.

14: Transport information

14.1: Transport consideration
14.1.1: Classification Not classified as hazardous for transport.
14.1.2: ADR (Road) Not subject to identification
14.1.3: RID (Rail) Not subject to identification
14.1.4: IMDG / GGV/Sea (Sea) Not subject to identification
14.1.5: IATA-DGR / ICTAO-TI(Air) Not subject to identification

14.2: Special precaution
Avoid any release of dust during transportation, by using tight tanks.

Hydrated Lime MSDS – Page 7/7

15: Regulatory information

15.1: Labeling according to EEC-directives
15.1.1: Symbol and classification of the substance according to Directive 67/548/EEC

16: Other information

16.1: Risk phrases
R37 Irritating to respiratory system
R38 Irritating to skin
R41 Risk of serious damage to eyes

16.2: Safety phrases
S2 Keep out of reach of children
S25 Avoid contact with eyes
S28 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S37 Wear suitable gloves
S39 Wear eye/face protection

16.3: Further information
This safety data sheet supplements the technical use instructions without replacing them. The information contained therein is based on the state of our knowledge regarding the product, at the mentioned date. They are provided in good faith. It does not exempt the user from knowing and applying all texts regulating his activity. It will be his sole responsibility to take all necessary precautions when using the product.

16.4: Guidance and references
Data sheet prepared in accordance with:
References:
3. IUCLID Dataset – 2000
4. The Merck Index (Ed. Merck & Co. Rahway, USA)

16.5: Revision
The additions or modifications are announced in italic. The present version is a renewed version, in order to be in accordance with the Annex II of the REACH Regulation (EC) 1907/2006. Version November 2008

End of the safety data sheet
Carbon Dioxide

Material Safety Data Sheet

Section 1. Chemical product
Carbon Dioxide 124-38-8 100 ACGIH TLV (United States, 9/2004).
STEL: 54000 mg/m³ 15 minute(s). Form: All forms
STEL: 30000 ppm 15 minute(s). Form: All forms
TWA: 9000 mg/m³ 8 hour(s). Form: All forms
TWA: 5000 ppm 8 hour(s). Form: All forms
NIOSH REL (United States, 6/2001).
STEL: 54000 mg/m³ 15 minute(s). Form: All forms
STEL: 30000 ppm 15 minute(s). Form: All forms
TWA: 9000 mg/m³ 10 hour(s). Form: All forms
TWA: 5000 ppm 10 hour(s). Form: All forms
OSHA PEL (United States, 6/1993).
TWA: 9000 mg/m³ 8 hour(s). Form: All forms
TWA: 5000 ppm 8 hour(s). Form: All forms

Section 2. Composition, Information on Ingredients
Name CAS number % Volume Exposure limits
Inhalation, Dermal, Eyes
Emergency overview

Section 3. Hazards identification
Routes of entry
Potential acute health effects
Moderately irritating to the respiratory system.
Moderately irritating to the eyes.
Ingestion is not a normal route of exposure for gases
Moderately irritating to the skin.

Physical state Gas.
Warning!
CONTENTS UNDER PRESSURE.
CAUSES DAMAGE TO THE FOLLOWING ORGANS: LUNGS, CARDIOVASCULAR
SYSTEM, SKIN, EYES, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA.
May cause respiratory tract, eye and skin irritation.
Avoid contact with skin and clothing. Avoid breathing gas. Do not puncture or incinerate
container. Keep container closed. Use only with adequate ventilation. Wash thoroughly
after handling.
Contact with rapidly expanding gas, liquid, or solid can cause frostbite.

Section 4. First aid measures
Eye contact
Skin contact
Inhalation
Ingestion
No action shall be taken involving any personal risk or without suitable training. If fumes are still suspected to be present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
Frostbite: Try to warm up the frozen tissues and seek medical attention.
Non-flammable.
Use an extinguishing agent suitable for surrounding fires.

Section 5. Fire fighting measures
Flammability of the product
Fire fighting media and instructions
If involved in fire, shut off flow immediately if it can be done without risk. Apply water from a safe distance to cool container and protect surrounding area. No specific hazard.
Special protective equipment for fire-fighters
Firefighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full facepiece operated in positive pressure mode. Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (Section 8). Shutoff gas supply if this can be done safely. Isolate area until gas has dispersed.
Environmental precautions

Section 6. Accidental release measures
Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
Personal precautions:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).
Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Do not puncture or incinerate container. Wash thoroughly after handling. High pressure gas. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement. Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

Section 7. Handling and storage
Handling
Storage
Build 1.1 Page: 2/8
Carbon Dioxide
Use only with adequate ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits.

Section 8. Exposure Controls, Personal Protection
Engineering controls
Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Personal protection
Eyes
Skin
Respiratory
Consult local authorities for acceptable exposure limits.
Personal protection in case of a large spill
A self-contained breathing apparatus should be used to avoid inhalation of the product. Chemical-resistant, impervious gloves or gauntlets complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

**Hands:**
The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
When working with cryogenic liquids, wear a full face shield. Insulated gloves suitable for low temperatures
-78.55°C (-109.4°F)
Sublimation temperature: -78.5°C (-109.3°F)
1.53 (Air = 1)
830 psig
30.9°C (87.6°F)
44.01 g/mole

**Boiling/condensation point**
**Melting/freezing point**
Not available.

## Section 9. Physical and chemical properties

- **Molecular weight**
- **Critical temperature**
- **Vapor pressure**
- **Vapor density**
- **Physical chemical comments**

- **Molecular formula** CO2
- **Specific Volume (ft³/lb) : 8.77193**
- **Gas Density (lb/ft³) : 0.114**

The product is stable.

## Section 10. Stability and reactivity

**Stability and reactivity :**

## Section 11. Toxicological information

- **Specific effects**
- **Carcinogenic effects** No known significant effects or critical hazards.
- **Mutagenic effects** No known significant effects or critical hazards.
- **Reproduction toxicity** No known significant effects or critical hazards.

No specific information is available in our database regarding the other toxic effects of this material for humans.

Causes damage to the following organs: lungs, cardiovascular system, skin, eyes, central nervous system (CNS), eye, lens or cornea.

- **Chronic effects on humans**
- **Other toxic effects on humans**

**Toxicity data**

- **IDLH : 40000 ppm**

These products are carbon oxides (CO, CO₂).
The product itself and its products of degradation are not toxic.

## Section 12. Ecological information

- **Toxicity of the products of biodegradation**
- **Products of degradation :**
- **Environmental fate :** Not available.
- **Environmental hazards :** No known significant effects or critical hazards.
- **Toxicity to the environment :** Not available.

## Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

## Section 14. Transport information
2.2 Limited quantity
   Yes.
   Packaging instruction
   Passenger Aircraft Quantity limitation: 75 kg
   Cargo Aircraft Quantity limitation: 150 kg

DOT Classification
TDG Classification 2.2

CARBON DIOXIDE
Carbon dioxide, refrigerated liquid
UN1013
UN2187

CARBON DIOXIDE
Carbon dioxide, refrigerated liquid
Regulatory information
UN number Proper shipping name
Class Packing group Label Additional information
UN1013
UN2187

Explosive Limit and Limited Quantity Index 0.125
Passenger Carrying Road or Rail Index 75

Mexico Classification
UN1013
UN2187

CARBON DIOXIDE
Carbon dioxide, refrigerated liquid
Not applicable (gas).

Section 15. Regulatory information

U.S. Federal regulations
Pennsylvania RTK: Carbon Dioxide: (generic environmental hazard)
Massachusetts RTK: Carbon Dioxide
New Jersey: Carbon Dioxide
TSCA 8(b) inventory: Carbon Dioxide
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean air act (CAA) 112 accidental release prevention: No products were found.
Clean air act (CAA) 112 regulated flammable substances: No products were found.
Clean air act (CAA) 112 regulated toxic substances: No products were found.

State regulations
CEPA DSL: Carbon Dioxide
WHIMIS (Canada) Class A: Compressed gas.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Carbon Dioxide
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Carbon Dioxide
Sudden Release of Pressure, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard

Canada
United States

Section 16. Other information

Reactivity

Personal protection
CONTENTS UNDER PRESSURE
CAUSES DAMAGE TO THE FOLLOWING ORGANS: LUNGS, CARDIOVASCULAR SYSTEM, SKIN, EYES, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA.
MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
CORTROL OS5607

1 Identification
Identification of substance or preparation
CORTROL OS5607
Product Application Area
Water based dissolved oxygen scavenger/metal passivator.
Company/Undertaking identification
GE Betz, Inc.
4636 Somerton Road
Trevose, PA 19053
T 215 355-3300, F 215 953 5524
Emergency Telephone
(800) 877-1940

2 Hazard(s) Identification

EMERGENCY OVERVIEW

CAUTION
May cause slight irritation to the skin. May cause slight irritation to the eyes. Mists/aerosols may cause irritation to upper respiratory tract.
DOT hazard is not applicable.
Odor: Slight; Appearance: Colorless To Light Yellow. Liquid. Fire fighters should wear positive pressure self-contained breathing apparatus(full face-piece type). Proper fire-extinguishing media:
dry chemical, carbon dioxide, foam or water.

POTENTIAL HEALTH EFFECTS
ACUTE SKIN EFFECTS:
Primary route of exposure; May cause slight irritation to the skin.
ACUTE EYE EFFECTS:
May cause slight irritation to the eyes.
ACUTE RESPIRATORY EFFECTS:
Mists/aerosols may cause irritation to upper respiratory tract.
Substance or Preparation: CORTROL OS5607 Page 1
INGESTION EFFECTS:
May cause gastrointestinal irritation.
TARGET ORGANS:
No evidence of potential chronic effects.
MEDICAL CONDITIONS AGGRAVATED:
Not known.
SYMPTOMS OF EXPOSURE:
May cause redness or itching of skin.

3 Composition / information on ingredients

Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:
CAS# Chemical Name Range(w/w%) 407-18-7 CARBONIC DIHYDRAZIDE 5-10 Exothermic hydrolysis to hydrazine can occur with high temperature; also occurs by contact with mineral acids, oxidizers, or low grade metals; irritant (skin and eyes)
Avid contact with low grade metals (LCS, AL, Cu), mineral acids and oxidizers to avoid accelerated actives degradation.
Do not mix with other chemicals. Feed independently to system.
4 First-aid measures
SKIN CONTACT:
Wash thoroughly with soap and water. Remove contaminated clothing. Get medical attention if irritation develops or persists.

EYE CONTACT:
Remove contact lenses. Hold eyelids apart. Immediately flush eyes with plenty of low-pressure water for at least 15 minutes. Get medical attention if irritation persists after flushing.

INHALATION:
If nasal, throat or lung irritation develops - remove to fresh air and get medical attention.

INGESTION:
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Dilute contents of stomach using 2-8 fluid ounces (60-240 mL) of milk or water.

NOTES TO PHYSICIANS:
No special instructions

5 Fire-fighting measures
Substance or Preparation: CORTROL OS5607 Page 2
FIRE FIGHTING INSTRUCTIONS:
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

EXTINGUISHING MEDIA:
dry chemical, carbon dioxide, foam or water
HAZARDOUS DECOMPOSITION PRODUCTS:
oxides of carbon and nitrogen
FLASH POINT:
> 200°F > 93°C P-M(CC)

6 Accidental release measures
PROTECTION AND SPILL CONTAINMENT:
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.

DISPOSAL INSTRUCTIONS:
Water contaminated with this product may be sent to a sanitary sewer treatment facility, in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 Handling and storage
HANDLING:
Contact with oxidizers, peroxide and metal oxide may result in a violent reaction. Contamination with low pH products and low grade metal accelerate decomposition to hydrazine.

STORAGE:
Keep containers closed when not in use. Store in a manner that minimizes potential contamination. Store only in vented containers. Protect from freezing. Shelf life 180 days.

8 Exposure controls / personal protection
EXPOSURE LIMITS
CHEMICAL NAME
CARBONIC DIHYDRAZIDE
PEL (OSHA): LIMITS HAVE NOT BEEN ESTABLISHED BY US OSHA.
TLV (ACGIH): LIMITS HAVE NOT BEEN ESTABLISHED BY ACGIH.
ENGINEERING CONTROLS:
adquate ventilation
PERSONAL PROTECTIVE EQUIPMENT:
Use protective equipment in accordance with 29CFR 1910 Subpart I

RESPIRATORY PROTECTION:
A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.
If air-purifying respirator use is appropriate, use a respirator with ammonia/methyamine cartridges.

SKIN PROTECTION:
rubber, vinyl or neoprene gloves -- Wash off after each use.

Substance or Preparation: CORTROL OS5607 Page 3
Replace as necessary.

EYE PROTECTION:
- splash proof chemical goggles

9 Physical and chemical properties
- Spec. Grav. (70°F, 21°C) 1.021
- Vapor Pressure (mmHg) ~ 18.0
- Freeze Point (F) 32
- Vapor Density (air=1) < 1.00
- Freeze Point (C) 0
- Viscosity/cps 70°F, 21°C 9
- % Solubility (water) 100.0
- Odor Slight
- Appearance Colorless To Light Yellow
- Physical State Liquid
- Flash Point P-M(CC) > 200°F > 93°C
- pH As is (approx.) 8.0
- Evaporation Rate (Ether=1) < 1.00
- Percent VOC: 0.0
- NA = not applicable, ND = not determined

10 Stability and reactivity
- CHEMICAL STABILITY:
  - Stable under normal storage conditions.
- POSSIBILITY OF HAZARDOUS REACTIONS:
  - Contact with water reactive compounds may cause fire or explosion.
- INCOMPATIBILITIES:
  - May react with strong oxidizers.
- DECOMPOSITION PRODUCTS:
  - oxides of carbon and nitrogen

11 Toxicological information
- Oral LD50 RAT: >2,000 mg/kg
- NOTE - Value is for testing of similar material.
- Dermal LD50 RABBIT: >2,000 mg/kg
- NOTE - Value is for testing of similar material.
- Skin Irritation Score RABBIT: 0.23
- NOTE - Value is for testing of similar material.
- Eye Irritation Score RABBIT: 0.33
- NOTE - Value is for testing of similar material.

12 Ecological information
- Substance or Preparation: CORTRIL DS5607 Page 4
- AQUATIC TOXICOLOGY
  - Ceriodaphnia 48 Hour Static Renewal Bioassay
    - LC50= 160; 10% Mortality= 96 mg/L
  - Daphnia magna 48 Hour Static Renewal Bioassay
    - LC50= 850; No Effect Level= 150 mg/L
  - Fathead Minnow 96 Hour Static Renewal Bioassay
    - LC50= 260; 5% Mortality= 96 mg/L
- BIODEGRADATION
  - No Data Available.

13 Disposal considerations
- If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is:
  - Not applicable.
- Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14 Transport information
- Transportation Hazard: Not Applicable
- DOT: Not Regulated
- DOT EMERGENCY RESPONSE GUIDE #: Not applicable
- Note: Some containers may be DOT exempt, please check BOL for exact container classification
- IATA: Not Regulated
- IMDG: Not Regulated

15 Regulatory information
TSCA:
All components of this product are included on or are in compliance with the U.S. TSCA regulations.
CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):
No regulated constituent present at OSHA thresholds
NSF Registered and/or meets USDA (according to 1998 Guidelines):
Registration number: Not Registered
SARA SECTION 312 HAZARD CLASS:
Immediate (acute)
SARA SECTION 302 CHEMICALS:
No regulated constituent present at OSHA thresholds
SARA SECTION 313 CHEMICALS:
No regulated constituent present at OSHA thresholds
CALIFORNIA REGULATORY INFORMATION
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):
This product contains one or more ingredients at trace levels known to the state of California to cause cancer and reproductive toxicity.
Substance or Preparation: CORTROL OS5607 Page 5
MICHIGAN REGULATORY INFORMATION
No regulated constituent present at OSHA thresholds

16 Other information

HMIS VII CODE TRANSLATION
Health 1 Slight Hazard
Fire 1 Slight Hazard
Reactivity 0 Minimal Hazard
Special NONE No special Hazard
(1) Protective Equipment B Goggles, Gloves
(1) refer to section 8 of MSDS for additional protective equipment recommendations.
FLOGARD MS6209

1 Identification
Identification of substance or preparation
FLOGARD MS6209

Product Application Area
Water-based corrosion inhibitor.

Company/Undertaking Identification
GE Betz, Inc. 4636 Somerton Road Trevose, PA 19053 T 215 355-3300, F 215 953 5524

Emergency Telephone
(800) 877-1940


2 Hazard(s) identification

******************************************************************************

EMERGENCY OVERVIEW

DANGER: Corrosive to skin. Corrosive to the eyes. Mists/aerosols cause irritation to the upper respiratory tract.

DOT hazard: Corrosive to skin/steel

Odor: Slight; Appearance: Colorless To Yellow, Liquid

Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type). Proper fire-extinguishing media: dry chemical/CO2 foam or water--slippery condition; use sand/grit.

******************************************************************************

POTENTIAL HEALTH EFFECTS

ACUTE SKIN EFFECTS:
Primary route of exposure; Corrosive to skin.

ACUTE EYE EFFECTS:
Corrosive to the eyes.

ACUTE RESPIRATORY EFFECTS:
Mists/aerosols cause irritation to the upper respiratory tract.

INGESTION EFFECTS:
Substance or Preparation: FLOGARD MS6209 Page 1

May cause severe irritation or burning of mouth, throat, and gastrointestinal tract with severe chest and abdominal pain, nausea, vomiting, diarrhea, lethargy and collapse. Possible death when ingested in very large doses.

TARGET ORGANS:
Prolonged or repeated exposures may cause tissue necrosis.

MEDICAL CONDITIONS AGGRAVATED:
Not known.

SYMPTOMS OF EXPOSURE:
Causes severe irritation, burns or tissue ulceration with subsequent scarring.

3 Composition / information on ingredients

Information for specific product ingredients as required by the U.S. CSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:

\begin{itemize}
  \item \textit{CAS#} Chemical Name Range(w/w\%)
  \item 15596-37-3 PHOSPHORIC ACID, ZINC SALT (2:1) 40-70
  \item Irritant
  \item 7684-38-2 PHOSPHORIC ACID 15-40
  \item Corrosive
\end{itemize}

4 First-aid measures

SKIN CONTACT:

URGENT! Wash thoroughly with soap and water. Remove contaminated clothing. Get immediate medical attention. Thoroughly wash clothing.
before reuse.

EYE CONTACT:
URGENT! Immediately flush eyes with plenty of low-pressure water for at least 20 minutes while removing contact lenses. Hold eyelids apart. Get immediate medical attention.

INHALATION:
Remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get immediate medical attention.

INGESTION:
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Rinse mouth with plenty of water. Dilute contents of stomach using 4-10 fluid ounces (120-300 mL) of milk or water.

NOTES TO PHYSICIANS:
Material is corrosive. It may not be advisable to induce vomiting. Possible mucosal damage may contraindicate the use of gastric lavage.

Substance or Preparation: FLOGARD MS6209 Page 2

5 Fire-fighting measures

FIRE FIGHTING INSTRUCTIONS:
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

EXTINGUISHING MEDIA:
dry chemical/CO2/foam or water—slippery condition; use sand/grit.

HAZARDOUS DECOMPOSITION PRODUCTS:
oxides of phosphorus
FLASH POINT:
> 200°F > 93°C P-M(CC)

MISCELLANEOUS:
Corrosive to skin/steel
UN 1805; Emergency Response Guide #154

6 Accidental release measures

PROTECTION AND SPILL CONTAINMENT:
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.

DISPOSAL INSTRUCTIONS:
Water contaminated with this product may be sent to a sanitary sewer treatment facility in accordance with any local agreement. A permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 Handling and storage

HANDLING:
Acidic. Corrosive(Skin/eyes). Do not mix with alkaline material.

STORAGE:
Keep containers closed when not in use. Preferably stored between 40-100°F (5-38°C).

8 Exposure controls / personal protection

EXPOSURE LIMITS

CHEMICAL NAME
PHOSPHORIC ACID, ZINC SALT (2:1)

PEL (OSHA): LIMITS HAVE NOT BEEN ESTABLISHED BY US OSHA.
TLV (ACGIH): LIMITS HAVE NOT BEEN ESTABLISHED BY ACGIH.

PHOSPHORIC ACID
PEL (OSHA): 1 MG/M3
TLV (ACGIH): TWA = 1 MG/M3; STEL = 3 MG/M3
MISC: NIOSH REL = 1 MG/M3; NIOSH STEL = 3 MG/M3; NIOSH IDLH = 1000

MG/M3

ENGINEERING CONTROLS:
Adequate ventilation to maintain air contaminants below exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:
Use protective equipment in accordance with 29 CFR 1910 Subpart I
Substance or Preparation: FLOGARD MS6206 Page 3

RESPIRATORY PROTECTION:
A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE. USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.
If air-purifying respirator use is appropriate, use any of the following particulate respirators: N95, N99, N100, R95, R99, R100, P95, P99 or P100.

SKIN PROTECTION:
guantlet-type rubber, butyl or neoprene gloves, chemical resistant apron -- Wash off after each use. Replace as necessary.

EYE PROTECTION:
splash proof chemical goggles, face shield

9 Physical and chemical properties
Spec. Grav.(70F,21C) 1.711 Vapor Pressure (mmHg) ~ 15.0
Freeze Point (F) ~ -30 Vapor Density (air=1) < 1.00
Freeze Point (C) ~ -34
Viscosity (cPcs) 70F,21C) 70 % Solubility (water) 100.0
Odor Slight
Appearance Colorless To Yellow
Physical State Liquid
Flash Point P-M(°C) > 200F > 90C
pH As Is (approx.) < 1.0
Evaporation Rate (Ether=1) < 1.00
Percent VOC: 0.0
NA = not applicable ND = not determined

10 Stability and reactivity
CHEMICAL STABILITY:
Stable under normal storage conditions.
POSSIBILITY OF HAZARDOUS REACTIONS:
Contact with strong bases may cause a violent reaction releasing heat.

INCOMPATIBILITIES:
May react with bases or strong oxidizers.

DECOMPOSITION PRODUCTS:
oxides of phosphorus

11 Toxicological information
Oral LD50 RAT: 2930 mg/kg
NOTE - Calculated value according to GHS additivty formula
Dermal LD50 RABBIT: 3890 mg/kg
NOTE - Calculated value according to GHS additivty formula
Skin Irritation Score RABBIT: CORROSIVE
NOTE - EPA Category I
Eye Irritation Score RABBIT: CORROSIVE
NOTE - Estimated value
Substance or Preparation: FLOGARD MS6206 Page 4

12 Ecological information
AQUATIC TOXICOLOGY
Ceriodaphnia 48 Hour Static Renewal Bioassay
LC50= 1.5; No Effect Level= .83 mg/L
Ceriodaphnia 7 Day Static Renewal Bioassay
IC25 = 1.9 mg/L
Daphnia magna 48 Hour Static Renewal Bioassay
LC50= 12; No Effect Level= 1.5 mg/L
Fathead Minnow 7 Day Static Renewal Bioassay
IC25 = 5 mg/L
Fathead Minnow 96 Hour Static Renewal Bioassay
LC50= 14; No Effect Level= 2.5 mg/L
Rainbow Trout 96 Hour Static Renewal Bioassay
LC50= 4.5; No Effect Level= 1.6 mg/L

BIODEGRADATION
Product contains only inorganics that are not subject to typical biological degradation. Assimilation by microbes may occur in
13 Disposal considerations
If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is:
D002=Corrosive (pH,steel); D006=Cadmium; D008=Lead.
Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14 Transport information
Transportation Hazard: Corrosive to skin/steel
DOT: PHOSPHORIC ACID SOLUTION
8, UN 1805, PG III, RQ
DOT EMERGENCY RESPONSE GUIDE #: 154
Note: Some containers may be DOT exempt. Please check BOL for exact container classification
IATA: PHOSPHORIC ACID SOLUTION
8, UN 1805, PG III
IMDG: PHOSPHORIC ACID SOLUTION
8, UN 1805, PG III

15 Regulatory information
TSCA:
All components of this product are included on or are in compliance with the U.S. TSCA regulations.
CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):
1,962 gallons due to PHOSPHORIC ACID;
FOOD AND DRUG ADMINISTRATION:
Substance or Preparation: FLOGARD MS5206 Page 5
21 CFR 175, 170 (components of paper and paperboard in contact with aqueous and fatty foods)
NSF Registered and/or meets USDA (according to 1998 Guidelines):
Registration number. 140901
Category Code(s):
SARA SECTION 312 HAZARD CLASS:
Immediate (acute); Delayed (Chronic)
SARA SECTION 302 CHEMICALS:
No regulated constituent present at OSHA thresholds
SARA SECTION 313 CHEMICALS:
CAS# CHEMICAL NAME RANGE
13598-37-3 PHOSPHORIC ACID, ZINC SALT (2:1) 41.0-50.0%
CALIFORNIA REGULATORY INFORMATION
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):
This product contains one or more ingredients at trace levels known to the state of California to cause cancer and reproductive toxicity.
MICHIGAN REGULATORY INFORMATION
No regulated constituent present at OSHA thresholds

16 Other information
HMIS VIII CODE TRANSLATION
Health 3 Serious Hazard
Fire 0 Minimal Hazard
Reactivity 0 Minimal Hazard
Special CORR DOT corrosive
(1) Protective Equipment: Goggles, Face Shield, Gloves, Apron
(1) refer to section 8 of MSDS for additional protective equipment recommendations.

1 Identification
Identification of substance or preparation
GENGARD GN9004
Product Application Area
Corrosion inhibitor
Company/Undertaking Identification
GE Betz, Inc.
4636 Somerton Road
Trevose, PA 19053
T 215 355-3300, F 215 953 5524
Emergency Telephone
(800) 877-1940

2 Hazard(s) Identification

EMERGENCY OVERVIEW
CAUTION
May cause slight irritation to the skin. May cause slight irritation to the eyes. Not expected to cause respiratory tract irritation.
DOT hazard is not applicable
Odor: Mild; Appearance: Amber; Liquid
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type). Proper fire-extinguishing media: dry chemical, carbon dioxide, foam or water.

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POTENTIAL HEALTH EFFECTS
ACUTE SKIN EFFECTS:
Primary route of exposure; May cause slight irritation to the skin.
ACUTE EYE EFFECTS:
May cause slight irritation to the eyes.
ACUTE RESPIRATORY EFFECTS:
Not expected to cause respiratory tract irritation.
Substance or Preparation: GENGARD GN8004 Page 1
INGESTION EFFECTS:
May cause gastrointestinal irritation with possible nausea, vomiting, abdominal discomfort and diarrhea.
TARGET ORGANS:
Repeated skin contact may cause sensitization.
MEDICAL CONDITIONS AGGRAVATED:
Not known.
SYMPTOMS OF EXPOSURE:
May cause redness or itching of skin.

3 Composition / information on ingredients

Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:
This product is not hazardous as defined by OSHA regulations. No component is considered to be a carcinogen by the National Toxicology Program, the International Agency for Research on Cancer, or the Occupational Safety and Health Administration at OSHA thresholds for carcinogens.

4 First-aid measures

SKIN CONTACT:
Wash thoroughly with soap and water. Remove contaminated clothing. Get medical attention if irritation develops or persists.

EYE CONTACT:
Remove contact lenses. Hold eyelids apart. Immediately flush eyes with plenty of low-pressure water for at least 15 minutes. Get medical attention if irritation persists after flushing.

INHALATION:
If nasal, throat or lung irritation develops - remove to fresh air and get medical attention.

INGESTION:
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Dilute contents of stomach using 2-8 fluid ounces (60-240 mL) of milk or water.

NOTES TO PHYSICIANS:
No special instructions

5 Fire-fighting measures
Substance or Preparation: GENARD GN8004 Page 2

FIRE FIGHTING INSTRUCTIONS:
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

EXTINGUISHING MEDIA:
dry chemical, carbon dioxide, foam or water

HAZARDOUS DECOMPOSITION PRODUCTS:
oxides of carbon

FLASH POINT:
> 213°F > 101°C P-M(CC)

6 Accidental release measures

PROTECTION AND SPILL CONTAINMENT:
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.

DISPOSAL INSTRUCTIONS:
Water contaminated with this product may be sent to a sanitary sewer treatment facility, in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product-as-is - Incinerate or land dispose in an approved landfill.

7 Handling and storage

HANDLING:
Normal chemical handling.

STORAGE:
Keep containers closed when not in use. Store in cool ventilated location. Store away from oxidizers. Shelf life 360 days.

8 Exposure controls / personal protection

EXPOSURE LIMITS
This product is not hazardous as defined by OSHA regulations.

ENGINEERING CONTROLS:
adequate ventilation

PERSONAL PROTECTIVE EQUIPMENT:
Use protective equipment in accordance with 29CFR 1910 Subpart I

RESPIRATORY PROTECTION:
A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.
If air-purifying respirator use is appropriate, use any of the following particulate respirators: N95, N99, N100, R95, R99, R100, P95, P99 or P100.

SKIN PROTECTION:
rubber, butyl, viton or neoprene gloves -- Wash off after each use. Replace as necessary.

EYE PROTECTION:
splash proof chemical goggles

Substance or Preparation: GENARD GN8004 Page 3

9 Physical and chemical properties

Spec. Grav. (70F, 21C) 1.134 Vapor Pressure (mmHg) ~ 18.0
Freeze Point (F) 25 Vapor Density (air=1) < 1.00
Freeze Point (C) ~ -4
Viscosity(cps) 70F, 21C 44% Solubility (water) 100.0
Odor Mild
Appearance Amber
10 Stability and reactivity

CHEMICAL STABILITY:
Stable under normal storage conditions.

POSSIBILITY OF HAZARDOUS REACTIONS:
Contact with water reactive compounds may cause fire or explosion.

INCOMPATIBILITIES:
May react with strong oxidizers.

DECOMPOSITION PRODUCTS:
oxides of carbon

11 Toxicological information

Oral LD50 RAT: >5000 mg/kg
NOTE - Calculated value according to GHS additivity formula
Dermal LD50 RABBIT: >5000 mg/kg
NOTE - Calculated value according to GHS additivity formula

12 Ecological information

AQUATIC TOXICOLGY
Ceriodaphnia 48 Hour Static Acute Bioassay
LC50= 1707.6; No Effect Level= 1250 mg/L
Daphnia magna 48 Hour Static Acute Bioassay
LC50= 3677; No Effect Level= 2500 mg/L
Fathead Minnow 96 Hour Static Acute Bioassay
LC50= 2367; No Effect Level= 1250 mg/L
Rainbow Trout 96 Hour Static Acute Bioassay
LC50= 1894; No Effect Level= 1250 mg/L

BIODEGRADATION
BOD-5 (mg/g): 0
COD (mg/g): 385
TOC (mg/g): 109

13 Disposal considerations

Substance or Preparation: GENGARD GN8004 Page 4
If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is:
Not applicable.
Please be advised: however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14 Transport information

Transportation Hazard: Not Applicable
DOT: Not Regulated
DOT EMERGENCY RESPONSE GUIDE #: Not applicable
Note: Some containers may be DOT exempt, please check BOL for exact container classification
IATA: Not Regulated
IMDG: Not Regulated

15 Regulatory information

TSCA:
All components of this product are included on or are in compliance with the U.S. TSCA regulations.
CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):
No regulated constituent present at OSHA thresholds
NSF Registered and/or meets USDA (according to 1998 Guidelines):
Registration number: Not Registered
SARA SECTION 312 HAZARD CLASS:
Delayed(Chronic)
<table>
<thead>
<tr>
<th>SARA SECTION 302 CHEMICALS:</th>
<th>No regulated constituent present at OSHA thresholds</th>
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</thead>
<tbody>
<tr>
<td>SARA SECTION 313 CHEMICALS:</td>
<td>No regulated constituent present at OSHA thresholds</td>
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<tr>
<td>CALIFORNIA REGULATORY INFORMATION</td>
<td></td>
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<tr>
<td>CALIFORNIA SAFE DRINKING WATER AND TOXIC</td>
<td></td>
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<tr>
<td>ENFORCEMENT ACT (PROPOSITION 65):</td>
<td></td>
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<tr>
<td>This product contains one or more ingredients at</td>
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<tr>
<td>trace levels known to the state of California to</td>
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<tr>
<td>cause cancer.</td>
<td></td>
</tr>
<tr>
<td>MICHIGAN REGULATORY INFORMATION</td>
<td></td>
</tr>
<tr>
<td>No regulated constituent present at OSHA thresholds</td>
<td></td>
</tr>
</tbody>
</table>

**16 Other information**

**HMIS v7 CODE TRANSLATION**

- Health 1 Slight Hazard
- Fire 1 Slight Hazard
- Reactivity 0 Minimal Hazard
- Special NONE No special Hazard

(1) Protective Equipment B Goggles, Gloves

Substance or Preparation: GENGARD GN8004 Page 5
(1) refer to section 8 of MSDS for additional protective equipment recommendations.
OPTISPERSE HP3100

1 Identification
Identification of substance or preparation
OPTISPERSE HP3100
Product Application Area
Water based internal boiler treatment chemical.
Company/Undertaking Identification
GE Betz, Inc.
4636 Somerton Road
Trevose, PA 19053
T 215 355-3300, F 215 953 5524
Emergency Telephone
(800) 877-1640

2 Hazard(s) identification

EMERGENCY OVERVIEW
DANGER
Corrosive to skin. Corrosive to the eyes. Mists/aerosols may cause irritation to upper respiratory tract.
DOT hazard: Corrosive to skin
Odor: None; Appearance: Colorless To Light Yellow. Liquid
Fire fighters should wear positive pressure self-contained breathing apparatus(full face-piece type). Proper fire-extinguishing media:
dry chemical, carbon dioxide, foam or water

POTENTIAL HEALTH EFFECTS
ACUTE SKIN EFFECTS:
Primary route of exposure; Corrosive to skin.
ACUTE EYE EFFECTS:
Corrosive to the eyes.
ACUTE RESPIRATORY EFFECTS:
Mists/aerosols may cause irritation to upper respiratory tract.
INGESTION EFFECTS:
Substance or Preparation: OPTISPERSE HP3100 Page 1
May cause gastrointestinal irritation.
TARGET ORGANS:
No evidence of potential chronic effects.
MEDICAL CONDITIONS AGGRAVATED:
Not known.
SYMPTOMS OF EXPOSURE:
May cause redness or itching of skin, irritation, and/or tearing of eyes (direct contact).

3 Composition / information on ingredients
Information for specific product ingredients as required by the
U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to
additional sections of this MSDS for our assessment of the potential
hazards of this formulation.
HAZARDOUS INGREDIENTS:
Cas# Chemical Name Range(w/w\%)
1310-73-2 SODIUM HYDROXIDE 3-7
Corrosive; toxic (by ingestion)

4 First-aid measures
SKIN CONTACT:
URGENT! Wash thoroughly with soap and water. Remove contaminated
clothing. Get immediate medical attention. Thoroughly wash clothing
before reuse.
EYE CONTACT:
URGENT! Immediately flush eyes with plenty of low-pressure water
for at least 20 minutes while removing contact lenses. Hold eyelids
apart. Get immediate medical attention.
INHALATION:
If nasal, throat or lung irritation develops - remove to fresh air and get medical attention.

INGESTION:
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician.
Dilute contents of stomach using 2-8 fluid ounces (60-240 mL) of milk or water.

NOTES TO PHYSICIANS:
No special instructions

5 Fire-fighting measures
FIRE FIGHTING INSTRUCTIONS:
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).
EXTINGUISHING MEDIA:
dry chemical, carbon dioxide, foam or water
HAZARDOUS DECOMPOSITION PRODUCTS:
oxides of phosphorus
Substance or Preparation: OPTISPHERE HP3100 Page 2
FLASH POINT:
> 200°F > 93°C P-Md(CC)
MISCELLANEOUS:
Corrosive to skin
UN 3266; Emergency Response Guide #154

6 Accidental release measures
PROTECTION AND SPILL CONTAINMENT:
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container.
Flush area with water. Wet area may be slippery. Spread sand/ grit.
DISPOSAL INSTRUCTIONS:
Water contaminated with this product may be sent to a sanitary sewer treatment facility, in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 Handling and storage
HANDLING:
Alkaline. Corrosive(Eyes). Do not mix with acidic material.

STORAGE:
 Shelf life = 180 days. Keep containers closed when not in use. Protect from freezing. If frozen, thaw and mix completely prior to use. Store below 100°F (38°C).

8 Exposure controls / personal protection
EXPOSURE LIMITS
CHEMICAL NAME
SODIUM HYDROXIDE

PEL (OSHA): 2 MG/M3
TLV (ACGIH): TWA (Ceiling) = 2 MG/M3

ENGINEERING CONTROLS:
Adequate ventilation to maintain air contaminants below exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:
Use protective equipment in accordance with 29CFR 1910 Subpart I

RESPIRATORY PROTECTION:
A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.
If air-purifying respirator use is appropriate, use any of the following particulate respirators: N95, N99, N100, R95, R99, R100, P95, P99 or P100.

SKIN PROTECTION:
Gauntlet-type rubber, butyl or neoprene gloves, chemical
resistant apron -- Wash off after each use. Replace as necessary.

**EYE PROTECTION:**
splash proof chemical goggles, face shield
Substance or Preparation: OPTISPERS HP3100 Page 3

**9 Physical and chemical properties**
Spec. Grav. (70F,21C) 1.113 Vapor Pressure (mmHg) ~ 18.0
Freeze Point (F) 21 Vapor Density (air=1) < 1.00
Freeze Point (C) -6
Viscosity(cps 70F,21C) 12 % Solubility (water) 100.0
Odor None
Appearance Colorless To Light Yellow
Physical State Liquid
Flash Point P-M(CC) > 200F > 93C
pH As Is (approx) > 13.0
Evaporation Rate (Ether=1) < 1.00
Percent VOC: 0.0
NA = not applicable ND = not determined

**10 Stability and reactivity**
CHEMICAL STABILITY:
 Stable under normal storage conditions.
POSSIBILITY OF HAZARDOUS REACTIONS:
Contact with strong acids may cause a violent reaction releasing heat.
INCOMPATIBILITIES:
 May react with acids or strong oxidizers.
DECOMPOSITION PRODUCTS:
oxides of phosphorus

**11 Toxicological information**
Oral LD50 RAT: 2800 mg/kg
NOTE - Calculated value according to GHS additivity formula
Dermal LD50 RABBIT: >5000 mg/kg
NOTE - Calculated value according to GHS additivity formula

**12 Ecological information**
AQUATIC TOXICITY
Daphnia magna 48 Hour Static Renewal Bioassay (pH adjusted)
LC50= 3300; No Effect Level= 1250 mg/L
Fathead Minnow 96 Hour Static Renewal Bioassay (pH adjusted)
LC50= 5020; No Effect Level= 2750 mg/L

BIODEGRADATION
Product contains only inorganics that are not subject to typical biological degradation. Assimilation by microbes may occur in waste treatment or the environment.

**13 Disposal considerations**
Substance or Preparation: OPTISPERS HP3100 Page 4
If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is:
D002=Corrosive(pH).

Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

**14 Transport information**
Transportation Hazard: Corrosive to skin
DOT: CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S.(SODIUM HYDROXIDE SOLUTION) 8, UN3266, PG III, RQ DOT EMERGENCY RESPONSE GUIDE #: 154
Note: Some containers may be DOT exempt, please check BOL for exact container classification IATA: CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S.(SODIUM HYDROXIDE SOLUTION) 8, UN3266, PG III
IMDG: CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S.(SODIUM HYDROXIDE SOLUTION)8, UN3266, PG III

**15 Regulatory information**
TSCA:
All components of this product are included on or are in compliance with the U.S. TSCA regulations.

CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):
2,158 gallons due to SODIUM HYDROXIDE.

FOOD AND DRUG ADMINISTRATION:
ALL ingredients in this product are authorized in 21CFR173.310 for use as boiler water additives where the steam may contact food.

NSF Registered and/or meets USDA (according to 1998 Guidelines):
Registration number: Not Registered
This product is composed of ingredients previously approved by USDA to meet the G6 classification and may be used in boilers or steamlines where the steam produced may contact edible products.

SARA SECTION 312 HAZARD CLASS:
Immediate (acute)

SARA SECTION 302 CHEMICALS:
No regulated constituent present at OSHA thresholds

SARA SECTION 313 CHEMICALS:
No regulated constituent present at OSHA thresholds

CALIFORNIA REGULATORY INFORMATION
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):
No regulated constituents present

MICHIGAN REGULATORY INFORMATION
No regulated constituent present at OSHA thresholds
Substance or Preparation: OPTISPERSE HP3000 Page 5
16 Other Information
Fire 0 Minimal Hazard
Reactivity 0 Minimal Hazard
Special CORR DOT corrosive
(1)

HMIS v1 CODE TRANSLATION
Health 3 Serious Hazard
Protective Equipment D Goggles, Face Shield, Gloves, Apron
(1) refer to section 8 of MSDS for additional protective equipment recommendations.
SPECTRUS BD1500

1 Identification
Identification of substance or preparation
SPECTRUS BD1500
Product Application Area
Water-based deposit control agent.
Company/Undertaking identification
GE Betz, Inc.
4636 Somerton Road
Trevose, PA 19053
T 215-355-3300, F 215-953-5524
Emergency Telephone
(800) 877-1940

2 Hazard(s) Identification
*************************************************************
EMERGENCY OVERVIEW
CAUTION
May cause slight irritation to the skin. May cause moderate
irritation to the eyes. Mists/aerosols may cause irritation to
upper respiratory tract.
DOT hazard is not applicable
Odor: Slight; Appearance: Colorless, Liquid
Fire fighters should wear positive pressure self-contained breathing
apparatus(full face-piece type). Proper fire-extinguishing media:
dry chemical, carbon dioxide, foam or water
*************************************************************
POTENTIAL HEALTH EFFECTS
ACUTE SKIN EFFECTS:
Primary route of exposure; May cause slight irritation to the skin.
ACUTE EYE EFFECTS:
May cause moderate irritation to the eyes.
ACUTE RESPIRATORY EFFECTS:
Mists/aerosols may cause irritation to upper respiratory tract.
Substance or Preparation: SPECTRUS BD1500 Page 1
INGESTION EFFECTS:
May cause slight gastrointestinal irritation.
TARGET ORGANS:
No evidence of potential chronic effects.
MEDICAL CONDITIONS AGGRAVATED:
Not known.
SYMPTOMS OF EXPOSURE:
May cause redness or itching of skin.

3 Composition / Information on ingredients
Information for specific product ingredients as required by the
U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to
additional sections of this MSDS for our assessment of the potential
hazards of this formulation.
HAZARDOUS INGREDIENTS:
This product is not hazardous as defined by OSHA regulations.
No component is considered to be a carcinogen by the National
Toxicology Program, the International Agency for Research on Cancer,
or the Occupational Safety and Health Administration at OSHA
thresholds for carcinogens.

4 First-aid measures
SKIN CONTACT:
Wash thoroughly with soap and water. Remove contaminated clothing.
Get medical attention if irritation develops or persists.
EYE CONTACT:
Remove contact lenses. Hold eyelids apart. Immediately flush eyes
with plenty of low-pressure water for at least 15 minutes. Get
Immediate medical attention.

**INHALATION:**
If nasal, throat or lung irritation develops - remove to fresh air and get medical attention.

**INGESTION:**
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Dilute contents of stomach using 2-8 fluid ounces (60-240 mL) of milk or water.

**NOTES TO PHYSICIANS:**
No special instructions

5 Fire-fighting measures
Substance or Preparation: SPECTRUZ BD1500 Page 2

**FIRE FIGHTING INSTRUCTIONS:**
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

**EXTINGUISHING MEDIA:**
dry chemical, carbon dioxide, foam or water.

**HAZARDOUS DECOMPOSITION PRODUCTS:**
oxides of carbon

**FLASH POINT:**
> 200°F > 93°C SETA(CC)

6 Accidental release measures

**PROTECTION AND SPILL Containment:**
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.

**DISPOSAL INSTRUCTIONS:**
Water contaminated with this product may be sent to a sanitary sewer treatment facility in accordance with any local agreement. A permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 Handling and storage

**HANDLING:**
Alkaline. Do not mix with acidic material.

**STORAGE:**
Keep containers closed when not in use. Reasonable and safe chemical storage. Store away from acids

8 Exposure controls / personal protection

**EXPOSURE LIMITS:**
This product is not hazardous as defined by OSHA regulations.

**ENGINEERING CONTROLS:**
Adequate ventilation.

**PERSONAL PROTECTIVE EQUIPMENT:**
Use protective equipment in accordance with 29CFR 1910 Subpart I

**RESPIRATORY PROTECTION:**
A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENCEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.
USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.
If air-purifying respirator use is appropriate, use any of the following particulate respirators: N95, N99, N100, R95, R99, R100, P95, P99 or P100.

**SKIN PROTECTION:**
rubber, butyl or viton gloves -- Wash off after each use.
Replace as necessary.

**EYE PROTECTION:**
splash proof chemical goggles

Substance or Preparation: SPECTRUZ BD1500 Page 3

9 Physical and chemical properties

Spec. Grav.(70°F,21°C) 1.020 Vapor Pressure (mmHG) ~ 18.0
10 Stability and reactivity

Chemical stability:
Stable under normal storage conditions.

Possibility of hazardous reactions:
Contact with strong acids may cause a violent reaction releasing heat. Contact with water reactive compounds may cause fire or explosion.

Incompatibilities:
May react with strong oxidizers.

Decomposition products:
Oxides of carbon

11 Toxicological information

Oral LD50 RABBIT: >5000 mg/kg
NOTE - Calculated value according to GHS additivity formula

Dermal LD50 RABBIT: >5000 mg/kg
NOTE - Calculated value according to GHS additivity formula

12 Ecological information

Aquatic Toxicology
Ceriodaphnia 48 Hour Static Renewal Bioassay
LC50 Greater Than= 3000 mg/L
Ceriodaphnia 7 Day Static Renewal Bioassay
IC25 = 652 mg/L
Daphnia magna 48 Hour Static Acute Bioassay
0% Mortality= 2000 mg/L
Fathead Minnow 7 Day Static Renewal Bioassay
IC25 = 3000; LC50 Greater Than= 3000 mg/L
Fathead Minnow 96 Hour Static Bioassay with 48-Hour Renewal
0% Mortality= 2000 mg/L
Menidia beryllina (Silversides) 96 Hour Static Acute Bioassay
0% Mortality= 5000 mg/L
Myriad Shrimp 96 Hour Static Acute Bioassay
25% Mortality= 5000; No Effect Level= 2500 mg/L
Rainbow Trout 96 Hour Static Renewal Bioassay
Substance or Preparation: SPECTRUS BD1600 Page 4
No Effect Level= 3000 mg/L
No Data Available.

Biodegradation
BOD-28 (mg/g): 5
BOD-5 (mg/g): 4
COD (mg/g): 341
TOC (mg/g): 80

13 Disposal considerations
If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is:
D002=Corrosive(pH).

Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14 Transport information
Transportation Hazard: Not Applicable
DOT: Not Regulated
15 Regulatory information

TSCA:
All components of this product are included on or are in compliance with the U.S. TSCA regulations.

CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):
No regulated constituent present at OSHA thresholds

FOOD AND DRUG ADMINISTRATION:
21 CFR 176.170 (components of paper and paperboard in contact with aqueous and fatty foods)

NSF Registered and/or meets USDA (according to 1998 Guidelines):
Registration number: 141059
Category Code(s): G5 Cooling and retort water treatment products - all food processing areas G7 Boiler treatment products - all food processing areas/nonfood contact

SARA SECTION 312 HAZARD CLASS:
Product is non-hazardous under Section 311/312

SARA SECTION 302 CHEMICALS:
No regulated constituent present at OSHA thresholds

SARA SECTION 313 CHEMICALS:
No regulated constituent present at OSHA thresholds

CALIFORNIA REGULATORY INFORMATION
Substance or Preparation: SPECTRUS BD1500 Page 5

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):
This product contains one or more ingredients at trace levels known to the state of California to cause cancer and reproductive toxicity.

MICHIGAN REGULATORY INFORMATION
No regulated constituent present at OSHA thresholds

16 Other information

HMIS VII CODE TRANSLATION
Health 1 Slight Hazard
Fire 0 Minimal Hazard
Reactivity 0 Minimal Hazard
Special ALK pH above 12.0
(1) Protective Equipment B Goggles,Gloves
(1) refer to section 8 of MSDS for additional protective equipment recommendations.
1 Identification
Identification of substance or preparation
SPECTRUS DT1404
Product Application Area
Chemical cleaning compound.
Company/Undertaking Identification
GE Betz, Inc.
4636 Somerton Road
Trevose, PA 19053
Tel: 215 355-3300, F 215 953 5524
Emergency Telephone
(800) 877-1940

2 Hazard(s) identification

EMERGENCY OVERVIEW

CAUTION
May cause slight irritation to the skin. May cause slight irritation to the eyes. Dusts or mists are irritating to mucous membranes. Repeated exposure may result in respiratory sensitization.

DOT hazard: Corrosive to steel
Odor: Mild; Appearance: Colorless To Yellow, Liquid
Fire fighters should wear positive pressure self-contained breathing apparatus(full face-piece type). Proper fire-extinguishing media:
dry chemical, carbon dioxide, foam or water.

POTENTIAL HEALTH EFFECTS

ACUTE SKIN EFFECTS:
Primary route of exposure: May cause slight irritation to the skin.

ACUTE EYE EFFECTS:
May cause slight irritation to the eyes.

ACUTE RESPIRATORY EFFECTS:
Dusts or mists are irritating to mucous membranes. Repeated exposure may result in respiratory sensitization.

INGESTION EFFECTS:
May cause gastrointestinal irritation. Very large doses may cause diarrhea, depression, colic and death. May also cause severe allergic reactions in sensitive individuals.

TARGET ORGANS:
Prolonged or repeated exposures may cause primary irritant dermatitis, skin sensitization, and/or allergic respiratory reactions.

MEDICAL CONDITIONS AGGRAVATED:
Asthma.

SYMPTOMS OF EXPOSURE:
Inhalation may cause eye, nose, throat and lung irritation and possible respiratory sensitization or asthma. Skin contact may cause moderate irritation to severe burns and sensitization.

3 Composition / information on ingredients
Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:
Cas# Chemical Name Range(w/w%)
7631-90-5 SODIUM BISULFITE 30-60
may generate SO2 IARC=3 (carcinogen status not classifiable)
4 First-aid measures

SKIN CONTACT:
Wash thoroughly with soap and water. Remove contaminated clothing.
Thoroughly wash clothing before reuse. Immediately contact a physician.

EYE CONTACT:
Remove contact lenses. Hold eyelids apart. Immediately flush eyes with plenty of low-pressure water for at least 15 minutes. Get immediate medical attention.

INHALATION:
If nasal, throat or lung irritation develops - remove to fresh air and get medical attention.

INGESTION:
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Dilute contents of stomach using 2-8 fluid ounces (60-240 mL) of milk or water.

NOTES TO PHYSICIANS:
No special instructions
Substance or Preparation: SPECTRUS DT1404 Page 2

5 Fire-fighting measures

FIRE FIGHTING INSTRUCTIONS:
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

EXTINGUISHING MEDIA:
dry chemical, carbon dioxide, foam or water

HAZARDOUS DECOMPOSITION PRODUCTS:
oxides of sulfur

FLASH POINT:
> 206°F > 93°C F-M(CC)

MISCELLANEOUS:
Corrosive to steel
UN 2693: Emergency Response Guide #154

6 Accidental release measures

PROTECTION AND SPILL CONTAINMENT:
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container.
Flush area with water. Wet area may be slippery. Spread sand/grit.

DISPOSAL INSTRUCTIONS:
Water contaminated with this product may be sent to a sanitary sewer treatment facility, in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 Handling and storage

HANDLING:
Vent carefully before opening. Sulfur dioxide can be formed during the normal use and handling of this product.

STORAGE:
Keep containers closed when not in use. Protect from freezing. If frozen, thaw and mix completely prior to use. Shelf life 270 days.

8 Exposure controls / personal protection

EXPOSURE LIMITS

CHEMICAL NAME
SODIUM BISULFITE

PEL (OSHA): LIMITS HAVE NOT BEEN ESTABLISHED BY US OSHA.
TLV (ACGIH): TWA = 5 MG/M3; A4

ENGINEERING CONTROLS:
Adequate ventilation to maintain air contaminants below exposure limit.

PERSONAL PROTECTIVE EQUIPMENT:
Use protective equipment in accordance with 29CFR 1910 Subpart I RESPIRATORY PROTECTION:
A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA’S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHenever WORKPLACE CONDITIONS WARRANT A RESPIRATOR’S USE USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED Subastance or Preparation: SPECRUSD DT4104 Page 3 WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS. If air-purifying respirator use is appropriate, use a respirator with acid gas cartridges and any of the following particulate respirators: N95, N99, N100, R95, R99, R100, P95, P99 or P100. SKIN PROTECTION: rubber, butyl, viton or neoprene gloves — Wash off after each use. Replace as necessary. EYE PROTECTION: splash proof chemical goggles

9 Physical and chemical properties
Spec. Grav.(70F,21C) 1.360 Vapor Pressure (mmHg) ~ 18.0 Freeze Point (F) 27 Vapor Density (air=1) < 1.00 Freeze Point (C) -3 Viscosity(cps 70F,21C) 20 % Solubility (water) 100.0 Odor Mild Appearance Colorless To Yellow Physical State Liquid Flash Point P-M(CC) > 200F > 93C pH As Is (approx.) 3.8 Evaporation Rate (Ether=1) < 1.00 Percent VOC: 0.0 NA = not applicable ND = not determined

10 Stability and reactivity
CHEMICAL STABILITY: Stable under normal storage conditions. POSSIBILITY OF HAZARDOUS REACTIONS: No known hazardous reactions. INCOMPATIBILITIES: May react with strong oxidizers and amines. DECOMPOSITION PRODUCTS: oxides of sulfur

11 Toxicological information
Oral LD50 RAT: 2,000 mg/kg Dermal LD50 RABBIT: >2,000 mg/kg NOTE - Estimated value

12 Ecological information
AQUATIC TOXICOLOGY
Daphnia magna 48 Hour Static Renewal Bioassay LC50= 175; No Effect Level= 125 mg/L Fathead Minnow 96 Hour Static Renewal Bioassay LC50= 175; No Effect Level= 125 mg/L Rainbow Trout 96 Hour Static Renewal Bioassay (pH adjusted) Substance or Preparation: SPECRUSD DT4104 Page 4 LC50= 330; No Effect Level= 125 mg/L BIODEGRADATION
Product contains only inorganics that are not subject to typical biological degradation. Assimilation by microbes may occur in waste treatment or the environment.

13 Disposal considerations
If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is: D002=Corrosive(steel). Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.
14 Transport information
Transportation Hazard: Corrosive to steel
DOT: BISULFITES, AQUEOUS SOLUTIONS, N.O.S.(SODIUM BISULFITE SOLUTION)
8, UN2693, PG III, RQ
DOT EMERGENCY RESPONSE GUIDE #: 154
Note: Some containers may be DOT exempt, please check BOL for exact container classification
IATA: BISULPHITES, AQUEOUS SOLUTIONS, N.O.S.(SODIUM BISULFITE SOLUTION)
8, UN2693, PG III
IMDG: BISULPHITES, AQUEOUS SOLUTION, N.O.S.(SODIUM BISULPHITE SOLUTION)
8, UN2693, PG III

15 Regulatory information
TSCA:
All components of this product are included on or are in compliance with the U.S. TSCA regulations.
CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):
1,104 gallons due to SODIUM BISULFITE;
NSF Registered and/or meets USDA (according to 1998 Guidelines):
Registration number: Not Registered
SARA SECTION 312 HAZARD CLASS:
Immediate(acute), Delayed(Chronic)
SARA SECTION 302 CHEMICALS:
No regulated constituent present at OSHA thresholds
SARA SECTION 313 CHEMICALS:
No regulated constituent present at OSHA thresholds
CALIFORNIA REGULATORY INFORMATION
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):
No regulated constituents present
Substance or Preparation: SPECTRUS DT1404 Page 5
MICHIGAN REGULATORY INFORMATION
No regulated constituent present at OSHA thresholds

16 Other information
HMIS v11 CODE TRANSLATION
Health 1 Slight Hazard
Fire 0 Minimal Hazard
Reactivity 0 Minimal Hazard
Special NONE No special Hazard
(1) Protective Equipment B Goggles,Gloves
(1) refer to section 8 of MSDS for additional protective equipment recommendations.
CHANGE LOG
EFFECTIVE
1 Identification
Identification of substance or preparation
STEAMATE NA1324
Product Application Area
Steam condensate treatment.

Company/Undertaking Identification
GE Betz, Inc.
4636 Somerton Road
 Trevose, PA 19053
T 215 355-3300, F 215 953 5524
Emergency Telephone
(800) 877-1940

2 Hazard(s) identification

EMERGENCY OVERVIEW

DANGER
Corrosive. Absorbed by skin. Corrosive to the eyes. Vapors, gases,
mists and/or aerosols cause irritation to the upper respiratory
tract.
DOT hazard: Corrosive to skin
Odor: Strong Ammonia; Appearance: Colorless, Liquid
Fire fighters should wear positive pressure self-contained breathing
apparatus (full face-piece type). Proper fire-extinguishing media:
dry chemical, carbon dioxide, foam or water.

POTENTIAL HEALTH EFFECTS

ACUTE SKIN EFFECTS:
Primary route of exposure: Corrosive. Absorbed by skin.

ACUTE EYE EFFECTS:
Corrosive to the eyes.

ACUTE RESPIRATORY EFFECTS:
Primary route of exposure: Vapors, gases, mists and/or aerosols
cause irritation to the upper respiratory tract.

Substance or Preparation: STEAMATE NA1324 Page 1

INGESTION EFFECTS:
May cause severe irritation or burning of mouth, throat, and
gastrointestinal tract with severe chest and abdominal pain, nausea,
vomiting, diarrhea, lethargy and collapse. Possible death when
ingested in very large doses.

TARGET ORGANS:
Prolonged or exposures may cause primary irritant dermatitis,
tissue necrosis, and/or toxicity to the liver and kidney.

MEDICAL CONDITIONS AGGRAVATED:
Pre-existing skin disorders and chronic respiratory disease.

SYMPTOMS OF EXPOSURE:
Symptoms range from headache, eye irritation, chest pain, nausea
and vomiting to severe coughing, difficulty in breathing, pulmonary
edema and production of pink frothy sputum.

3 Composition / information on ingredients

Information for specific product ingredients as required by the
U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to
additional sections of this MSDS for our assessment of the potential
hazards of this formulation.

HAZARDOUS INGREDIENTS:
Cas# Chemical Name Range(w/w%)
1336-21-6 AMMONIUM HYDROXIDE 30-60
Corrosive: toxic (by ingestion)
141-43-5 MONOETHANOLAMINE 3-7
Combustible: corrosive; irritant; CNS depressant;
may cause liver and kidney toxicity; fetotoxic and
developmental toxin in laboratory animals

4 First-aid measures
SKIN CONTACT:
URGENT! Wash thoroughly with soap and water. Remove contaminated clothing. Get immediate medical attention. Thoroughly wash clothing before reuse.
EYE CONTACT:
URGENT! Immediately flush eyes with plenty of low-pressure water for at least 20 minutes while removing contact lenses. Hold eyelids apart. Get immediate medical attention.
INHALATION:
If nasal, throat or lung irritation develops - remove to fresh air and get medical attention.
INGESTION:
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Rinse mouth with plenty of water. Dilute contents of stomach using 4-10 fluid ounces (120-300 mL) of milk or water.
Substance or Preparation: STEAMATE NA1324 Page 2
NOTES TO PHYSICIANS:
Material is corrosive. It may not be advisable to induce vomiting. Possible mucosal damage may contraindicate the use of gastric lavage.

5 Fire-fighting measures
FIRE FIGHTING INSTRUCTIONS:
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).
EXTINGUISHING MEDIA:
dry chemical, carbon dioxide, foam or water
HAZARDOUS DECOMPOSITION PRODUCTS:
oxides of carbon and nitrogen, ammonia and volatile amines
FLASH POINT:
> 213°F > 101°C P-M(CC)
MISCELLANEOUS:
Corrosive to skin
UN 2672: Emergency Response Guide #154

6 Accidental release measures
PROTECTION AND SPILL CONTAINMENT:
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush with water. Wet area may be slippery. Spread sand/ grit.
DISPOSAL INSTRUCTIONS:
Water contaminated with this product may be sent to a sanitary sewer treatment facility in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 Handling and storage
HANDLING:
Alkaline. Corrosive (Skin/eyes). Do not mix with acidic material.
STORAGE:
Keep containers closed when not in use. Store in cool, well ventilated area. Protect from freezing. If frozen, thaw completely and mix thoroughly prior to use. Store away from acids.

8 Exposure controls / personal protection
EXPOSURE LIMITS
CHEMICAL NAME
AMMONIUM HYDROXIDE
PEL (OSHA): 60 PPM (35P/STEL)
TLV (ACGIH): 25 PPM (STEL)
MONOETHANOLAMINE
PEL (OSHA): 3 PPM (6 MG/M3)
TLV (ACGIH): TWA = 3 PPM; STEL = 6 PPM
MISC: NIOSH REL = 3 PPM (8 MG/M3); NIOSH STEL = 6 PPM (15 MG/M3);
NIOSH IDLH = 30 PPM
Substance or Preparation: STEAMATE NA1324 Page 3
ENGINEERING CONTROLS:
Adequate ventilation to maintain air contaminants below exposure
9 Physical and chemical properties

Spec. Grav (70°F, 21°C) 0.936 Vapor Pressure (mmHG) ~ 240.0
Freeze Point (F) -24 Vapor Density (air=1) < 1.00
Freeze Point (C) -31
Viscosity (cP) 70°F, 21°C 6% Solubility (water) 100.0
Odor Strong Ammonia
Appearance Colorless
Physical State Liquid
Flash Point P-M(°C) > 213F > 101C
pH As Is (approx.) 13.0
Evaporation Rate (Ether=1) < 1.00
Percent VOC: 4.0
NA = not applicable ND = not determined

10 Stability and reactivity

CHEMICAL STABILITY:
Stable under normal storage conditions.

POSSIBILITY OF HAZARDOUS REACTIONS:
Contact with strong acids may cause a violent reaction releasing heat.

INCOMPATIBILITIES:
May react with acids.

DECOMPOSITION PRODUCTS:
oxides of carbon and nitrogen, ammonia and volatile amines

11 Toxicological information

Oral LD50 RAT: 980 mg/kg
NOTE - Calculated value according to GHS additivity formula
Dermal LD50 RABBIT: >5000 mg/kg
NOTE - Calculated value according to GHS additivity formula
Substance or Preparation: STEAMATE NA1324 Page 4

12 Ecological information

AQUATIC TOXICOLOGY
Daphnia magna 48 Hour Static Acute Bioassay (Estimated)
LC50= 277; 100% Mortality: 185 mg/L
Fathead Minnow 96 Hour Static Acute Bioassay (Estimated)
LC50= 120; No Effect Level: 86 mg/L

13 Disposal considerations

If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is:
D002=Corrosive(pH). Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14 Transport information

Transportation Hazard: Corrosive to skin
DOT: AMMONIA SOLUTION
8, UN2672, PG III, RQ
15 Regulatory information

TSCA:
All components of this product are included on or are in compliance with the U.S. TSCA regulations.

CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):
363 gallons due to AMMONIUM HYDROXIDE.

NSF Registered and/or meets USDA (according to 1998 Guidelines):
Registration number: Not Registered

SARA SECTION 312 HAZARD CLASS:
Immediate (acute); Delayed (Chronic)

SARA SECTION 302 CHEMICALS:
No regulated constituent present at OSHA thresholds

SARA SECTION 313 CHEMICALS:
CAS# CHEMICAL NAME RANGE
1336-21-8 AMMONIUM HYDROXIDE 31.0-40.0%

CALIFORNIA REGULATORY INFORMATION
Substance or Preparation: STEAMATE NA1324 Page 5

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):
This product contains one or more ingredients at trace levels known to the state of California to cause cancer and reproductive toxicity.

MICHIGAN REGULATORY INFORMATION
No regulated constituent present at OSHA thresholds

16 Other information

HMIS 7 CODE TRANSLATION
Health 3 Serious Hazard
Fire 0 Minimal Hazard
Reactivity 0 Minimal Hazard
Special CORR DOT corrosive

(1) Protective Equipment: Goggles, Face Shield, Gloves, Apron
(1) Refer to section 8 of MSDS for additional protective equipment recommendations.
THERMINOL® VP1 Heat transfer fluid

Material Safety Data Sheet
Product name: THERMINOL® VP1 Heat transfer fluid
Reference Number: 0000000000211 Date: 05/18/2012
Company Information:
United States: Canada:
Solutia Inc. Solutia Canada Inc.
575 Maryville Center Drive, P.O. Box 66760 7475 Boul Newman Suite 301
St. Louis, MO 63166-6760 LaSalle, QC H8N 1X3
International Emergency telephone: Chemtrec: 703-527-3887
Non-Emergency telephone: 1-314-674-6661
Non-Emergency telephone: 1-314-674-6661
Mexico: Brazil:
Solutia MEXICO, S. DE R.L. DE C.V. Solutia Brazil Ltd.
Prol. Paseo de la Reforma 2554 Local 501, Piso-5
Avenue Carlos Marcondes, 1200 CEP: 12241-420-São José dos Campos/SP-Brazil
Col. Lomas Altas 11950 Mexico, D.F.
Emergency telephone: SETIQ: (in Mexico) 01-800-002-1400
Non-Emergency telephone: (in Mexico) 01-55-5259-5800
Emergency telephone: 55 12 3932 7100 (PABX)
Non-Emergency telephone: 55 11 3365 1800 (PABX)

2. HAZARDS IDENTIFICATION
EMERGENCY OVERVIEW
Form: liquid
Color: clear to colorless
Odor: characteristic
WARNING STATEMENTS
WARNING:
Causes eye irritation
Causes skin irritation
Causes respiratory tract irritation
Contains material which can cause liver and nerve damage

POTENTIAL HEALTH EFFECTS
Product name: THERMINOL® VP1 Heat transfer fluid Page 2 / 8
Solutia Inc. Material Safety Data Sheet Date: 05/18/2012
Reference Number: 0000000000211 Version 5.4/E

Likely routes of exposure:
eye and skin contact

Inhalation
Eye contact: Highly irritating to eyes. Skin contact: Highly irritating to skin. Prolonged or repeated skin contact may result in irritant dermatitis. Inhalation: Severely irritating if inhaled. No more than slightly toxic if inhaled. Significant adverse health effects are not expected to develop under normal conditions of exposure. Ingestion: No more than slightly toxic if swallowed. Significant adverse health effects are not expected to develop if only small amounts (less than a mouthful) are swallowed.
Signs and symptoms of overexposure: headache fatigue nausea/vomiting indigestion abdominal pain tremors
Target organs/systems: May cause liver damage. May cause nerve damage. Refer to Section 11 for toxicological information.

3. COMPOSITION/INFORMATION ON INGREDIENTS
Components CAS No. Average range
Units
diphenyl ether 101-84-8 73.5 % biphenyl 92-52-4 26.5 %

4. FIRST AID MEASURES
If in eyes: Immediately flush with plenty of water for at least 15 minutes.
If easy to do, remove any contact lenses.
Get medical attention.
Remove material from skin and clothing.
If on skin: Immediately flush the area with plenty of water.
Remove contaminated clothing.
Wash skin gently with soap as soon as it is available.
Get medical attention.
Wash clothing before reuse.
If inhaled: Remove patient to fresh air.
If not breathing, give artificial respiration.
If breathing is difficult give oxygen.
Remove material from eyes, skin and clothing.
Product name: THERMINOL® VP1 Heat transfer fluid Page 3 / 8
Solutia Inc. Material Safety Data Sheet Date: 05/18/2012
Reference Number: 00000000211 Version 5.4/E
If swallowed: Immediate first aid is not likely to be required. A physician or Poison Control Center can be contacted for advice. Wash heavily contaminated clothing before reuse.

5. FIRE FIGHTING MEASURES
Fire point:
127 °C
Hazardous products of combustion:
carbon monoxide (CO); carbon dioxide; hydrocarbons
Extinguishing media:
Water spray, foam, dry chemical, or carbon dioxide
Unusual fire and explosion hazards:
None known
Fire fighting equipment:
Firefighters and others exposed, wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.
Miscellaneous advice: This product is not classified as a fire-resistant heat transfer fluid. Precautions to avoid sources of ignitions should be taken.

6. ACCIDENTAL RELEASE MEASURES
Personal precautions:
Use personal protection recommended in section 8.
Environmental precautions:
Keep out of drains and water courses.
Methods for cleaning up:
Contain large spills with dikes and transfer the material to appropriate containers for reclamation or disposal. Absorb remaining material or small spills with an inert material and then place in a chemical waste container. Flush spill area with water.
Refer to Section 13 for disposal information and Sections 14 and 15 for reportable quantity information.

7. HANDLING AND STORAGE
Handling:
Avoid contact with eyes, skin and clothing.
Avoid breathing vapor or mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Precautions against ignitions and fire should be taken with this product.
Heat transfer fluids are intended for INDIRECT heating purposes ONLY.
This product has not been approved for food grade use. Emptied containers retain vapor and product residue. Observe all recommended safety precautions until container is cleaned, reconditioned or destroyed. Do not cut, drill, grind or weld on or near this container. The reuse of this material's container for non industrial purposes is prohibited and any reuse must be in consideration of the data provided in this material safety data sheet. Storage
General: Stable under normal conditions of handling and storage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION
Product name: THERMINOL® VP1 Heat transfer fluid Page 4 / 8
Solutia Inc. Material Safety Data Sheet Date: 05/18/2012
Reference Number: 00000000211 Version 5.4/E
Airborne exposure limits: (mL/m3 = ppm)
THERMINOL® VP1
No specific occupational exposure limit has been established.
biphenyl
ACGIH TLV: 0.2 mL/m³ ; 8-hr TWA
OSHA PEL: 0.2 mL/m³ ; 10 mg/m³ ; 8-hr TWA
Mexican OEL: 0.2 mL/m³ ; 1.5 mg/m³ ; 8-hr TWA
Mexican OEL: 0.6 mL/m³ ; 4 mg/m³ ; 15-min STEL
diphenyl ether
ACGIH TLV: 1 mL/m³ ; 8-hr TWA
ACGIH TLV: 2 mL/m³ ; 15-min STEL
OSHA PEL: 1 mL/m³ ; 7 mg/m³ ; 8-hr TWA
Mexican OEL: 1 mL/m³ ; 7 mg/m³ ; 8-hr TWA
Mexican CEL: 2 mL/m³; 14 mg/m³; 15-min STEL

Eye protection: Wear safety goggles. Have eye flushing equipment available. Hand protection: Wear chemical resistant gloves. Consult the glove/clothing manufacturer to determine the appropriate type glove/clothing for a given application. See Solutia Glove Facts for permeation data. Body protection: Wear suitable protective clothing. Consult the glove/clothing manufacturer to determine the appropriate type glove/clothing for a given application. Wear full protective clothing if exposed to splashes. Wash contaminated skin promptly. Launder contaminated clothing and clean protective equipment before reuse. Wash thoroughly after handling. Have safety shower available at locations where skin contact can occur. Respiratory protection: Avoid breathing vapour or mist. Use approved respiratory protection equipment (full face piece recommended) when airborne exposure limits are exceeded. If used, full facepiece replaces the need for face shield and/or chemical goggles. Consult the respirator manufacturer to determine the appropriate type of equipment for a given application. Observe respirator use limitations specified by the manufacturer. Ventilation: Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits. If practical, use local mechanical exhaust ventilation at sources of air contamination such as processing equipment. Components referred to herein may be regulated by specific Canadian provincial legislation. Please refer to exposure limits legislated for the province in which the substance will be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

Flash point: 110 °C Pensky-Martens closed tester
124 °C Cleveland Open Cup
Product name: THERMINOL® VP1 Heat transfer fluid Page 5 / 8
Solutia Inc. Material Safety Data Sheet Date: 05/18/2012
Reference Number: 000000000211 Version 6.4/E
Autoignition temperature: 612 °C ASTM D-2165
Density: 1.06 g/cm³ @ 25 °C
Boiling point: 257 °C
Crystallising point: 12 °C
Water solubility: ~26 mg/l

NOTE: These physical data are typical values based on material tested but may vary from sample to sample.
Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Conditions to avoid: All sources of ignition.
Materials to avoid: Contact with strong oxidizing agents.
Hazardous reactions: Hazardous polymerization does not occur.
Hazardous decomposition products:
None known.

11. TOXICOLOGICAL INFORMATION

This product has been tested for toxicity. Results from Solutia sponsored studies or from the available public literature are described below.
Acute animal toxicity data
Oral: LD₅₀, rat, 2,050 mg/kg, No more than slightly toxic
Dermal: LD₅₀, rabbit, > 5,010 mg/kg, Practically nontoxic after skin application in animal studies.
Inhalation: LC₅₀, rat, 2.66 mg/l, 4 h, Toxic based on animal inhalation exposure studies.
Skin irritation: rabbit, Slightly irritating to skin, 24 h
Repeat dose toxicity: rat, Inhalation, 13 weeks, Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies.
Repeat dose toxicity rat, gavage, 26 weeks, Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies. Effects only observed at very high dose levels. Target organs affected kidneys, liver, spleen. Repeat dose toxicity: rat, diet, subchronic, Repeated oral exposure produced liver and kidney changes in animal models. Target organs affected liver, kidneys Developmental toxicity: rat, gavage, No effects on offspring observed in laboratory animals in the presence of maternal toxicity. Product name: THERMINOL® VP1 Heat transfer fluid Page 8
Solutia Inc. Material Safety Data Sheet Date: 05/18/2012
Reference Number: 000000000211 Version 6.4/E
Mutagenicity: No genetic effects were observed in standard tests using bacterial and animal cells.
Components Data from Solutia studies and/or the available scientific literature on the components of this material which have been identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200) or the Canadian Hazardsous Products Act are discussed below. Biphenyl Chronic exposure has been reported to cause headache, fatigue, nausea, indigestion, abdominal pain, tremor, central and peripheral nerve damage and liver injury. Slightly toxic following oral administration.
Practically nontoxic after skin application in animal studies.
Practically non irritating to skin (rabbit). Slightly irritating to eyes (rabbit). No mortality or signs of toxicity at the highest level achievable. Irritating to respiratory system in animal models. Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies.
Produced no dermal sensitization (guinea pigs). No effects on offspring observed in laboratory animals in the presence of maternal toxicity.
No genetic effects were observed in standard tests using bacterial and animal cells.
Diphenyl ether. Predictive patch testing on human volunteers did not produce irritation or sensitization.
Slightly toxic following oral administration.
Practically nontoxic after skin application in animal studies.
Slightly irritating to eyes (rabbit).
Slightly irritating to skin (rabbit).
Repeated exposure produced reduced respiratory tract irritation in animal models.
Repeated exposure produced eye irritation in animal models.
No genetic effects were observed in standard tests using bacterial and animal cells.

12. ECOLOGICAL INFORMATION
Environmental Toxicity Invertebrates 48 h, EC50 Water flea (Daphnia magna) 2.4 mg/l Fish: 96 h, LC50 Rainbow trout (Oncorhynchus mykiss) 7.6 mg/l 96 h, LC50 Fathead minnow (Pimephales promelas) 24 mg/l Algae: 96 h, EC50 Algae (Selenastrum capricornutum) 1.3 mg/l Biodegradation Modified SCAS (OECD 302A) Primary degradation 99 %

13. DISPOSAL CONSIDERATIONS
US EPA RCRA Status: This material when discarded may be a hazardous waste as that term is defined by the Resource Conservation and Recovery Act (RCRA), 40 CFR 261.24, due to its toxicity characteristic. This material should be analyzed in accordance with Method 1311 for the compound(s) below.
US EPA CRRA DB18 Compound/Characteristic: BENZENE
Product name: THERMINOL® VP1 Heat transfer fluid Page 7 / 8
Solutia Inc. Material Safety Data Sheet Date: 05/18/2012
Reference Number: 000000002111 Version 5.4/E
hazardous waste number:
Disposal considerations:
Incineration
Miscellaneous advice:
This product meets the criteria for a synthetic used oil under the U.S. EPA Standards for the Management of Used Oil (40 CFR 278). These standards govern recycling and disposal in lieu of 40 CFR 260-272 of the Federal hazardous waste program in states that have adopted these used oil regulations. Consult your attorney or appropriate regulatory official to be sure these standards have been adopted in your state. Recycle or burn in accordance with the applicable standards. Solutia operates a used fluid return program for certain fluids under these used oil standards. Contact your Sales Representative for details. This product should not be dumped, spilled, rinsed or washed into sewers or public waterways.

14. TRANSPORT INFORMATION
The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.
US DOT
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
biphenyl
Hazard Class: 9
Hazard Identification number: UN3082
Packing Group: Packing Group III
Transport label: Class 9
Special provisions: This material meets the definition of a marine pollutant. Other: Applies ONLY to containers with an RQ or for shipments in bulk via water transportation. Canadian TDG Other: Not regulated for transport. Reportable Quantity/Limit
US DOT RQ 100 lb biphenyl Package size containing reportable amount: 377 lb
ICAO/IATA Class Other: See DOT Information

15. REGULATORY INFORMATION
All components are in compliance with the following inventories:
US TSCA, EU EINECS, Canadian DSL, Australian AICS, Korean, Japanese ENCS, Philippine PICCS, Chinese
Canadian WHMIS classification:
D2(A) - Materials Causing Other Toxic Effects
D2(B) - Materials Causing Other Toxic Effects
SARA Hazard Notification:
Hazard Categories Under Title III
Rules (40 CFR 370):
Immediate
Delayed
Product name: THERMINOL® VP1 Heat transfer fluid Page 8 / 8
Solutia Inc. Material Safety Data Sheet Date: 05/18/2012
Reference Number: 0000000000211 Version 5.4/E
Section 302 Extremely Hazardous
Substances:
Not applicable
Section 313 Toxic Chemical(s):
biphenyl
CERCLA Reportable Quantity:
100 lbs biphenyl

For this/these chemicals, release of more than the Reportable Quantity to the environment in a 24 hour period requires notification to the National Response Center (800-424-8802 or 202-426-2875). This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation and the MSDS contains all the information required by the Canadian Controlled Products Regulation. Refer to Section 11 for OSHA/HPA Hazardous Chemical(s) and Section 13 for RCRA classification. Safety data sheet also created in accordance with Brazilian law NBR 14725.

16. OTHER INFORMATION
Product use: Heat transferring agents
Reason for revision: Routine review and update
Health Fire Reactivity Additional Information
Suggested NFPA Rating 2 1 0
Suggested HMIS Rating: 2 1 0 G
Prepared by the Solutia Hazard Communication Group. Please consult Solutia @ 314-674-9661 if further information is needed.

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SOLUTIA is a registered trademark of the American Chemistry Council. Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, Solutia Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Solutia Inc. be responsible for damages of any nature whatsoever resulting from the use of or reliance upon information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.
Material Safety Data Sheet

Section 1. Chemical product and company identification

Hydrogen

Supplier
1-866-734-3438
Synonym: Dihydrogen; o-Hydrogen; p-Hydrogen; Molecular hydrogen; H2; UN 1049; UN 1966;
Liquid hydrogen

Emergency overview

Section 2. Hazards identification

Routes of entry
Potential acute health effects
Acts as a simple asphyxiant.
Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic
liquid can cause frostbite and cryogenic burns.
Ingestion is not a normal route of exposure for gases Contact with cryogenic liquid can
cause frostbite and cryogenic burns.
Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic
liquid can cause frostbite and cryogenic burns.

Eyes
Skin
Inhalation
Ingestion

Physical state Gas or Liquid.

See toxicological information (Section 11)

WARNING!
GAS:
CONTENTS UNDER PRESSURE.
Extremely flammable
Do not puncture or incinerate container.
Can cause rapid suffocation.
May cause severe frostbite.
LIQUID:
Extremely flammable
Extremely cold liquid and gas under pressure.
Can cause rapid suffocation.
May cause severe frostbite.
Do not puncture or incinerate container. May cause target organ damage, based on
animal data.

Medical conditions
aggravated by overexposure
Pre-existing disorders involving any target organs mentioned in this MSDS as being at
risk may be aggravated by over-exposure to this product.

: Contact with rapidly expanding gases or liquids can cause frostbite.
Target organs: May cause damage to the following organs: lungs.
Potential chronic health effects
Chronic effects: May cause target organ damage, based on animal data.
Target organs: May cause damage to the following organs: lungs.
Build 1.1 Page: 1/6

Hydrogen
Hydrogen 1333-74-0 100 Oxygen Depletion [Asphyxiant]
Section 3. Composition, Information on Ingredients
Name CAS number % Volume Exposure limits
As this product is a gas, refer to the inhalation section.
Check for and remove any contact lenses. Immediately flush eyes with plenty of water
for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical
attention immediately.
In case of contact, immediately flush skin with plenty of water for at least 15 minutes
while removing contaminated clothing and shoes. Wash clothing before reuse. Clean
shoes thoroughly before reuse. Get medical attention immediately.
Move exposed person to fresh air. If not breathing, if breathing is irregular or if
respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel.
Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention
immediately.
Section 4. First aid measures
Eye contact
Skin contact
Inhalation
Ingestion
No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes
are still present,
the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to
the person
providing aid to give mouth-to-mouth resuscitation.
Frostbite: Try to warm up the frozen tissues and seek medical attention.
500 to 571°C (932 to 1059.8°F)
Flammable.
No specific data.
Lower: 4% Upper: 76%
Use an extinguishing agent suitable for the surrounding fire.
Extremely flammable in the presence of the following materials or conditions: oxidizing
materials.
Section 5. Fire-fighting measures
Flammability of the product
Auto-ignition temperature
Flammable limits
Products of combustion
Fire hazards in the presence
of various substances
Fire-fighting media and
instructions
Apply water from a safe distance to cool container and protect surrounding area. If
involved in fire, shut off flow immediately if it can be done without risk.
Contains gas under pressure. In a fire or if heated, a pressure increase will occur and
the container may burst or explode.
Special protective equipment for fire-fighters

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Immediately contact emergency personnel. Stop leak if without risk. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Environmental precautions

Section 6. Accidental release measures
- Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Personal precautions:

Methods for cleaning up:
- High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

Section 7. Handling and storage

Handling:
- Build 1.1 Page: 2/6

Hydrogen

Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

For additional information concerning storage and handling refer to Compressed Gas Association pamphlets P-1 Safe Handling of Compressed Gases in Containers and P-12 Safe Handling of Cryogenic Liquids available from the Compressed Gas Association, Inc.

Storage:
- Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

hydrogen Oxygen Depletion [Asphyxiant]

Section 8. Exposure controls/personal protection

Engineering controls

Product name
- Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Personal protective equipment for the body should be selected based on the task being
performed and the risks involved and should be approved by a specialist before handling this product.

Personal protection
Eyes
Skin
Respiratory
Consult local authorities for acceptable exposure limits.

Personal protection in case of a large spill
Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.
Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Hands:
The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
When working with cryogenic liquids, wear a full face shield.
Insulated gloves suitable for low temperatures
-253°C (-423.4°F)
-259.15°C (-434.5°F)
0.07 (Air = 1) Liquid Density@BP: 4.43 lb/ft3 (70.96 kg/m3)
-240.15°C (-400.3°F)
2.02 g/mole

Boiling/condensation point
Melting/freezing point

Section 9. Physical and chemical properties

Molecular weight

Critical temperature

Vapor density

Molecular formula H2
Specific Volume (ft 3/lb) : 191.9386
Gas Density (lb/ft 3) : 0.00521

The product is stable.

Extremely reactive or incompatible with the following materials: oxidizing materials.

Under normal conditions of storage and use, hazardous polymerization will not occur.
Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 10. Stability and reactivity

Stability and reactivity

Incompatibility with various substances

Hazardous decomposition products

Hazardous polymerization

Section 11. Toxicological information

Specific effects

Carcinogenic effects No known significant effects or critical hazards.
Mutagenic effects No known significant effects or critical hazards.
Reproduction toxicity No known significant effects or critical hazards.
No specific information is available in our database regarding the other toxic effects of this material to humans.

Chronic effects on humans May cause damage to the following organs: lungs.

Other toxic effects on humans
Toxicity data
Section 12. Ecological information
Environmental fate: Not available.
Environmental hazards: No known significant effects or critical hazards.
Toxicity to the environment: Not available.
Aquatic ecotoxicity
Not available.
Section 13. Disposal considerations
Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.
Section 14. Transport information
2.1 Limited quantity Yes.
Packaging instruction
Passenger aircraft Quantity limitation: Forbidden.
Cargo aircraft Quantity limitation: 150 kg
DOT Classification
TDG Classification 2.1
HYDROGEN, COMPRESSED Hydrogen, refrigerated liquid
UN1049 UN1966
HYDROGEN, COMPRESSED Hydrogen, refrigerated liquid
Regulatory information
UN number Proper shipping name
Class Packing group Label Additional Information
Explosive Limit and Limited Quantity
Index
0.125
ERAP Index
3000
Passenger Carrying Ship Index Forbidden
Not applicable (gas).
Not applicable (gas).
Passenger Carrying Road or Rail Index Forbidden
Mexico Classification
UN1049
UN1966
HYDROGEN, COMPRESSED Hydrogen, refrigerated liquid
2.1 Not applicable (gas).
“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”
Section 15. Regulatory information
U.S. Federal regulations
Class B-1: Flammable gas.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: hydrogen
SARA 311/312 MSDS distribution - chemical inventory - hazard identification:
hydrogen: Fire hazard, Sudden release of pressure
Canada
United States
Hydrogen
Clean Air Act (CAA) 112 accidental release prevention - Flammable Substances:
Section 16. Other information
3
4
0
0
4
Health 3
Special
Instability
flammability
Health
Fire hazard
Reactivity
Personal protection
GAS:
CONTENTS UNDER PRESURE.
Extremely flammable
Do not puncture or incinerate container.
Can cause rapid suffocation.
May cause severe frostbite.
LIQUID:
Extremely flammable
Extremely cold liquid and gas under pressure.
Can cause rapid suffocation.
May cause severe frostbite.
Label requirements: Class A: Compressed gas.
Class B-1: Flammable gas.
United States Canada
0
4
0
National Fire Protection Association (U.S.A.)
0
4
0
Health
flammability
Physical hazards
Material Safety Data Sheet

NITROGEN, GAS

1. PRODUCT AND COMPANY IDENTIFICATION
Product Name NITROGEN, GAS
Product Code(s) G-7, 1018
UN-Number UN1066
Recommended Use Compressed gas.
Synonyms LASER Nitrogen, LASER Nitrogen Ultra, Nitrogen, compressed
Supplier Address* Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
575 Mountain Ave.
Murray Hill, NJ 07974
Phone: 908-464-8100
www.lindeus.com
Linde Gas Puerto Rico, Inc.
Las Palmas Village
Road No. 869, Street No. 7
Catano, Puerto Rico 00962
Phone: 787-641-7445
www.pr.lindegas.com
Linde Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
Phone: 905-501-1700
www.lindecana.com
* May include subsidiaries or affiliate companies/divisions.
For additional product information contact your local customer service.

Chemical Emergency Phone Number Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

2. HAZARDS IDENTIFICATION
OSHA Regulatory Status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Potential Health Effects
WARNING!
Emergency Overview
Simple asphyxiant
Contents under pressure
Keep at temperatures below 52°C / 125°F
Appearance Colorless Physical State Compressed gas. Odor Odorless
NITROGEN, GAS , Material Safety Data Sheet , Revision Date 24-Sep-2013 , Page 2 / 8

Principle Routes of Exposure Inhalation.
Acute Toxicity
Chronic Effects None known
Aggravated Medical Conditions None known.
Environmental Hazard See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS
Chemical Name CAS-No Volume % Chemical Formula
Nitrogen 7727-37-9 >99 N2

4. FIRST AID MEASURES
Eye Contact None required for gas. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.
Skin Contact None required for gas. For dermal contact or suspected frostbite, remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if contact with the product has resulted in blistering of the dermal surface or in deep tissue freezing.
Inhalation PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.
Ingestion None under normal use. Get medical attention if symptoms occur.
Notes to Physician Treat symptomatically.

5. FIRE-FIGHTING MEASURES
Inhalation
Skin This product is a gas at room temperature. Contact with liquid may cause frostbite. Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.
Skin Absorption Hazard No known hazard in contact with skin.
Ingestion Not an expected route of exposure.
Eyes This product is a gas at room temperature. Contact with liquid may cause frostbite.
NITROGEN, GAS , Material Safety Data Sheet, Revision Date 24-Sep-2013 , Page 3 / 8

Flammable Properties Not flammable.
Suitable Extinguishing Media Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Explosion Data
Sensitivity to Mechanical Impact None
Sensitivity to Static Discharge None
Specific Hazards Arising from the Chemical
Cylinders may rupture under extreme heat. Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES
Personal Precautions Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment. Monitor oxygen level.

Environmental Precautions Prevent spreading of vapors through sewers, ventilation systems and confined areas.

Methods for Containment Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.

Methods for Cleaning Up Return cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Handling Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur.

Use an adjustable strap wrench to remove overtight or rusted caps. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres.


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Storage Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Measures Showers. Eyewash stations. Ventilation systems. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%.

Ventilation Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment Eye/Face Protection If splashes are likely to occur, wear: Goggles. Face-shield.

Skin and Body Protection Wear cold insulating gloves when handling liquid. Work gloves and safety shoes are recommended when handling cylinders.

Respiratory Protection General Use No special protective equipment required.

Emergency Use Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%).

Hygiene Measures Wear suitable gloves and eye/face protection.

10. STABILITY AND REACTIVITY

9. PHYSICAL AND CHEMICAL PROPERTIES
-195.8 °C / -320.4 °F

**Appearance**
Freezing Point: -209.9 °C / -345.9 °F
Molecular Weight: 28.01

**Odor Threshold**
No information available

**Water Solubility**
Very slight
No information available

**Evaporation Rate**
No information available

**Colorless.**

**Vapor Pressure**
No data available. **Vapor Density**: 0.97 (air = 1)

**Physical State**
Gas Density: 0.072 lb/ft³ (1.153 kg/m³) (@ 21.1°C)
Compressed gas

**VOC Content (%)**
Not applicable.

**Specific Vol. @21.1°C & 1 atm**
13.8 ft³/lb (0.867 m³/kg)

**Critical Pressure**
492.9 psia (3399 kPa abs)

**Flash Point**
No information available.

**Autoignition Temperature**
No information available.

**Odor**
Decomposition Temperature
No information available.

**Odorless.**

**Boiling Point/Boiling Range**
Lower: Not applicable
Upper: Not applicable

**Flammability Limits in Air**
NITROGEN, GAS

**Stability**
Stable.

**Incompatible Products**
None known.

**Conditions to Avoid**
None known.

**Hazardous Decomposition Products**
None known.

**Hazardous Polymerization**
Hazardous polymerization does not occur.

**11. TOXICOLOGICAL INFORMATION**

**Acute Toxicity**
LD50 Oral: No information available.
LD50 Dermal: No information available.
LC50 Inhalation: No information available.

Inhalation: Product is a simple asphyxiant.

**Repeated Dose Toxicity**
No information available.

**Chronic Toxicity**

**Carcinogenicity**
Contains no ingredient listed as a carcinogen.

**Irritation**
No information available.

**Sensitization**
No information available.

**Reproductive Toxicity**
No information available.

**Developmental Toxicity**
Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

**Synergistic Materials**
None known.

**Target Organ Effects**
None known.

**12. ECOLOGICAL INFORMATION**

**Ecotoxicity**
The environmental impact of this product has not been fully investigated.

**Ozone depletion potential; ODP; (R-11 = 1):** Does not contain ozone depleting chemical (40 CFR Part 82).

**13. DISPOSAL CONSIDERATIONS**
**Waste Disposal Methods** Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Linde for proper disposal.

### 14. TRANSPORT INFORMATION

**DOT**
- **Proper shipping name**: Nitrogen, compressed
- **Hazard Class**: 2.2
- **UN-Number**: UN1066
- **Description**: UN1066, Nitrogen, compressed, 2.2
- **Emergency Response Guide Number**: 121

**TDG**
- **Proper Shipping Name**: Nitrogen, compressed
- **Hazard Class**: 2.2
- **UN-Number**: UN1066
- **Description**: UN1066, NITROGEN, COMPRESSED, 2.2

**MEX**
- **Proper Shipping Name**: Nitrogen, compressed
- **Hazard Class**: 2.2
- **UN-Number**: UN1066
- **Description**: UN1066, Nitrogen, compressed, 2.2

**IATA**
- **UN-Number**: UN1066
- **Proper Shipping Name**: Nitrogen, compressed
- **Hazard Class**: 2.2
- **ERG Code**: 2L
- **Description**: UN1066, Nitrogen, compressed, 2.2

**Maximum Quantity for Passenger**: 75 kg
**Maximum Quantity for Cargo Only**: 150 kg
**Limited Quantity**: No information available.

**IMDG/IMO**
- **Proper Shipping Name**: Nitrogen, compressed
- **Hazard Class**: 2.2
- **UN-Number**: UN1066
- **EmS No.**: F-C, S-V
- **Description**: UN1066, Nitrogen, compressed, 2.2

**ADR**
- **Proper Shipping Name**: Nitrogen, compressed
- **Hazard Class**: 2.2
- **UN-Number**: UN1066
- **Classification Code**: 1A
- **NITROGEN, GAS**, Material Safety Data Sheet, Revision Date 24-Sep-2013, Page 7 / 8

### 15. REGULATORY INFORMATION

**International Inventories**

**Legend**
- U.S. Federal Regulations
- SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

**SARA 311/312 Hazard Categories**
Acute Health Hazard No
Chronic Health Hazard No
Fire Hazard No
Sudden Release of Pressure Hazard Yes
Reactive Hazard No

Clean Water Act
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

Risk and Process Safety Management Programs
This material, as supplied, does not contain any regulated substances with specified thresholds under 40 CFR Part 68.
This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CERCLA/SARA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

U.S. State Regulations
California Proposition 65
This product does not contain any Proposition 65 chemicals.

EINECS/ELINCS
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory Complies
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
TSCA Complies
DSL Complies

NITROGEN, GAS , Material Safety Data Sheet, Revision Date 24-Sep-2013, Page 8 / 8

U.S. State Right-to-Know Regulations
Chemical Name Massachusetts New Jersey Pennsylvania Illinois Rhode Island Nitrogen X X X - X

International Regulations
Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
A Compressed gases

Prepared By Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date 05-Mar-2010
Revision Date 24-Sep-2013

Revision Number 2
Revision Note Not applicable.
Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

General Disclaimer
For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES
Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

End of Safety Data Sheet
Personal Protection -
NFPA Physical and Chemical
Hazards Simple asphyxiant
Health Hazard 0
HMIS Health Hazard 0
Flammability 0
Flammability 0 Physical Hazard 3
Stability 0
1. **Product Identification**

*Product Identity:* Ammonium Hydroxide Solutions (10%-30%)

*Molecular Weight:* 35.05 (NH₄OH)

*Chemical Formula:* NH₄OH + H₂O

*Synonyms:* Aqua Ammonia greater than 10% and less than 30%; Aqua ammonia 15.8 to 26°Be.(all grades)

**Distributed By Brenntag**

<table>
<thead>
<tr>
<th>Brenntag Great Lakes LLC.</th>
<th>Brenntag Mid-South Inc.</th>
<th>Brenntag Northeast, Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4420 N. Harley Davidson Ave</td>
<td>1405 Hwy 136 W</td>
<td>81 West Huller Lane</td>
</tr>
<tr>
<td>Wauwatosa, WI 53225</td>
<td>Henderson, KY 42420</td>
<td>Reading, PA 19605</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 East Pettigrew Street</td>
<td>610 Fisher Road</td>
<td>10747 Patterson Place</td>
</tr>
<tr>
<td>Durham, NC 27703</td>
<td>Longview, TX 75604</td>
<td>Santa Fe Springs, CA 90670</td>
</tr>
</tbody>
</table>

2. **Hazards Identification**

**Emergency Overview**

**DANGER!**

POISON! DANGER! CORROSIVE, ALKALINE SOLUTION. CAUSES BURNS TO ANY AREA OF CONTACT. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN.

**Potential Health Effects**

**Inhalation:**

Exposure by inhalation can cause irritation of the nose, throat, and mucous membranes. Exposure to high concentrations of ammonia vapor (above approximately 2500ppm) is life threatening, causing severe damage to the respiratory tract and resulting in bronchitis Chemical pneumonitis, and pulmonary edema, which can be fatal. Chronic exposure to ammonia can cause respiratory irritation and damage.
Skin Contact:

Skin contact can result in severe irritation, blister formation and burns; contact with the liquid results in cryogenic burns as well.

Eye Contact:

Eye contact with ammonia vapor is severely irritating, and exposure of the eyes to ammonium hydroxide can result in serious damage and may cause permanent eye injury and blindness. Tearing or edema may occur.

3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1336-21-6</td>
<td>Ammonium Hydroxide</td>
<td>10-30%</td>
</tr>
<tr>
<td>7732-18-5</td>
<td>Water</td>
<td>70-90</td>
</tr>
</tbody>
</table>

4. First Aid Measures

Inhalation:

If a person breathes in chemical, remove exposed person promptly to fresh air. If breathing has stopped, perform artificial respiration. Oxygen should be provided for a person having difficulty breathing (but only administered by an authorized individual) until the person is able to breath easily by themselves. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Ingestion:

If conscious, give large amounts of water. DO NOT induce vomiting. Get medical attention immediately. If vomiting occurs spontaneously, keep head below hips. May drink orange juice or diluted vinger (1: 4) to counteract ammonia.

Skin Contact:

Promptly wash the contaminated skin using soap or mild detergent and water. If chemical, or solution containing chemical, soaks through clothing, remove the clothing promptly and wash the skin using soap or mild detergent and water. Medical attention should be given as soon as possible for all burns, regardless of how minor they seem.

Eye Contact:
Flush eyes with large amounts of water, lifting the upper and lower lids at periodic intervals to insure contact of water with all accessible tissue of the eyes and lids. Medical attention should be given as soon as possible, preferably an eye specialist.

5. Fire Fighting Measures

Go to Section 9 for Flammable Properties.

Fire:

Not considered to be a fire hazard. The mixture will not burn, but escaping ammonia gas can burn in the range of 16-25% in air. 
LEL /UEL = 15 – 28%

Explosion:

Not considered to be an explosion hazard. When heated, will give off ammonia gas. Ammonia increases the fire hazards from other combustible materials, including oil. Flammable limits are broadened by increasing temperature. Ammonia vapor in the rate of 16 - 25% in air can explode on contact with ignition sources. Closed containers exposed to extreme heat may build up pressure and rupture violently. Combustion of released ammonia may form nitrogen oxides.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Water spray or fog may be used for escaping ammonia gas and to cool ammonia containers.

Special Considerations:

Firefighters should avoid all bodily contact; wear full protective clothing and self-contained breathing apparatus in positive pressure mode. When this product is heated to combustion it will release ammonia which could form nitrogen oxides.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment. Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate fumes. Use copious amounts of water spray or fog to absorb the evolved gas. Stay upwind when containers are threatened. Contain spill and runoff from entering drains, sewers, and water systems by utilizing methods such as diking, containment, and absorption. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.
7. Handling and Storage

Keep containers tightly closed. Store in a cool, dry place. Use only with adequate ventilation, dust mask or self-contained breathing apparatus. Protective clothing should always be worn. Avoid contact with eyes, skin, and clothing. Keep container closed when not in use. Avoid breathing mist. Do not get on skin, clothing, or in eyes. Wash off with water. Do not take internally. Open container slowly in case of pressure build-up. Ammonia hydroxide will react exothermically with acid.

8. Exposure Controls/Personal Protection

OSHA Permissible Exposure Limit (PEL): 35 ppm (STEL)
ACGIH Threshold Limit Value (TLV): 25 PPM (TLV) 35 PPM (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, a Manual of Recommended Practices*, most recent edition, for details. Personal Respirators (NIOSH Approved): If the exposure limit is exceeded and engineering controls are not feasible, a full-face piece particulate respirator (NIOSH type N100 filters) may be worn for exposure limits, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Impervious rubber or neoprene gloves should be worn. Protective, impervious clothing should be worn in presence to prevent contact with skin (coveralls, boots, etc.).

Eye Protection:

Splash-proof goggles and full face shield should be worn when there is danger of splash from solution containing chemical. Protection against splash or mist from solution containing chemical with 8-inch minimum face shield is recommended. Eye protection should be worn in presence of solution containing chemical, at all times. Maintain eye wash fountain and quick-drench facilities in work area.
9. Physical and Chemical Properties

Appearance: Clear colorless liquid
Odor: strong pungent (ammonia) odor
Physical State: liquid
PH of water solutions: 13+
Melting Point: N/A
Boiling Point: 27.8 - 59.5 °C (82-139F)
Flash Point: N/A
Upper Explosive Limit: N/A
Lower Explosive Limit: N/A
Vapor Pressure: (60F) 420 – 475 FOR 29.7% NH3
Vapor Density: 0.596
Specific Gravity: 0.89-0.96
Solubility in Water: 100% Soluble in Water

10. Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.

Conditions to Avoid: Heat, exposure to high temperature should be minimized. This material should avoid direct sunlight.

Incompatible Materials: Contact with strong acids and alkalis, chlorine bleach, halogens, strong hydroxide, iron, reactive metals, mercury, gold, silver and strong oxidizers.


11. Toxicological Information

LD50 Inhalation Rat: 2000 ppm/4hr
LD50 Oral Rat: 350 mg/kg
LD50 Oral mouse: 4837mg/kg

Acute: POISON! DANGER! CORROSIVE, ALKALINE SOLUTION. CAUSES BURNS TO ANY AREA OF CONTACT. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN.
Exposure by inhalation can cause irritation of the nose, throat, and mucous membranes. Exposure to high concentrations of ammonia vapor (above approximately 2500ppm) is life threatening, causing severe damage to the respiratory tract and resulting in bronchitis. Chemical pneumonitis, and pulmonary edema, which can be fatal. Chronic exposure to ammonia can cause respiratory irritation and damage. Ingestion of ammonium hydroxide burns the mouth, throat, and gastrointestinal tract and can lead to severe abdominal pain, nausea, vomiting, and collapse. Ingestion of as little as 3-4 ml of ammonium hydroxide may be fatal. Skin contact can result in severe irritation and burns; contact with the liquid results in cryogenic burns as well. Eye contact with ammonia vapor is severely irritating, and exposure of the eyes to ammonium hydroxide can result in serious damage and may cause permanent eye injury and blindness.

**Chronic:** Ingestion of as little as 3-4 ml of ammonia hydroxide may be fatal. Investigated as a tumorigen and mutagen.

### 12. Ecological Information

**ENVIRONMENTAL FATE:** No data found

**ENVIRONMENTAL TOXICITY:** LC50 Daphnia magna 0.66 mg/l/48 hr 22°C; LC50 Perch 0.29 mg/l/7 days/un-ionized NH3; LC50 Salmon gairdnerii 8 ug/ml NH3/24 hr
13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

US DOT (ground)
Proper Shipping Name: Ammonia Solution
Hazard Class: 8
UN/NA: UN2672
Packing Group: III
Marine Pollutant: No
RQ Amount: 1,000 lbs

IMDG (water)
Proper Shipping Name: Ammonia Solution
Hazard Class: 8
UN/NA: UN2672
Packing Group: III
Marine Pollutant: No
RQ Amount: 1,000 lbs

15. Regulatory Information

<table>
<thead>
<tr>
<th>SARA 302</th>
<th>SARA 304</th>
<th>SARA 313</th>
<th>CERCLA</th>
<th>TSCA Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Listed</td>
<td>Not Listed</td>
<td>Not Listed</td>
<td>Listed 1,000 lbs</td>
<td>Yes</td>
</tr>
</tbody>
</table>

California Proposition 65
Not Listed

16. Other Information

This MSDS is provided as an information resource only. It should not be taken as a warranty or representation for which Brenntag assumes legal liability. While Brenntag believes the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its identity. The buyer assumes all responsibility for using and handling the product in accordance with applicable federal, state, and local regulations.

Distributed By Brenntag

Brenntag Great Lakes LLC.
4420 N. Harley Davidson Ave
Wauwatosa, WI 53225

Brenntag Mid-South Inc.
1405 Hwy 136 W
Henderson, KY 42420

Brenntag Northeast, Inc.
81 West Huller Lane
Reading, PA 19605

Brenntag Southeast, Inc.
2000 East Pettigrew Street
Durham, NC 27703

Brenntag Southwest, Inc.
610 Fisher Road
Longview, TX 75604

Brenntag Pacific, Inc.
10747 Patterson Place
Santa Fe Springs, CA 90670

SOLUTION-SPECIFIC PHYSICAL DATA

<table>
<thead>
<tr>
<th></th>
<th>20.5°F Baume</th>
<th>25°F Baume</th>
<th>26°F Baume</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIA %</td>
<td>18.5-19.5%</td>
<td>26.5-27.5%</td>
<td>29.0-29.9%</td>
</tr>
<tr>
<td>WATER %</td>
<td>81.5-80.5%</td>
<td>73.5-72.5%</td>
<td>71.0-70.1%</td>
</tr>
<tr>
<td>SPECIFIC GRAVITY</td>
<td>0.9341-0.9276 @60°F</td>
<td>0.9061-0.9032 @60°F</td>
<td>0.8974-0.8960 @60°F</td>
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<tr>
<td>BOILING POINT</td>
<td>124°F @14.7 psis</td>
<td>88°F @14.7 psis</td>
<td>84.9°F @14.7 psis</td>
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<tr>
<td>VAPOR PRESSURE</td>
<td>3.9 psis @60°F</td>
<td>6.9 @60°F</td>
<td>9.1 @60°F</td>
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<tr>
<td>APPROX. FREEZING POINT</td>
<td>-32°F</td>
<td>-89°F</td>
<td>-110°F</td>
</tr>
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</table>
MATERIAL SAFETY DATA SHEET

BRENNTAG

1. CHEMICAL PRODUCT IDENTIFICATION & COMPANY IDENTIFICATION
PRODUCT IDENTIFIER: Citric Acid 50% Solution (All Grades)
GENERAL USE: Used as an acidulant in beverages, to adjust the pH of foods, as synergistic antioxidant in processing cheese, as a foam inhibitor, and as a sequestering agent to remove trace metals.
PRODUCT DESCRIPTION: An aqueous solution of an alpha-hydroxy acid. Synonyms include: beta-hydroxyisocarboxylic acid, and 2-hydroxy-1,2,3-propanecarboxylic acid.

INFORMATION PROVIDED BY:
BRENNTAG Pacifi c, Inc.
5700 N.W. Front Avenue
Portland, OR 97210

FOR MSDS call: PHONE: 503-242-0200

2. COMPOSITION & INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CAS #</th>
<th>OSHA HAZARD</th>
<th>WT%</th>
<th>TLV(PEL)</th>
<th>STEL</th>
</tr>
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<tbody>
<tr>
<td>Citric Acid</td>
<td>77-92-9</td>
<td>Severe Eye &amp; Respiratory</td>
<td>50 ± 2</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

AGGHI: None
OSHA: None

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: A clear, colorless to light yellow, strongly acidic liquid having no characteristic odor. This product can cause severe irritation or burns to the eyes. It may cause moderate to severe irritation to the skin and respiratory tract.

POTENTIAL HEALTH EFFECTS

INHALATION: Inhalation of mists or aerosols may cause severe irritation to the nose, mouth, throat, mucus membranes and lungs. Symptoms of exposure may include sneezing, coughing, chest discomfort or pain and sootiness of breath. Inhalation of high mist concentrations may result in permanent lung damage.

EYE CONTACT: Exposure to the mists or liquid can cause severe eye irritation. Symptoms of exposure may include tearing, redness, swelling and a painful burning sensation. Corneal damage with impairment of vision may result from direct contact with the liquid, unless promptly treated.

SKIN CONTACT: Exposure to the mists or liquid may cause moderate to severe skin irritation. Symptoms of exposure may include redness, swelling, a stinging sensation and/or pain. No published reports indicate this product is absorbed through the skin.

INGESTION: Ingestion may cause moderate to severe irritation to the mouth, throat and the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, possible bleeding and/or tissue ulceration.

CHRONIC: The chronic health effects of exposure to this product are expected to be the same as for acute exposure.
4. FIRST AID MEASURES

INHALATION: If inhaled, immediately move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance: use the Holger Nielson method (back pressure-arm lift) or proper respiratory device. If breathing is difficult, give oxygen. Call a physician.

EYE CONTACT: In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower lids occasionally. Remove contact lenses, if worn. Get medical attention immediately.

SKIN CONTACT: In case of contact, immediately flush skin with plenty of clean running water for at least 15 minutes, while removing contaminated clothing and shoes. Then wash with soap and water. If burn or irritation occurs, call a physician.

INGESTION: If swallowed, DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give plenty of water to drink. Never give anything by mouth to an unconscious person.

NOTE TO PHYSICIANS: Treat exposure symptomatically.

5. FIRE FIGHTING MEASURES

Flashpoint and Method: This product does not flash.

Flammable Limits (in air, % by volume) Lower: Not applicable Upper: Not applicable

Autoignition Temperature: Not applicable

GENERAL HAZARD: This product is an aqueous solution of a non-volatile organic acid having no characteristic odor. The Uniform Fire Code health hazard classification for this product is irritant. When in contact with some soft metals (i.e. Aluminum), this product can corrode the metal, liberating flammable explosive Hydrogen gas. This product may produce hazardous mists or hazardous decomposition products.

FIRE FIGHTING INSTRUCTIONS: EXTINGUISHING MEDIA: Water fog, CO₂ foam or dry chemicals.

Use the extinguishing media that is appropriate to the surrounding fire.

FIRE FIGHTING EQUIPMENT: Fire fighters should wear full protective equipment, including self-contained breathing apparatus.

HAZARDOUS COMBUSTION PRODUCTS: When heated to dryness and decomposition, it emits toxic carbon monoxide and carbon dioxide plus dense, irritating smoke.

6. ACCIDENTAL RELEASE MEASURES

LAND SPILL: Wearing recommended protective equipment and clothing, dike spill using soil, sand or compatible commercial absorbent. Pick up bulk of liquid using pumps or vacuum truck or absorb liquid in sand or commercial absorbent. Place in approved containers for recovery, disposal or satellite accumulation. Neutralize the acidity using soda ash, lime or a suitable agent appropriate for neutralizing acidic liquids. Flush the spill area with water; collect rinsates for disposal or sewer, as appropriate.

WATER SPILL: Wear recommended protective equipment and clothing if contact with hazardous material can occur. Stop or divert water flow. Dike contaminated water and remove for disposal and/or treatment. As appropriate, notify all downstream users of possible contamination.
7. HANDLING AND STORAGE

STORAGE TEMPERATURE: Ambient
STORAGE PRESSURE: Ambient

GENERAL: Store in a cool, dry, well-ventilated area away from incompatible materials and products. Avoid getting this product in eyes, on skin or on clothing. Wear the recommended personal protective equipment. Avoid breathing mists or aerosols. Use with adequate ventilation. Keep the container tightly closed when not in use. Wash thoroughly after handling this product.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

CONTROL: Use a local or general mechanical exhaust ventilation system capable of maintaining mist levels, in the work area, below any level, which may be irritating.

MEASURES: 

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

RESPIRATOR: If use causes an irritating mist, wear a NIOSH-approved respirator equipped with a good mist/particulate cartridge or supplied air.

EYES: Wear chemical goggles (recommended by ANSI Z87.1-1979).

GLOVES: Wear Nitrile, Neoprene, Butyl Rubber, Viton or Natural Rubber gloves.

CLOTHING & EQUIPMENT: Wear a Nitrile, Neoprene, Butyl Rubber or Natural Rubber apron when handling this product. An eye wash station and safety shower should be available in the work area.

FOOTWEAR: Wear Nitrile, Neoprene, Butyl Rubber or Natural Rubber boots, if contact is likely.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear, colorless to light yellow</td>
</tr>
<tr>
<td>Physical State</td>
<td>Liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>No characteristic</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C6H8O7 (in water)</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>192.14 (in water)</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>Approximately 104°C (219°F)</td>
</tr>
<tr>
<td>Freezing/Melting Point</td>
<td>Less than 0°C (32°F)</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Approximately 1.22 @ 20°C</td>
</tr>
<tr>
<td>Density (pounds/gallon)</td>
<td>Approximately 10.2</td>
</tr>
<tr>
<td>Bulk Density (pounds/ft³)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Solubility in H2O</td>
<td>Complete</td>
</tr>
<tr>
<td>Octanol/Water Partition Coef.</td>
<td>No data available</td>
</tr>
<tr>
<td>pH (ss Is)</td>
<td>1.5 – 2.0</td>
</tr>
<tr>
<td>pH (1% solution)</td>
<td>2.0 – 2.5</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

GENERAL: This product is stable and hazardous polymerization will not occur.

CONDITIONS TO AVOID: Hot storage.

INCOMPATIBLE MATERIAL: Strong oxidizers, caustics & alkali, chlorine releasers, sulfides, sulfites, cyanides, Aluminum, Magnesium, Zinc and alloys of these metals.

HAZARDOUS DECOMPOSITION PRODUCTS: When heated to dryness and decomposition, it emits toxic oxides of carbon plus dense, irritating smoke.

SENSITIVITY TO MECHANICAL IMPACT: This product is not sensitive to mechanical impact.

SENSITIVITY TO STATIC DISCHARGE: This product is not sensitive to static discharge.
11. TOXICOLOGICAL INFORMATION

Components:
Citric Acid

Eye Contact: Rabbit: 750 µg/24 Hours; Severe
Skin Contact: Rabbit: 500 mg/24 Hours; Moderate
Oral Rat LD₅₀: 3 g/kg
Dermal Rabbit LD₅₀: No data available
Inhalation Rat LD₅₀: No data available
Human Data:
Other Toxicological Data: Intravenous Mouse LD₅₀: 42 mg/kg
Carcinogenicity: No data available
Teratogenicity: No data available
Mutagenicity: No data available
Synergistic Products: None reported
Target Organ: Eyes, Skin, Mucous membranes, Lungs & Teeth

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE:
The environmental fate of this product is expected to be: Land: biodegradation with some leaching into the groundwater. Water: biodegradation. Air: not expected to volatilize due to low vapor pressure. This product is not expected to bioaccumulate.

ENVIRONMENTAL CONSIDERATIONS:
The aquatic toxicity of this product has not been determined. However, the aquatic toxicity of pure Citric Acid is: Goldfish LD₅₀: 625 mg/liter, longterm exposure in hard water. Goldfish LD₅₀: 894 mg/liter, longterm exposure in hard water.

13. DISPOSAL CONSIDERATIONS

RCRA 40 CFR 261 CLASSIFICATION: Corrosive Waste
U.S. EPA WASTE NUMBER/DESCRIPTION: D002

If this product is disposed of as shipped, it meets the criteria of a hazardous waste as defined under 40 CFR 261 due to its corrosivity. If this product becomes a waste, it will be a hazardous waste which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly. As a hazardous liquid waste, it must be disposed of in accordance with local, state and federal regulations in a permitted hazardous waste treatment, storage, and disposal facility.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Not Restricted (See Other Shipping Information)

Hazard Class: Not applicable
UN Number: Not applicable
Packing Group: Not applicable
Primary Label: None Required
Primary/Secondary Placards: None Required

DOT Reportable Quantity (RQ): Not listed
RG for Product: Not applicable

Marine Pollutant: No

2004 North American Emergency Response Guidebook No.: Not applicable (in U.S.); 154 (Outside U.S.)

TDG PROPER SHIPPING NAME: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (Contains Citric Acid)

Hazard Class: 8
UN Number: UN3265
Packing Group: III
Primary Label: Corrosive
Secondary Label(s): None Required
Primary/Secondary Placards: Corrosive

TDG Reportable Quantity (RQ): # At least 5 kg or 5 liters.

TDG Schedule KII: Not listed
Regulated Limit (RL): && Not listed
RL for Product: Not applicable

Other Shipping Information: DOT exception taken for materials only corrosive to Aluminum and mild steel; 49 CFR 173.154 (d) (1) and (2), when shipped by ground.

# Canadian Transportation of Dangerous Goods Regulations (TDGR), Part IX, Table I. Quantities or levels for Immediate Reporting: releases of reportable quantities, RQ, that meet the definition of a "dangerous occurrence" to life, health, property, or the environment must be reported to the appropriate authorities as outlined in TDGR 9.12(1) and 9.14(1).

&& Reporting to Environment Canada is required for any releases exceeding the regulated limits, RL, of S.2 materials (primary or secondary). The regulated limits are found in Schedule A31 of the TDGR.
### REGULATORY INFORMATION

<table>
<thead>
<tr>
<th>COMPONENTS:</th>
<th>Citric Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA Target Organs:</td>
<td>Eyes, Skin, Mucous membranes, Lungs &amp; Teeth</td>
</tr>
</tbody>
</table>

**Carcinogenic Potential:**
- Regulated by OSHA: No
- Listed on NTP Report: No
- Listed by IARC: No
- IARC Group: Not applicable
- ACGIH Appendix A: Not listed
- A1 Confirmed Human: Not applicable
- A2 Suspected Human: Not applicable

**U.S. EPA Requirements**
- Release Reporting
  - CERCLA (40 CFR 302): Not listed
  - U.S. EPA Requirements
    - Reportable Quantity: Not applicable
    - Category: Not applicable
    - RCRA Waste No.: Not applicable
  - Unlisted Substance: Yes
    - Reportable Quantity: 100 pounds
    - Characteristic: Corrosivity
    - RCRA Waste No.: DD02

**SARA TITLE III**
- Section 302 & 303 (40 CFR 355):
  - Listed Substance: Not listed
  - Reportable Quantity: Not applicable
  - Planning Threshold: Not applicable
- Section 311 & 312 (40 CFR 372):
  - Planning threshold: 10,000 pounds
- Section 313 (40 CFR 372):
  - Listed Toxic Chemical: Not listed
  - Reporting Threshold: Not applicable

**U.S. TSCA Status**
- Listed (40 CFR 710): Yes

**State Regulations**
- State of California: Safe Drinking Water and Toxins Enforcement Act, 1986 (Proposition 65):
  - Carcinogen: No
  - Reproductive Toxin: No

**Other Regulations**
- State Right To Know Laws: None known

**Canadian Regulations**
- Product Information:
  - Controlled Product: Yes
  - WHMIS Hazard Symbols: Corrosive Material
  - WHMIS Class & Division: E
- Ingredient Information:
  - IDL Substance: Yes
  - DSL or NDSL Lists: DSL
16. OTHER INFORMATION

EPA Registration number: Not applicable
Approved Product Uses: Not applicable

Special Notes:
This product does not contain any material which the State of California has found to cause cancer and/or birth defects or other reproductive harm.

Special Instructions:
When making solutions, always add this product to water with adequate mixing to ensure a uniform solution.

Do not mix this product with strong caustic or alkaline solutions as violent boiling or spattering may result.

Do not add Citric Acid 50% Solution to hypochlorite bleaches, chlorine sanitizers or chlorinated cleaners as this liberates toxic, corrosive Chlorine gas.

MSDS Revision Information: Information Revised This Issue Date: New MSDS format with additional information.
Form Revision made 2/03/06

MSDS Distributed by: Brenntag Pacific, Inc.
NW Environmental Department
Phone: 503-242-0200 FAX: 503-412-3390

Prepared By: Edward Doherty Date Prepared: July 26, 2007

This Material Safety Data Sheet is provided as an information resource only. It should not be taken as a warranty or representation for which Brenntag Pacific, Inc. assumes legal responsibility. While Brenntag Pacific, Inc. believes the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its validity. The buyer assumes all responsibility of using and handling the product in accordance with applicable federal, state, and local regulations.
MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT IDENTIFICATION & COMPANY IDENTIFICATION

PRODUCT IDENTIFIER: Sodium Hydroxide 50% Solution (All Grades)

GENERAL USE: Used in industry to neutralize acids; to precipitate alkaloids; in metal finishing; in cleaners, and to precipitate most metals (as hydroxides) from aqueous solutions.

PRODUCT DESCRIPTION: An aqueous solution of Sodium Hydroxide. Synonyms for Sodium Hydroxide include: caustic soda, lye soda, sodium hydroxide and white caustic.

INFORMATION PROVIDED BY: Brenntag Pacific, Inc.
5700 N.W. Front Avenue
Portland, OR 97210

For MSDS call: PHONE: 903-242-0280

EMERGENCY PHONE NUMBERS
BRENNTAG: 503-699-7055
CHEMTREC: 800-424-9300
CANUTEC: 613-996-6666

2. COMPOSITION & INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CAS #</th>
<th>OSHA HAZARD</th>
<th>WT %</th>
<th>ACGIH TLV-TWA</th>
<th>STEL</th>
<th>OSHA PEL-TWA</th>
<th>STEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Hydroxide</td>
<td>1310-73-2</td>
<td>Corrosive; Lung Toxin</td>
<td>50 ± 1</td>
<td>None</td>
<td>None</td>
<td>2 mg/m³</td>
<td>None</td>
</tr>
</tbody>
</table>

Ceiling: 2 mg/m³
3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: A clear to slightly turbid, colorless liquid having no characteristic odor. The mists and liquid are corrosive to all tissues contacted. Inhalation of mists may cause permanent lung damage. This material reacts with water to release a large amount of heat and can react violently with acids and other substances. The NIOSH I.D.L.H. for Sodium Hydroxide is: 10 mg/m³.

POTENTIAL HEALTH EFFECTS

INHALATION: Inhalation of mists or an aerosol can cause severe irritation or burns to the nose, mouth, throat, mucous membranes and lungs. Symptoms of exposure can include coughing, sneezing, choking, shortness of breath, chest pain and impairment of lung function. Inhalation of a high mist concentration may result in permanent lung damage.

EYE CONTACT: Exposure to the mists or liquid can cause severe eye irritation and/or burns. Symptoms of exposure can include tearing redness, swelling, pain and possible mucous discharge. Exposure may cause corneal damage and/or visual impairment even when prompt treatment is provided.

SKIN CONTACT: Exposure to the mists or liquid can cause severe skin irritation and/or burns. Symptoms of exposure may include redness, swelling, pain and possible ulceration. Prolonged skin exposure to this material may cause destruction of the dermis with impairment of the skin, at site of contact, to regenerate. No published data indicates this material is absorbed through the skin.

INGESTION: Ingestion can cause severe irritation and/or burns to the entire gastrointestinal tract, including the stomach and intestines characterized by nausea, vomiting, abdominal pain, bleeding, tissue ulceration and possible diarrhea.

CHRONIC: The chronic health effects of exposure to this material are expected to be the same as for acute exposure.
### 4. FIRST AID MEASURES

**INHALATION:** If inhaled, immediately move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; use the Holger Nielsen method (back pressure-arm lift) or proper respiratory device. If breathing is difficult, give oxygen. Call a physician.

**EYE CONTACT:** In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower lids occasionally. Remove contact lenses, if worn. Get medical attention immediately.

**SKIN CONTACT:** In case of contact, immediately flush skin with plenty of clean running water for at least 15 minutes, while removing contaminated clothing and shoes. If burn or irritation occurs, call a physician.

**INGESTION:** If swallowed, DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give plenty of water to drink. Never give anything by mouth to an unconscious person.

**NOTE TO PHYSICIANS:** Sodium Hydroxide has a relatively low oral toxicity, but it can be corrosive to the eyes, skin and mucous membranes. If ingested, consideration should be given to careful endoscopy as stomach or esophageal burns, perforations or strictures may occur. Careful gastric lavage with an endotracheal tube in place should be considered. Treat exposure symptomatically.

### 5. FIRE FIGHTING MEASURES

**Flashpoint and Method:** This material does not flash.

<table>
<thead>
<tr>
<th>Flammable Limits (in air, % by volume)</th>
<th>Lower: Not applicable</th>
<th>Upper: Not applicable</th>
</tr>
</thead>
</table>

**Autoignition Temperature:** Not applicable

**GENERAL HAZARD:** The Uniform Fire Code physical hazard classification for this material is: *Water Reactive, Class I*. Direct contact with water causes an exothermic reaction (generation of heat). The Uniform Fire Code health hazard classification for this material is: *Corrosive (Alkaline)*. This material may generate flammable / explosive hydrogen gas on contact with some soft metals (e.g. Aluminum). This material may produce hazardous decomposition products.

**FIRE FIGHTING INSTRUCTIONS:**

**EXTINGUISHING MEDIA:** Foam, CO₂ or dry chemicals.

If water must be used and it can contact this material, it is best to use a water flood technique.

**FIRE FIGHTING EQUIPMENT:** Fire fighters should wear full protective equipment, including self-contained breathing apparatus.

**HAZARDOUS COMBUSTION PRODUCTS:** When heated to dryness and decomposition, it emits toxic sodium oxide.
<table>
<thead>
<tr>
<th>6. ACCIDENTAL RELEASE MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LAND SPILL:</strong> Wearing recommended protective equipment and clothing, dike the spill and pick up the bulk of liquid using pumps or a vacuum truck, or absorb the liquid in sand or a commercial absorbent. Place in approved containers for recovery, disposal, or satellite accumulation. Neutralize the alkalinity of the remaining liquid, using a dilute acid solution appropriate for neutralizing alkaline liquids. Liberally cover the spill area with sodium bicarbonate. Flush the spill area with water; collect the rinsates for disposal or sewer, as appropriate.</td>
</tr>
<tr>
<td><strong>WATER SPILL:</strong> Wear recommended protective equipment and clothing if contact with hazardous material can occur. Stop or divert water flow. Dike contaminated water and remove for disposal and/or treatment. As appropriate, notify all downstream users of possible contamination.</td>
</tr>
</tbody>
</table>
7. HANDLING AND STORAGE

**GENERAL:** Store in a cool, dry, well-ventilated area away from incompatible materials and products. Do not get this material in eyes, on skin or on clothing. Wear recommended personal protective equipment. Do not breathe mists or aerosols. Use only with adequate ventilation. Do not take internally. Keep the container tightly closed when not in use. Wash thoroughly after handling.

This material is corrosive to Aluminum, Magnesium, Tin, Zinc and alloys containing these metals, and it will react violently with these metals in powder form.

Considerable heat is generated when this material is mixed with water. Never add water to this material. Always add this material slowly, with constant stirring, to the surface of cool (40 – 50° F) water. If this material is added too rapidly, or without stirring, and becomes concentrated at the bottom of the mixing vessel, excessive heat may be generated, resulting in dangerous boiling and spattering, and a possible immediate and violent eruption of a highly caustic solution.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**CONTROL MEASURES:** Use a local or general mechanical exhaust ventilation system capable of maintaining emissions, in the work area, below the OSHA-PEL or ACGIH Ceiling level.

**RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT**

**RESPIRATOR:** For exposure above the OSHA-PEL or ACGIH-TLV, wear a NIOSH-approved full facepiece or half mask air-purifying cartridge respirator equipped with a good particulate filter cartridge or supplied air. For exposure to Sodium Hydroxide above 10 mg/m3, wear a supplied air respirator or a self-contained breathing apparatus (SCBA) operated in the positive pressure mode.

**EYES:** Wear chemical goggles (recommended by ANSI Z87.1-1979), unless a full facepiece respirator is worn.

**GLOVES:** Wear Neoprene, Nitrile, Butyl Rubber or Natural Rubber gloves.

**CLOTHING & EQUIPMENT:** Wear a Neoprene, Nitrile, Butyl Rubber or Natural Rubber apron, or full protective clothing when handling this material. An eye wash station and safety shower should be available in the work area.

**FOOTWEAR:** Wear Neoprene, Nitrile, Butyl Rubber or Natural Rubber boots.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear to slightly turbid, colorless</td>
</tr>
<tr>
<td>Physical State</td>
<td>Liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>No characteristic</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>NaOH (in water)</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>40.00 (in water)</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>Approximately 142.2° C. (286° F.)</td>
</tr>
<tr>
<td>Freezing/Melting Point</td>
<td>Approximately 12.2° C. (54° F.)</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Approximately 1.525 @ 20° C.</td>
</tr>
<tr>
<td>Density (pounds/galll.)</td>
<td>Approximately 12.72</td>
</tr>
<tr>
<td>Bulk Density (pounds/ft³)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>13 mm Hg @ 60° F.</td>
</tr>
<tr>
<td>Vapor Density (slug/ft³)</td>
<td>No data available</td>
</tr>
<tr>
<td>Evaporation Rate (n-Butyl Acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>VOC Content</td>
<td>Nil</td>
</tr>
<tr>
<td>% Volatile</td>
<td>49 – 51</td>
</tr>
<tr>
<td>Solubility in H₂O</td>
<td>Complete</td>
</tr>
<tr>
<td>pH (as is)</td>
<td>14.0</td>
</tr>
<tr>
<td>pH (% solution)</td>
<td>13.0 to 14.0</td>
</tr>
</tbody>
</table>
10. STABILITY AND REACTIVITY

GENERAL: This product is stable and hazardous polymerization will not occur.

CONDITIONS TO AVOID: Avoid contact with small amounts of water.

INCOMPATIBLE MATERIAL: Acids and acidic salts, chlorinated or fluorinated hydrocarbons, Acetaldehyde, Acrolein, Chlorine trifluoride, Hydroquinone, Maleic anhydride. Phosphorus pentoxide, Tetrahydrofuran, Aluminum, Magnesium, Tin, Zinc and alloys of these metals.

HAZARDOUS DECOMPOSITION PRODUCTS: When heated to decomposition, it emits toxic oxides of sodium.

SENSITIVITY TO MECHANICAL IMPACT: This material is not sensitive to mechanical impact.

SENSITIVITY TO STATIC DISCHARGE: This material is not sensitive to static discharge.

PRODUCT IDENTIFIER: Sodium Hydroxide 50% Solution (All Grades)

11. TOXICOLOGICAL INFORMATION

Components: Sodium Hydroxide

Eye Contact: Rabbit: 50 ug/24 hours; Severe
Skin Contact: Rabbit: 500 mg/24 hours; Severe
Oral Rat LD₅₀: No data available (Oral Rabbit LD₅₀: 500 mg/kg)
Dermal Rabbit LD₅₀: 1,300 mg/kg
Inhalation Rat LC₅₀: No data available
Human Data: No data available
Other Toxicological Data: Intraperitoneal Mouse LD₅₀: 40 mg/kg
Carcinogenicity: No data available
Teratogenicity: No data available
Mutagenicity: Hamster Cytogenetic Analysis: Lung: 10 mmol/Liter
Synergistic Products: None reported
Target Organs: Eyes, Skin, Mucous membranes & Lungs

Medical Conditions Aggravated By Exposure: Skin or Respiratory disorders

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE:
This material is completely soluble in water and will significantly affect the pH of water. No specific environmental fate information is available.

ENVIRONMENTAL CONSIDERATIONS:
The aquatic toxicity for this material has not been determined. The aquatic toxicity for pure Sodium Hydroxide is Cyprinus carpio LC₅₀ = 180 ppm/24 hours at 25°C.

13. DISPOSAL CONSIDERATIONS

RCRA 40 CFR 261 CLASSIFICATION: Corrosive Waste
U.S. EPA WASTE NUMBER/DESCRIPTION: D002

If this product is disposed of as shipped, it meets the criteria of a hazardous waste as defined under 40 CFR 261 due to its corrosivity. If this product becomes a waste, it will be a hazardous waste, which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly. As a hazardous liquid waste, it must be disposed of in accordance with local, state, and federal regulations in a permitted hazardous waste treatment, storage, and disposal facility.
14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Sodium hydroxide solution

Hazard Class: 8
UN Number: UN1824
Packaging Group: II
Primary Label: Corrosive
Primary/Subsidiary Placards: Corrosive

DOT Reportable Quantity (RQ): 1,000 pounds (NaOH)
RG for Product: 2,000 pounds (157.2 gallons)

Marine Pollutant: No

2004 North American Emergency Response Guidebook No.: 154

TDG PROPER SHIPPING NAME: SODIUM HYDROXIDE SOLUTION

Hazard Class: 8
UN Number: UN1824
Packaging Group: II
Primary Label: Corrosive
Primary/Subsidiary Placards: Corrosive

TDG Reportable Quantity (RQ): # At least 5 kg or 5 liters.
TDG Schedule XII: Not listed
Regulated Limit (RL): ## 50 kg (NaOH)
RL for Product: 100 kg (65.6 liters)

Other Shipping Information: None

# Canadian Transportation of Dangerous Goods Regulations (TDGR), Part IX, Table I. Quantities or levels for immediate reporting: releases of reportable quantities, RQ. That meet the definition of a "dangerous occurrence" (a threat to life, health, property, or the environment) must be reported to the appropriate authorities as outlined in TDGR 1.13(1) and 5.14(1).
## Reporting to Environment Canada is required for any releases exceeding the regulated limits, RL, of 9.2 materials (primary or secondary). The regulated limits are found in Schedule XII of the TDGR.

15. REGULATORY INFORMATION

COMPONENTS: Sodium Hydroxide

OSHA Target Organ(s): Eyes, Skin, Mucous membranes & Lungs

Carcinogenic Potential:
Regulated by OSHA: No
Listed on NTP Report: No
Listed by IARC: No
IARC Group: Not applicable
ACGIH Appendix A: Not listed
A1 Confirmed Human: Not applicable
A2 Suspected Human: Not applicable

U.S. EPA Requirements
Release Reporting
CERCLA (40 CFR 302)
Listed Substance: Yes
Reportable Quantity: 1,000 pounds
Category: C
RCRA Waste No.: None listed
Unlisted Substance: Not applicable
Reportable Quantity: Not applicable
Characteristic: Not applicable
RCRA Waste No.: Not applicable
SARA TITLE III
Section 302 & 303 (40 CFR 355):
Listed Substance: Not listed
Reportable Quantity: Not applicable
Planning Threshold: Not applicable

Section 311 & 312 (40 CFR 370):
Planning threshold: 10,000 pounds

Section 313 (40 CFR 372):
Listed Toxic Chemical: Not listed
Reporting Threshold: Not applicable

U.S. TSCA Status
Listed (40 CFR 710): Yes

State Regulations
State of California: Safe Drinking Water and Toxins Enforcement Act, 1986 (Proposition 65):
Carcinogen: No
Reproductive Toxin: No

Other Regulations
State Right To Know Laws: MA, NJ, PA, CA

Canadian Regulations
Product Information:
Controlled Product: Yes
WHMIS Hazard Symbols: Corrosive Material
WHMIS Class & Division: E

Ingredient Information:
IDL Substance: Yes
DSL or NDSL Lists: DSL

16. OTHER INFORMATION

EPA Registration number: Not applicable
Approved Product Uses: Not applicable

Special Notes:
This product does not contain any material, which the State of California has found to cause cancer and/or birth defects or other reproductive harm.

NOTE: Deadly carbon monoxide gas can form when this material contacts food soil containing sugars. After cleaning operations are completed, thoroughly ventilate enclosed areas before entering. Always monitor oxygen and carbon monoxide levels when personnel are in enclosed areas. For proper tank entry procedures, see ANSI Z117.1-1977.
Special Instructions:
When making solutions, always add this material to cool (40 – 50° F.) water with adequate mixing to prevent overheating and possible spotting of a highly alkaline solution.

Do not allow this product to contact Aluminum, Magnesium, Tin or Zinc surfaces as this causes corrosion of the metal and generation of flammable/explosive Hydrogen gas.

MSDS Revision Information: Information Revised This Issue Date: New product MSDS.
Form Revision made 2/03/06

MSDS Distributed by: Brenntag Pacific, Inc.
NW Environmental Department
Phone: 503-242-0200 FAX: 503-412-3390

Prepared By: Edward Doheny Date Prepared: July 31, 2007

This Material Safety Data Sheet is provided as an information resource only. It should not be taken as a warranty or representation for which Brenntag Pacific, Inc. assumes legal responsibility. While Brenntag Pacific, Inc. believes the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its validity. The buyer assumes all responsibility of using and handling the product in accordance with applicable federal, state, and local regulations.
### 1. PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** Sodium Nitrite  
**Other/Generic Names:** Nitrous Acid, Sodium Salt, Sodium Nitrite (various grades)  
**Recommended Use:** Food preservation, dye manufacturing, corrosion inhibitor  
**Manufacturer:** General Chemical, LLC  
90 East Halsey Road  
Parsippany, NJ  07054  
General Chemical Performance Products Ltd.  
90 East Halsey Road  
Parsippany, NJ  07054  
**For More Information:**  
Customer Service US ONLY: 800-631-8050  
(Monday – Friday 9:00AM – 4:30PM)  
Customer Service CANADA ONLY: 866-543-3896  
(Monday – Friday 9:00AM – 4:30PM)  
**Emergency Telephone Number:**  
US ONLY - CALL CHEMTREC: 800-424-9300 (24 Hours/Day, 7 Days/Week)  
CANADA ONLY - CALL CANUTEC: 613-996-6666 (24 Hours/Day, 7 Days/Week)  
OUTSIDE THE US - 703-527-3887

### 2. HAZARDS IDENTIFICATION

**EMERGENCY OVERVIEW:** White to slightly yellow crystalline solid. Toxic if swallowed or dust is inhaled. Oxidizer: may ignite organic materials and react with other materials. Can decompose if mixed with acids or exposed to fire conditions, releasing toxic nitrogen oxides.

**OSHA Status:** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)

**Potential Health Affects**

- **Skin:** May cause skin irritation.
- **Eyes:** May strongly irritate or burn the eyes.
- **Inhalation:** Product mists may cause irritation to the respiratory tract.
- **Ingestion:** May irritate the gastrointestinal tract. Although small quantities are used in food preparation, swallowing moderate amounts of sodium nitrite can result in serious toxic effects including death. Effects include nausea, weakness, cyanosis (blue skin), collapse and coma, possibly leading to death. Sodium nitrite interferes with the body’s ability to transport oxygen.

**Delayed Effects:** None known. If Sodium nitrite is used with amines found in certain cutting fluids, potentially carcinogenic nitrosamine compounds may be formed.
### 3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium nitrite</td>
<td>7632-00-0</td>
<td>&gt;98%</td>
</tr>
</tbody>
</table>

### 4. FIRST AID MEASURES

- **Eye Contact**: Immediately flush eyes with water for at least 15 minutes. Get medical attention if irritation persists.
- **Skin Contact**: Flush with plenty of water, removing contaminated clothing. If irritation develops, get medical attention.
- **Inhalation**: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get prompt medical attention.
- **Ingestion**: Do not induce vomiting. Immediately give large quantities of water. Get medical attention immediately.
- **Notes to Physician**: Sodium nitrite forms methemoglobin in the blood stream. Treat accordingly.

### 5. FIRE-FIGHTING MEASURES

- **Flammable Properties**
  
<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point</td>
<td>Not Flammable</td>
</tr>
<tr>
<td>Flash Point Method</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Upper Flame Limit (Volume % in Air)</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Lower Flame Limit (Volume % in Air)</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Flame Propagation Rate (Solids)</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>OSHA Flammability Class</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Suitable Extinguishing Media</td>
<td>Use flooding amounts of water or other agents.</td>
</tr>
<tr>
<td>Unsuitable Extinguishing Media</td>
<td>Do NOT use dry chemicals containing ammonium phosphate.</td>
</tr>
</tbody>
</table>

- **Explosion Limits**
  
  | Hazardous Combustion Products | No information available |
  | Impact Sensitivity            | No information available |
  | Sensitivity to static discharge | No information available |

- **Specific Hazards Arising from the Chemical**
  
  Material does not burn but is an oxidizing agent and will support combustion of other materials. Product decomposes above 608 °F releasing toxic nitrogen oxides.

- **Protective Equipment and Precautions for Firefighters**
  
  Wear self-contained breathing apparatus (SCBA) and full protective equipment.

### 6. ACCIDENTAL RELEASE MEASURES

**IN CASE OF SPILL OR OTHER RELEASE**

Remove sources of ignition. Ventilate area. Use non-sparking tools and equipment. Sweep or shovel spilled material into containers. Dispose of material according to local, state and federal authorities. Do not allow product or residues to enter waterways and/or any source of drinking water.

### 7. HANDLING AND STORAGE

- **Handling**: Avoid contact with skin and eyes. Do not breathe product dusts. Avoid contact with incompatible, combustible, organic or readily oxidizable materials.
- **Storage**: Store in a cool, dry, well-ventilated area. Keep containers tightly closed. Do not store on wooden floors. Isolate from combustible materials. Empty containers may contain product residues; observe all warnings and precautions listed for the product.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>Ontario TWA EV</th>
<th>Mexico OEL (TWA)</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Nitrite</td>
<td></td>
<td></td>
<td>TWA: 2 mg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Engineering Measures**

Use local exhaust to keep airborne concentrations below the permissible exposure limits.

**Personal Protective Equipment**

**Eye/Face Protection**

Wear chemical safety goggles. Do not wear contact lenses.

**Skin Protection**

Wear appropriate personal protective clothing to prevent skin contact. If prolonged or repeated contact is anticipated, all clothing should be impervious to liquid.

**Respiratory Protection**

A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 or applicable federal/provincial requirements must be followed whenever workplace conditions warrant respirator use. NIOSH’s “Respirator Decision Logic” may be useful in determining the suitability of various types of respirators.

**General Hygiene Considerations**

To identify additional Personal Protective Equipment (PPE) requirements, it is recommended that a hazard assessment in accordance with the OSHA PPE Standard (29 CFR 1910.132) be conducted before using this product. Eyewash and safety showers are recommended.

---

9. PHYSICAL AND CHEMICAL PROPERTIES

- **Appearance**: Crystals
- **Color**: White to slightly yellow
- **Chemical Formula**: NaNO₂
- **Odor**: None
- **Odor Threshold**: No information available
- **Physical State**: Solid
- **pH**: ~9.0 (for aqueous solution)
- **Flash Point**: Not flammable
- **Autoignition Temperature**: Not applicable
- **Boiling Point/Range**: Decomposes above 608°F
- **Melting Point/Range**: 520°F
- **Flammability Limits in Air**: No information available
- **Explosive Properties**: No information available
- **Oxidizing Properties**: No information available
- **Evaporation Rate**: Not determined
- **Vapor Pressure**: Not applicable
- **Vapor Density**: Not applicable
- **Specific Gravity**: 2.17
- **Partition Coefficient (n-octano/water)**: No information available
- **Viscosity**: No information available
- **Molecular Weight**: 69.0
- **Water Solubility**: 80.8 g/100 g at 68°F
- **VOC Content (%):**: 0
10. STABILITY AND REACTIVITY

Chemical Stability Normally stable.

Conditions to Avoid Material slowly oxidizes to sodium nitrate when exposed to air. Avoid heat, flame, ignition sources, shock, friction and incompatibilities.

Incompatible Products Hazardous reactions can occur with acids, ammonium compounds, reducing agents (particularly cyanides, thiocyanates and thiosulfates). May ignite organic compounds and other combustible materials.

Hazardous Decomposition Products Oxides of nitrogen (toxic and irritating)

Possibility of Hazardous Reactions Will not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium nitrite</td>
<td>88 mg/kg (rat)</td>
<td></td>
<td>5.5 mg/m³/4hr (rat)</td>
</tr>
</tbody>
</table>

Irritation No information available
Corrosivity No information available
Sensitization No information available

Chronic Toxicity

Carcinogenicity There are no known carcinogenic chemicals in this product.
Mutagenic Effects No information available
Reproductive Effects No information available
Developmental Effects No information available
Teratogenicity Multiple reproductive tests indicate that sodium nitrite is not teratogenic.
Target Organ Effects No information available
Other Adverse Effects Fetal toxicity has been demonstrated in pregnant animals fed toxic doses of sodium nitrite. This is due to the formation of methemoglobin.

Endocrine Disruptor Information No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Contains no substances known to be hazardous to the environment or not degradable in waste water treatment plants.

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtix</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium nitrite</td>
<td>LC50 = 0.19 mg/L</td>
<td>Oncorhynchus mykiss 96 h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Persistence and Degradability No information available
Bioaccumulation No information available
Mobility in Environmental Media No information available

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods Dispose of waste in accordance with all federal, state, and local regulations.

Contaminated Packaging Empty containers should be taken for local recycling, recovery or waste disposal.
### 14. TRANSPORT INFORMATION

<table>
<thead>
<tr>
<th>DOT</th>
<th>Regulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Sodium nitrite</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>5.1</td>
</tr>
<tr>
<td>Subsidiary Hazard Class</td>
<td>6.1</td>
</tr>
<tr>
<td>UN-No</td>
<td>UN1500</td>
</tr>
<tr>
<td>Packing Group</td>
<td>PGIII</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TDG</th>
<th>Regulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>5.1</td>
</tr>
<tr>
<td>Subsidiary Hazard Class</td>
<td>6.1</td>
</tr>
<tr>
<td>UN-No</td>
<td>UN1500</td>
</tr>
<tr>
<td>Packing Group</td>
<td>PGIII</td>
</tr>
</tbody>
</table>

| IMDG         | Product is a marine pollutant if shipped overseas |

### 15. REGULATORY INFORMATION

#### International Inventories
- TSCA: Yes
- DSL: Yes
- ELINCS: No
- EINECS: Yes
- ENCS: Yes
- CHINA: Yes
- KECL: Yes
- PICCS: Yes
- AICS: Yes

#### U.S. Federal Regulations

**SARA 313**
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains the following chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 13 - Threshold Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium nitrite</td>
<td>7532-00-0</td>
<td>&gt;98</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**SARA 311/312 Hazardous Categorization**
- Chronic Health Hazard: No
- Acute Health Hazard: Yes
- Fire Hazard: No
- Sudden Release of Pressure Hazard: No
- Reactive Hazard: Yes

#### Clean Water Act

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium nitrite</td>
<td>100 lb</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### CERCLA

<table>
<thead>
<tr>
<th>Component</th>
<th>CERCLA ROQ (lb)</th>
<th>SARA TPQ (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium nitrite</td>
<td>100 lb</td>
<td></td>
</tr>
</tbody>
</table>

#### U.S. State Regulations

**California Proposition 65**
This product does not contain any Proposition 65 chemicals.
State Right-to-Know

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium nitrite</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other International Regulations

- Mexico: No information available
- Canada: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class

- C Oxidizing materials
- D1B Toxic materials
- D2B Toxic materials

16. OTHER INFORMATION

Current Issue Date: May 16, 2013
Previous Issue Date: November 26, 2012
Revision Summary: Change to section 1

Disclaimer:

All information, statements, data, service and/or recommendations, including, without limitation, those relating to storage, loading/unloading, piping and transportation (collectively referred to herein as “information”) are believed to be accurate and reliable. However, no representation or warranty, express or implied, is made as to its completeness, accuracy, fitness for a particular purpose or any other matter, including, without limitation, that the practice or application of any such information is free of patent infringement or other intellectual property misappropriation. General Chemical, LLC is not engaged in the business of providing technical, operational, engineering or safety information for a fee, and therefore; any such information provided herein has been furnished as an accommodation and without charge. All information provided herein is intended for use by persons having requisite knowledge, skill and experience in the chemical industry. General Chemical, LLC shall not be responsible or liable for the use, application or implementation of the information, provided herein, and all such information is to be used at the risk, and in the sole judgment and discretion, of such persons, their employees, advisors and agents.

End of MSDS
1. Product and company identification

Product name: SURFONIC® N-95
Product use: Surfactant

Huntsman Petrochemical Corporation
P.O. Box 4980
The Woodlands, TX 77387-4980

TELEPHONE NUMBERS
Transportation Emergency
Company: (800) 328-8501
CHEMTREC: (800) 424-9300
Medical Emergency: (409) 722-9673 (24 Hour)
General MSDS Assistance: (281) 719-6000
Technical Information: (281) 719-7780
E-MAIL: MSDS@huntsman.com


In case of emergency
Spills Leaks Fire or Exposure Call Chemtrec: (800) 424-9300
Medical Emergency Information: (800) 328-8501
In Mexico: 01 800 00 214 00
In Columbia: 01 800 91 6012

2. Hazards identification

Physical state: Liquid. [Liquid.]
Odor: Slight
OSHA/HCS status: While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Emergency overview: CAUTION!
MAY CAUSE EYE AND SKIN IRRITATION.
Slightly irritating to the eyes and skin. Avoid breathing vapor or mist. Avoid contact with eyes. Avoid prolonged or repeated contact with skin. Wash thoroughly after handling.

3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonylphenol, ethoxylated</td>
<td>6016-45-9</td>
<td>60 - 100</td>
</tr>
</tbody>
</table>
### 4. First aid measures

**Eye contact**: Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

**Skin contact**: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Inhalation**: Move exposed person to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

**Ingestion**: Wash out mouth with water. Move exposed person to fresh air. Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms occur. Never give anything by mouth to an unconscious person.

**Notes to physician**: Symptomatic and supportive therapy as needed. Following severe exposure medical follow-up should be monitored for at least 48 hours.

### 5. Fire-fighting measures

**Flash point**: Closed cup: 237.7°C (460°F) [Penkey-Martens.]

**Products of combustion**: Decomposition products may include the following materials:
- Carbon dioxide
- Carbon monoxide

**Extinguishing media**

<table>
<thead>
<tr>
<th>Suitable</th>
<th>Use an extinguishing agent suitable for the surrounding fire.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not suitable</td>
<td>None known.</td>
</tr>
</tbody>
</table>

**Special exposure hazards**: In a fire or if heated, a pressure increase will occur and the container may burst. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

**Special protective equipment for fire-fighters**: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

### 6. Accidental release measures

**Personal precautions**: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Put on appropriate personal protective equipment (see section 8).

**Environmental precautions**: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

**Methods for cleaning up**: Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.
SURFONIC® N-85

7. Handling and storage

Handling: Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage: Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8. Exposure controls/personal protection

Consult local authorities for acceptable exposure limits.

Preventive Measures: Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering controls: Use local exhaust ventilation to maintain airborne concentrations below the TLV. Suitable respiratory equipment should be used in cases of insufficient ventilation or where operational procedures demand it. For guidance on engineering control measures refer to publications such as the ACGIH current edition of 'Industrial Ventilation, a manual of Recommended Practice.'

Personal protection

Eyes: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

9. Physical and chemical properties

General information

Appearance
Physical state: Liquid. [Liquid.]
Color: Pale color.
Odor: Slight
Odor threshold: Not available.

Important health, safety and environmental information

pH: 7
Boiling point: Not available.
Melting point: 5°C (41°F)
Flash point: Closed cup: 237.78°C (450°F) [Pensky-Martens.]
9. Physical and chemical properties

Oxidizing properties: Not available.
Vapor pressure: <0.13 kPa (<1 mm Hg)
Relative density: 1.05
Viscosity: Kinematic: 1.1 cm²/s (110 cSt at 100°F)
Vapor density: Not available.
VOC content: Not available.

10. Stability and reactivity

Stability and reactivity: The product is stable.
Incompatibility with various substances: Reactive or incompatible with the following materials: oxidizing materials, reducing materials and metals.
Hazardous polymerization: Under normal conditions of storage and use, hazardous polymerization will not occur.
Hazardous decomposition products: Decomposition products may include the following materials: carbon dioxide, carbon monoxide

11. Toxicological information

Toxicity data

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Test</th>
<th>Species</th>
<th>Result</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonylphenol, ethoxylated</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>3310 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>LD50 Dermal</td>
<td>Rabbit</td>
<td>&gt;2000 mg/kg</td>
<td>-</td>
</tr>
</tbody>
</table>

Potential acute health effects

Ingestion: No known significant effects or critical hazards.
Inhalation: No known significant effects or critical hazards.
Eyes: Slightly irritating to the eyes.
Skin: Slightly irritating to the skin.

Potential chronic health effects

Target organs: No known significant effects or critical hazards.
Carcinogenicity: No known significant effects or critical hazards.
Mutagenicity: No known significant effects or critical hazards.
Teratogenicity: No known significant effects or critical hazards.
Fertility effects: No known significant effects or critical hazards.
Developmental effects: No known significant effects or critical hazards.

12. Ecological information

Aquatic ecotoxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Test</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonylphenol, ethoxylated</td>
<td>-</td>
<td>Acute LC50 1 to 10 mg/L</td>
<td>Fish</td>
<td>96 hours</td>
</tr>
</tbody>
</table>

Biodegradability

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Test</th>
<th>Result</th>
<th>Dose</th>
<th>Inoculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonylphenol, ethoxylated</td>
<td>-</td>
<td>60 % - Inherent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Aquatic half-life</th>
<th>Photolysis</th>
<th>Biodegradability</th>
</tr>
</thead>
</table>


12. Ecological information

Nonylphenol, ethoxylated: Not readily
Environmental effects: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. Disposal considerations

Waste disposal: The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

14. Transport information

Transportation Emergency Number 1-800-424-9300 (CHEMTREC).

<table>
<thead>
<tr>
<th>Regulatory information</th>
<th>UN number</th>
<th>Proper shipping name</th>
<th>Class</th>
<th>PG*</th>
<th>Label</th>
<th>Additional information</th>
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<tr>
<td>DOT Classification</td>
<td>Not regulated.</td>
<td>-</td>
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<td>IATA-DGR Class</td>
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</tr>
</tbody>
</table>

PG*: Packing group

15. Regulatory information

United States

HCS Classification: Not regulated.
U.S. Federal regulations: United States inventory (TSCA 8b): All components are listed or exempted.
CERCLA: Hazardous substances: No ingredients listed.

This product does not contain nor is it manufactured with ozone depleting substances.

SARA 313

<table>
<thead>
<tr>
<th>Form R - Reporting requirements</th>
<th>Product name</th>
<th>CAS number</th>
<th>Concentration</th>
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<tr>
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<td>GLYCOL ETHERS (FRACTION OF PRODUCT MEETING EPA DEFINITION)</td>
<td>Blend</td>
<td>3%</td>
</tr>
</tbody>
</table>

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.
15. Regulatory information

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Cancer</th>
<th>Reproductive</th>
<th>No significant risk level</th>
<th>Maximum acceptable dosage level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylene oxide</td>
<td>Yes.</td>
<td>Yes.</td>
<td>Yes.</td>
<td>Yes.</td>
</tr>
</tbody>
</table>

Canada

WHMIS (Canada)       : Class D-2B: Material causing other toxic effects (Toxic).
CEPA (DSL)           : DSL: All Ingredients Listed.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

16. Other information

Label requirements: MAY CAUSE EYE AND SKIN IRRITATION.

Hazardous Material Information System (U.S.A.)

<table>
<thead>
<tr>
<th>Health</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire hazard</td>
<td>1</td>
</tr>
<tr>
<td>Reactivity</td>
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</tbody>
</table>

National Fire Protection Association (U.S.A.)

Flammability

Health

Instability

Date of printing : 3/5/2009.
Date of issue : 4 March 2009
Date of previous issue : 3/3/2009.

Notice to reader

While the information and recommendations in this publication are to the best of our knowledge, information and belief accurate at the date of publication, NOTHING HEREIN IS TO BE CONSTRUED AS A WARRANTY, EXPRESS OR OTHERWISE.

IN ALL CASES, IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE APPLICABILITY OF SUCH INFORMATION AND RECOMMENDATIONS AND THE SUITABILITY OF ANY PRODUCT FOR ITS OWN PARTICULAR PURPOSE.

THE PRODUCT MAY PRESENT HAZARDS AND SHOULD BE USED WITH CAUTION. WHILE CERTAIN HAZARDS ARE DESCRIBED IN THIS PUBLICATION, NO GUARANTEE IS MADE THAT THESE ARE THE ONLY HAZARDS THAT EXIST.

Hazards, toxicity and behaviour of the products may differ when used with other materials and are dependent upon the manufacturing circumstances or other processes. Such hazards, toxicity and behaviour should be determined by the user and made known to handlers, processors and end users.

NO PERSON OR ORGANIZATION EXCEPT A DULY AUTHORIZED HUNTSMAN EMPLOYEE IS AUTHORIZED TO PROVIDE OR MAKE AVAILABLE DATA SHEETS FOR HUNTSMAN PRODUCTS. DATA SHEETS FROM UNAUTHORIZED SOURCES MAY CONTAIN INFORMATION THAT IS NO LONGER CURRENT OR ACCURATE. NO PART OF THIS DATA SHEET MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM, OR BY ANY MEANS, WITHOUT PERMISSION IN WRITING FROM HUNTSMAN. ALL REQUESTS FOR PERMISSION TO REPRODUCE MATERIAL FROM THIS DATA SHEET SHOULD BE DIRECTED TO HUNTSMAN, MANAGER, PRODUCT SAFETY AT THE ABOVE ADDRESS.
1. PRODUCT AND COMPANY IDENTIFICATION

Product name: BONDERITE S-AD RODINE 2010 ACID INHIBITOR ADDITIVE known as P3 RODINE 2010
IDH number: 1314676
Product type: Corrosion inhibitor
Region: United States

Company address: Contact information:
Henkel Corporation
32100 Stephenson Highway
Madison Heights, MI 48071
Telephone: 248.583.9300
For Chemical Emergency: Call CHEMTREC at 800.424.9300
Internet: www.henkelna.com

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
HIMIS:
Physical state: Liquid
Color: Light amber
Odor: Aromatic

PHYSICAL HAZARD: 0
Personal Protection: See MSDS Section 8

WARNING: CAUSES EYE, SKIN AND RESPIRATORY TRACT IRRITATION.
MAY BE HARMFUL OR FATAL IF SWALLOWED.
MAY CAUSE ALLERGIC SKIN REACTION.

Relevant routes of exposure: Skin, Inhalation, Eyes

Potential Health Effects
Inhalation: Inhalation of vapors or mists of the product may be irritating to the respiratory system.
Skin Contact: Prolonged and/or repeated skin contact with this product may cause irritation/dermatitis.
Eye Contact: Contact with eyes can cause eye irritation. May cause severe eye irritation.
Ingestion: May cause irritation and symptoms similar to ethyl alcohol intoxication. Swallowing large volumes of ethylene glycol can lead to kidney damage.

Existing conditions aggravated by exposure:
Eye, skin and respiratory disorders.
This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Section 11 for additional toxicological information.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous components CAS NUMBER %
Poly(ethylene glycol) Proprietary 30 - 60
Ethylene glycol 107-21-1 5 - 10
1,3-Diethyl-2-thiourea 105-55-5 5 - 10
Ethoxylated Propoxylated alcohol Proprietary 1 - 5
Quinolinium chloride 530-64-3 1 – 5
4. FIRST AID MEASURES

Inhalation: If mist or vapor of this product is inhaled, remove person immediately to fresh air. Seek medical attention if symptoms develop or persist.

Skin contact: For skin contact flush with large amounts of water. Obtain medical attention if irritation persists.

Eye contact: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Ingestion: Seek medical advice. DO NOT induce vomiting unless directed to do so by medical personnel.

Notes to physician: In the treatment of ethylene glycol overdose, ethanol competitively inhibits alcohol dehydrogenase (ADH) and prevents the formation of toxic metabolites. The affinity of ethylene glycol for ADH appears to be similar to ethanol. Ethanol should be administered only by qualified medical personnel.

5. FIRE FIGHTING MEASURES

Flash point: Not applicable

Flamable/Explosive limits - lower: Not determined

Flammable/Explosive limits - upper: Not determined

Extinguishing media: Water spray (fog), foam, dry chemical or carbon dioxide.

Special firefighting procedures: Wear full protective clothing. Wear self-contained breathing apparatus.

Unusual fire or explosion hazards: This product is an aqueous mixture which will not burn.

Hazardous combustion products: Irritating and toxic gases or fumes may be released during a fire.

6. ACCIDENTAL RELEASE MEASURES

Use personal protection recommended in Section 8, isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental precautions: Prevent further leakage or spillage if safe to do so. Wear appropriate protective equipment and clothing during clean-up. Do not allow product to enter sewer or waterways.

Clean-up methods: Absorb spill with inert material. Shovel material into appropriate container for disposal.

7. HANDLING AND STORAGE

Handling: Prevent contact with eyes, skin and clothing. Do not breathe vapor and mist. Wash thoroughly after handling. Do not take internally. For industrial use only. Launder work clothes frequently.

Storage: For safe storage, store between -10 °C (14°F) and 40 °C (104°F)

Keep container tightly closed and in a cool, well-ventilated place away from incompatible materials. Thaw and mix thoroughly if frozen.

For information on product shelf life, please review labels on container or check the Technical Data Sheet.
8. EXPOSURE CONTROLS / PERSONAL PROTECTION
Employers should complete an assessment of all workplaces to determine the need for, and selection of, proper exposure controls and protective equipment for each task performed.
Hazardous components ACGIH TLV OSHA PEL AIHA WEEL OTHER
Poly(ethylene glycol) None None 10 mg/m3 TWA
Particulate. None
Ethylene glycol 100 mg/m3 Ceiling
Aerosol. None None None
1,3-Diethyl-2-thiourea None None None None
Ethoxylated Propoxylated alcohol None None None None
quinolinium chloride None None
0.001 ppm (0.005 mg/m3) TWA (SKIN)
None
Engineering controls: Provide local and general exhaust ventilation to effectively remove and prevent buildup of any vapors or mists generated from the handling of this product.
Respiratory protection: If ventilation is not sufficient to effectively prevent buildup of aerosols, mists or vapors, appropriate NIOSH/MSHA respiratory protection must be provided.
Eye/face protection: Wear chemical goggles; face shield (if splashing is possible).
Skin protection: Wear impervious gloves for prolonged contact. Use of impervious apron and boots are recommended.

9. PHYSICAL AND CHEMICAL PROPERTIES
Physical state: Liquid
Color: Light amber
Odor: Aromatic
Odor threshold: Not available
pH: 3.8 - 4.2 (10% solution)
Vapor pressure: 17 mbar
Boiling point/range: 103.2 °C (217.8 °F)
Melting point/ range: -20 °C (-4°F)
Specific gravity: 1.09 - 1.11 at 20 °C (68°F)
Vapor density: Not available
Flash point: Not applicable
Flashback: Not applicable
Flame projection: Not applicable
Flammable/Explosive limits - lower: Not determined
Flammable/Explosive limits - upper: Not determined
Autoignition temperature: Not determined
Evaporation rate: Not available
Solubility in water: Complete
Partition coefficient (n-octanol/water): Not determined
VOC content: Not available

10. STABILITY AND REACTIVITY
Stability: Stable at normal conditions.
Hazardous reactions: Will not occur.
Hazardous decomposition products: Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.
Incompatible materials: This product may react with strong alkalies.
Conditions to avoid: None identified.
11. TOXICOLOGICAL INFORMATION
Hazardous components NTP Carcinogen IARC Carcinogen OSHA Carcinogen
(Specifically Regulated)
Poly(ethylene glycol) No No No
Ethylene glycol No No No
1,3-Diethyl-2-thiourea No No No
Ethoxylated Propoxylated alcohol No No No
quinolinium chloride No No No

Hazardous components Health Effects/Target Organs
Poly(ethylene glycol) Irritant
Ethylene glycol Blood, Bone Marrow, Central nervous system, Developmental, Eyes, Irritant, Kidney, Liver, Metabolic
1,3-Diethyl-2-thiourea Irritant, Allergen
Ethoxylated Propoxylated alcohol Irritant, Allergen
quinolinium chloride No Data

12. ECOLOGICAL INFORMATION
Ecological information: Not available

13. DISPOSAL CONSIDERATIONS
Information provided is for unused product only.
Recommended method of disposal: Dispose of according to Federal, State and local governmental regulations.
Hazardous waste number: Material, if discarded, is not expected to be a characteristic hazardous waste under RCRA. Wastes must be tested using methods described in 40 CFR Part 261 to determine if it meets applicable definitions of hazardous wastes.

14. TRANSPORT INFORMATION
U.S. Department of Transportation Ground (49 CFR)
Proper shipping name: Not regulated
Hazard class or division: None
Identification number: None
Packing group: None
International Air Transportation (ICAO/IATA)
Proper shipping name: Not regulated
Hazard class or division: None
Identification number: None
Packing group: None
Water Transportation (IMO/IMDG)
Proper shipping name: Not regulated
Hazard class or division: None
Identification number: None
Packing group: None

15. REGULATORY INFORMATION
United States Regulatory Information
TSCA 8 (b) Inventory Status: All components are listed or are exempt from listing on the Toxic Substances Control Act Inventory.
TSCA 12(b) Export Notification: None above reporting de minimus
CERCLA/SARA Section 302 EHS: None above reporting de minimus
CERCLA/SARA Section 311/312: Immediate Health, Delayed Health
CERCLA/SARA 313: This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372). Ethylene glycol (CAS# 107-21-1).

California Proposition 65: This product contains a chemical known in the State of California to cause cancer. This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Canada Regulatory Information

CEPA DSL/NDSL Status: Contains one or more components listed on the Non-Domestic Substances List. All other components are listed on or are exempt from listing on the Domestic Substances List. Components listed on the NDSL must be tracked by all Canadian Importers of Record as required by Environment Canada. They may be imported into Canada in limited quantities. Please contact Regulatory Affairs for additional details.

WHMIS hazard class: D.2.A

16. OTHER INFORMATION

This material safety data sheet contains changes from the previous version in sections: Updated composition in Section 3.

Prepared by: John DiCerbo, Regulatory Affairs Specialist

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# Annex 03 Health and Safety Emergency Response and Preparedness Plan

## Process: Business Emergency Contingency Plan

## Project: Mojave Solar Project

<table>
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<th>Document No:</th>
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<tr>
<td>Date:</td>
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### Prepared by:

| Kirk Anderson – Environmental Engineer | Electronic Signature |

### Reviewed by:

| Efrain Perez – Quality Manager | Electronic Signature |
| Steven Pochmara – Permitting Manager | Electronic Signature |

### Approved by:

| Nicolas Gallo – Project Sub Director | Electronic Signature |
| Rafael Sanchez Mendoza – Project Director | Electronic Signature |

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# Emergency Response Plan

**Title:** Emergency Response and Preparedness Plan

**Process:** Implementation Requirements

**Sub process:** Establish an OH&S Emergency Management Process

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<td>01</td>
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<tr>
<td>Date:</td>
<td>04/22/2012</td>
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</table>

**Prepared by:**

- Jorge Daniel Collado Álvarez – Interim Health and Safety Manager
- Kirk Anderson – Environmental Engineer

**Electronic Signature**

**Concurred by:**

- Jorge Daniel Collado – Interim Health and Safety Manager
- Efraim Perez – Quality Manager

**Approved by:**

- Nicolás Gallo Massa – Project Sub-Director
- Rafael Sánchez Mendoza – Project Director

---

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If for any exceptional reasons due to specificities of project (e.g.: confidential project information, legal or regulatory requirements of local level and/or contractual requirements of the client), there was the need to modify these requirements, the changes must be documented in the quality, environment and prevention of occupational risks of the project plan, prior authorization by the Department of Central Services Management Systems.

The original of this document is electronically signed and filed in the document manager Abeinsa EPC.
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<th>Cause for Revision</th>
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<th>Concurred By</th>
<th>Approved By</th>
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<td>NGM-RSM</td>
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Changes from the original content to the next revision will be identified by underlines for quick identification of changes.
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1.0 Objectives

To develop a project specific Emergency Response Plan for the Abeinsa EPC Mojave Solar Site and provide site personnel the immediate actions, requirements, points of contact and any follow up actions in the event of, but not limited to the following:

- Evacuation
- Personnel Injury or Illness
- Security Threat
- Fire
- Severe Weather
- Earthquake
- Hazardous Chemical Spills

These procedures shall be adhered to and used in conjunction with the Mojave Solar Project Health and Safety Plan to ensure the protection of personnel, equipment and material.

2.0 Definitions

**Assembly Area(s) / Muster Point:**
Assembly area is a safeguard by which occupants of a building evacuate to the designated assembly area during an emergency.

**ERPP:**
Emergency Response and Preparedness Program.

**Incident Commander (IC):**
The Incident Commander is a trained and qualified person who is responsible for the overall management of an emergency situation.

**Material Safety Data Sheet (MSDS):**
is a document that explains the characteristics of a chemical, the hazards that it possess and how to contain those hazards and emergency responses. The document also explains the use and storage of said chemical.

**Shelter-in-place:**
Practices include closing windows and doors, and moving occupants away from perimeter windows and doors to a safer interior location. Ensure shut down of HVAC/air handling systems, external generators, etc.

**Landing Area:**
Location designated and reserved for air support and rescue/medi-evac.

3.0 Purpose and Scope of Application

This section applies to all personnel performing work on the Abeinsa EPC construction sites or inside any subsidiary facilities.
The history for response times from the medical team to this site is approximately 20 to 30 minutes. However, on-site medical services are provided. Note, construction or commissioning phases will require additional resources, rescue services for hi-angle rescue, confined space and excavations may require external resources.

The response of all site personnel to an emergency situation should be serious and immediate. An individual should not endanger themselves or co-workers by indecision, delay, or an attempt to save property or equipment. Individuals should be familiar with emergency procedures applicable to their normal working areas so that proper and prompt action can be taken in each emergency situation. If visiting another site area, follow the emergency procedures for that area by following the example of local personnel and asking for guidance.

4.0 Applicable Documentation

- ISO 9001:2008, Quality Management Systems-requirements
- ISO 14001: 2004, Environmental Management System-requirements
- OHSAS 18001:2007, Occupational Health and Safety and Assessment System
- POG-SCMA-72-02 Annex 5A, Health, Safety and Environmental
- Cal/OSHA Title 8 California Code of Regulations (T8CCR)
- OSHA 29 CFR 1926 – Standard for Construction Industry

5.0 Emergency Phone Numbers

For many emergencies, the first appropriate action to be taken is to summon competent assistance.

5.1 Agency Phone Numbers

See Appendix 01. Emergency Phone List

5.2 Site Emergency Contacts

See Appendix 01. Emergency Phone List

Once help has arrived, assist them according to your knowledge and training or as directed.

Attention:
In the event of any emergency requiring the notification of emergency response agencies, Site management or on-call supervision shall be notified only after the emergency service has been notified and is on the way.
6.0 Responsibilities

The duties and responsibilities of specific individuals or groups are further outlined below.

6.1 All Abeinsa EPC Personnel

- Read, understand, and comply with the requirements set forth in this plan.
- Report emergencies as specified in their specific section within this plan.
- Participate in and complete all required training.
- Participate in all emergency response drills.

6.2 Abeinsa EPC H&S Department

ABEINSA EPC H&S Site Orientation will include an explanation of the site emergency response and preparedness plan and procedures. The main site emergency contacts are:

- H&S Manager (Interim) – Jorge Daniel Collado Alvarez (314) 488-7221
- H&S Supervisor – Bruce Asaro (661) 754-6023
- Const. Director – Leonardo Bruno (949) 572-9254
- Const. Sub Director – Enrique Valades Nieto (314) 420-9367
- Assembly Director – Antonio Guimaraes Teixeira Junior (661) 754-3555
- H&S Supervisor – Michael Carey (661) 754-6560 (Ref. TAB ERPP)
- On Duty Site EMT – (813) 618-0790

For updates, be referred to Appendix 01. Emergency Phone List

The H&S Manager, or designee, shall furnish information regarding site-related emergency and evacuation measures. The following items are the responsibility of the H&S Department:

1. Develop and maintain all elements of the ERPP.
2. Develop and coordinate all training required by the ERPP.
3. Ensure the ERPP meets or exceeds all regulatory requirements.
4. Ensure the ERPP remains current.
5. Develop and coordinate emergency response drills.
6. Act as the liaison, along with ABEINSA EPC Project Management, with Community Emergency Response Organizations (i.e. Fire Dept., Police Dept., etc.).
7. Serve as the Incident Commander(s) in emergency situations.
8. Provide an overview of the information contained in this plan to all project personnel via site orientation.
6.3 Emergency Response Coordinators

Initially the Emergency Response Coordinator (ERC) for Alpha is Jorge Daniel Collado Alvarez who will set up the incident command post and place responsibilities within the team. The ERC is responsible for coordination of response activities, including contacting outside agencies, notification of management, and containment of hazard (if safely possible) and initiation of personnel evacuation. The construction director will assume this role upon arrival and receive a proper briefing prior to the arrival of emergency services. The ERC may report to an outside Emergency Agency’s Response Coordinator if an agency takes over (i.e. the Fire Department).

1. **Emergency Response Coordinator:** Jorge Daniel Collado Alvarez  
   Cell Phone: (314) 488-7221
2. **Emergency Response Coordinator:** Leonardo Bruno Carrero  
   Cell Phone: (949) 572-9254
3. **Alternate Emergency Response Coordinator:** Enrique Valades Nieto  
   Cell Phone: (314) 420-9367
4. **Alternate Emergency Response Coordinator:** Bruce Asaro  
   Cell Phone: (661) 754-6023

Initially the Emergency Response Coordinator (ERC) for Beta is Bruce Asaro, who will set up the incident command post and place responsibilities within the team. The ERC is responsible for coordination of response activities, including contacting outside agencies, notification of management, and containment of hazard (if safely possible) and initiation of personnel evacuation. The construction director will assume this role upon arrival and receive a proper briefing prior to the arrival of emergency services. The ERC may report to an outside Emergency Agency’s Response Coordinator if an agency takes over (i.e. the Fire Department).

1. **Emergency Response Coordinator:** Bruce Asaro  
   Cell Phone: (661) 754-6023
2. **Emergency Response Coordinator:** Leonardo Bruno Carrero  
   Cell Phone: (949) 572-9254
3. **Alternate Emergency Response Coordinator:** Enrique Valades Nieto  
   Cell Phone: (314) 420-9367
4. **Alternate Emergency Response Coordinator:** Jorge Daniel Collado Alvarez  
   Cell Phone: (314) 488-7221
5. 

6.4 Abeinsa EPC Activity Managers

All Abeinsa EPC Activity Managers are required to assist personnel in the event of an emergency as well as perform various other duties with regard to this Emergency Response and Preparedness Program. Activity Managers will lead all immediate search efforts and report emergency issues to the H&S Manager and
Incident Commander. Additional duties of the Activity Managers are outlined below.

6.5 Subcontractors

Each subcontractor shall obtain a copy of the ABEINSA EPC Mojave environmental, health and safety requirements applicable to their work. The subcontractor will be responsible for ensuring each employee receives and comprehends the information in this plan prior to beginning work on site. The subcontractor shall keep records indicating who has been given the information. In the event there is a change of personnel in the subcontractor’s work force, the subcontractor is responsible for providing any new employees with this information and maintaining all necessary records.

7.0 Procedures

7.1 Evacuations

When an evacuation is deemed necessary, there shall be no hesitation in requiring personnel to immediately vacate the area affected. Emergency exits and other means of egress from all areas have been identified in Appendix 03, of the Emergency Response and Preparedness Plan. An emergency phone list is provided in Appendix 01. Assembly areas are pre-determined and have been identified in Appendix 03. Once out of the affected area, workers will not be allowed to return until the emergency (or Evacuation Drill) is formally declared over by the Emergency Response Coordinator.

Localized area evacuations will be identified by the location affected.

The following Local Area Evacuation Identification(s) will be communicated when only a limited area or multiple areas are required to evacuate:

Alpha Offices, Alpha Power Block (APB), Alpha West, Alpha East, Alpha Mojavito, TAB, Beta West, Beta Offices, Beta Power Block (BPB), Beta East (West of BPB), Beta East (East of BPB).

If an Evacuation is required, per an announcement by the Construction Director, H&S Manager or Emergency Response Coordinator:

1. The Emergency Response Coordinator will sound the assembly alarm, **Five (5) 10 second blasts, 10 seconds apart** (Air Horns), in addition to verbal, phone, electronic devices and radio alerts, to notify all affected personnel to evacuate to the Assembly Area. For the annual evacuation drill, an announcement: “This is an Evacuation Drill” will precede each blast and all other communications.
2. Activity Managers will instruct all employees in the area affected to move to the nearest Assembly Area in an orderly manner (east of the main gate in Alpha and south of the main gate in Beta and south of TAB in Beta West). Appointed evacuation team leaders will ensure shut down of HVAC/air handling systems, external generators, etc. and that windows and doors are closed. Everyone in the affected area is to evacuate. Report to the Emergency Response Coordinator or Incident Commander that: “All affected multiplex office trailers, bathrooms, outhouses and lunch rooms are clear of personnel.”

3. Security will curtail non-emergency vehicle traffic into the affected area and account for all delivery vehicles leaving. An unobstructed entry into the site will be maintained by Security for emergency vehicle access. Security will meet emergency responders at the intersection of Harper Lake and Lockhart and provide an escort to the affected area.

4. Activity Managers and Supervisors will inform and account for their assigned Sub Contractors and their employees to ensure that all have left the work areas affected and proceeded to the assigned assembly area. Each subcontractor must assign a point person who will be responsible for acting as their warden.

5. Security will respond to the Assembly Area(s) and take head counts. Security will then relay this information back to the Emergency Response Coordinator or Incident Commander. If a person is missing from the roster, then it will be up to the Emergency Response Coordinator or Incident Commander to decide next steps. After taking head count of personnel, each warden will report back to their activity manager for verification.

6. In the absence of one of the Activity Managers, the remaining Supervisors or emergency response team leaders will fill in for the missing Activity Manager and cover the evacuation duties accordingly.

7. If needed H&S and emergency response search teams will provide area “sweeps” in order to assist in accounting for all personnel. Areas will only be searched if it is determined to be safe. If the decision is made to initiate a search, emergency response search teams will be assigned to “sweep” designated areas in all affected site locations where Abeinsa EPC employees and subcontractors are presently known to be working, (office trailers, conference rooms, restrooms, electrical/electronic rooms and lunch rooms, etc.). Each search team will be assigned a leader, who will record and supply the names of all team members and search area to the Emergency Response Coordinator. The search team leader is responsible for assuring that his/her team members complete their “sweep” safely and do not stray from their specific assigned search area.

8. The Activity Managers shall report any issues encountered to the Emergency Response Coordinator or Incident Commander. Such issues may be:
Any person who did not evacuate to the Assembly Area;
Any person who became injured and was unable to evacuate; and
Any disabled person who was unable to evacuate.

Location and type of problem and/or damage.

9. The Activity Managers shall remain at the Assembly Area to assist Security in completing a head count for the Emergency Response Coordinator or Incident Commander. Security will use current sign-in sheets and the card scanning system for ABEINSA EPC Mojave employees and Subcontractors to account for all employees to ensure that they have left their work areas and evacuated to the assigned assembly area.

10. Everyone is to remain at the Assembly Area until notice is given by the Site Emergency Coordinator or his designee as to the disposition of the evacuation, and whether to return to the building/work site or not.

11. The Temporary Assembly Building (TAB) will follow their approved evacuation plan. The TAB evacuation team will also be responsible for all employees and subcontractors located in Beta West. Abeinsa EPC employees and subcontractors located in Beta West shall report to the Tab Muster Points. Assigned emergency response team members will be organized for a search of the area if required.

The all clear process will include communication via verbal, phone, electronic devices, radio and Three (3) - 10 second blasts from an air horn.

Note - If a person refuses to evacuate in an emergency, Abeinsa EPC personnel should not argue with the person, but merely inform him that you will be reporting his failure to comply to the Incident Commander and to his/her Supervisor.

7.2 Personal Injury or Illness

Report - all injuries to the Health and Safety Supervisor or the Health and Safety Technician immediately upon discovery.
Evaluate - the area surrounding the injured employee for unsafe conditions. Quickly assess the extent of the injury and inform the site EMT if any assistance is required.

Site EMT. Phone – (813) 618-0790

If the injury or illness is deemed serious, call 911 for assistance. Be sure to give them your:

☐ Name
Exact Location: Mojave Solar Project: 42134 Harper Lake Road, Hinkley CA 92347.
Nature of the Emergency (include as much detail about the ill person as known)
Remain on the line until 911 has all the necessary information.
Assist Security in maintaining a clear pathway for Project EMT Medic and outside Emergency Medical Service personnel.
If Air rescue is needed the coordinates of Landing Area are:
- Lat. 35° 00' 41.12771 N
- Long. 117° 18' 23.24321 W

If the injury is minor and offsite medical attention is warranted, transport the employee to designated hospital. In the event of electrical shock, ensure the circuit is de-energized before touching victim. Administer emergency first aid only if safe to do so, using the below guidelines:

- If the victim is conscious, ensure you have permission to help.
- If victim has stopped breathing, perform CPR and use the AED if necessary.
- Stop bleeding by applying pressure directly to wound.
- Single use, disposable gloves such as surgical or examination gloves shall be used for procedures involving contact with patient’s bodily fluids.
- Do not attempt to move victim unless there is an imminent danger.
- Keep victim warm to help reduce the potential of shock until ambulance arrives.
- Send any available individual to meet ambulance at the front gate and direct them to accident scene.

7.3 Security Threat

Do Not Attempt to Locate or Handle any Suspicious Device.
The person receiving the threat:

- Remain calm
- Keep the caller on line as long as possible to obtain the most information you can. Document the conversation.

Report – Security threats should immediately be reported to the ERC. If the ERC determines a threat then take command of the situation and direct the following steps:
1. Notify local law enforcement via (760) 256-1796 or if no answer call 911.
2. Determine the course of action in conjunction with local authorities.
3. If evacuation is decided, be referred to point 7.1
4. Do not discuss that a security threat has been declared.
5. During the evacuation, report any unusual packages or containers that seems out of place to the Emergency Response Coordinator.

7.4 Fires
It has been demonstrated that individuals who have been intensively drilled in the proper procedure to follow in a fire emergency, will react swiftly and correctly to minimize the dangers to themselves and their fellow employees. Information on each of the following steps should be followed.

**Report** - Fires discovered on site shall be immediately reported to the Emergency Response Coordinator.

**Evaluate** - If the fire is small enough so as not to endanger personnel, determine the appropriate fire extinguisher and attempt to extinguish the fire.

If the fire is beyond the person’s capability to safely extinguish, the Emergency Response Coordinator shall be notified:

12. **Initiate** - The Emergency Response Coordinator will then, sound the assembly alarm, **Five 10 second blast, 20 seconds apart** (Air Horns), in addition to electronic device and radio alerts, to notify all personnel of the problem. Alert the Fire Department via (760) 253-7704. If there is no answer then use 911. The Emergency Response Coordinator will direct Security to meet emergency responders at the intersection of Harper Lake and Lockhart and provide an escort to the affected area. An available employee will also be directed to meet the Fire Department and Security at the gate to direct and escort them to the fire scene and the water tanks. The entrance gates shall be kept unobstructed to allow emergency vehicle access. If the condition warrants, the Facility Emergency Coordinator shall evacuate all unnecessary personnel from the site and if necessary, follow the Evacuation Plan, point 7.1

### 7.5 Severe Weather

Warnings of electrical storms, high winds, flooding, and freezing that have the potential to impact the safety of a community are typically distributed by the local government emergency organization via radio and television stations. In the event any employee becomes aware of a severe weather warning, the Facility Emergency Coordinator and Health and Safety Supervisor must be notified.

**Report** - Announce to on site personnel the severe weather condition, and determine if the office trailers provide shelter or if Evacuation of site personnel is necessary or if it is safe for everyone to be sent home for the remainder of the shift. The Facility Emergency Coordinator will also determine what other precautions will be taken to ensure the safety of personnel and reduce property loss.

**Evaluate** - During the severe weather occurrence, all on site personnel shall assess the safety of their work location immediately. The following examples of this assessment:

- High winds – have the potential to dislodge and lift heavy objects and reduce visibility.
Flooding – areas inundated with flowing water should not be crossed.
Lightning – stay clear of power lines, metal fences, and other conductive structures. During Lightning activity close to the Site, all crane and high lift activity shall be stopped.
Freezing – outside floor areas, ladders, and walkways may be slippery from ice.

Initiate – It may become necessary to seek shelter, evacuate the site, administer first aid, call in emergency assistance, initiate a Site shutdown and send everyone home or modify Site operations. The Facility Emergency Coordinator will announce changes to site work activities as conditions warrant. Do not restart equipment that tripped offline until the specific cause of the trip is known and addressed.

7.6 Earthquakes

In the case of an earthquake large enough to either have caused damage or thought to have the potential of causing damage:

Report: – To the Construction Director, Health and Safety Manager or direct supervisor after the event. If you are indoors, stay indoors. Lie to the side of a solid piece of furniture, such as a desk or table. Stay clear of windows, mirrors, bookshelves, and file cabinets. If you are outside, inform employees to get out into the open, away from equipment, buildings, mirrors and power lines. If safe; stay in your vehicle and move only to get away from danger. Please await further instructions. This message shall be communicated via verbal, electrical devices, phone and radio.

Evaluate – Following the earthquake, and if deemed safe to do so by the Emergency Response Coordinator, Abeinsa EPC Activity Managers will conduct a thorough site inspection to determine:
- Injured, missing, or trapped personnel (site personnel and contractors)
- Safety hazards caused by the earthquake, such as fires, downed power lines, damaged equipment, etc.
If the decision is made to initiate a search, teams must be assigned to designated areas for search. Each search team will be assigned a leader, and the names recorded. The search team leader is responsible for assuring that his/her team members stay in their specific area.

Initiate – Following thorough site inspections, it may become necessary to evacuate the site, administer first aid, call in emergency assistance, and initiate a Site shutdown. The Facility Emergency Coordinator will announce changes to site work activities as conditions warrant. Do not restart equipment that tripped offline during the earthquake until the specific cause of the trip is known and addressed.
7.7 Hazardous Chemical Spills Leaks

Even in a well-planned and executed program, the possibility exists that an accident will occur and an emergency spill or toxic chemical release will take place. Recognition of this possibility requires suitable emergency procedures be prepared beforehand, and shall be communicated to all affected personnel. Each separate facility location/project must consider the potential implications resulting from an emergency spill or a toxic chemical release and shall design methods for identifying, eliminating, isolating, or controlling the potential hazard as part of the site emergency response plan. If you cannot identify or are not familiar with the liquid and its chemical properties, vacate the area, keep other personnel away from the area and contact the supervisor. Regardless of the type of spill and magnitude the person who detects the spill must remain calm and follow this plan in an orderly manner.

1. **Emergency Response Coordinator:** Kirk Anderson, Cell Phone: (661) 754-6180
2. **Emergency Response Coordinator:** Leonardo Bruno Carrero Cell Phone: (949) 572-9254
3. **Alternate Emergency Response Coordinator:** Enrique Valades Nieto Cell Phone: (314) 420-9367
4. **Alternate Emergency Response Coordinator:** Jorge Daniel Collado Alvarez Cell Phone: (314) 488-7221
5. **Alternate Emergency Response Coordinator:** Bruce Asaro Cell Phone: (661) 754-6023

7.7.1 Spill Containment:

A. Identify spill source and assess hazard
   - Ensure all persons in the area are safe.
   - Assess hazards from the spill.
   - Read the Material Safety Data Sheet (MSDS) for the spilled material and follow all safety measures.
   - Check for fire and explosion risk
   - Extinguish all ignition sources in the area
   - Move machinery only if safe to do so or shut down.
   - Isolate all running equipment to prevent sparks.

B. If applicable, the isolation of the spill area shall be attempted
   - Ensure that necessary safety equipment is worn.
   - Stop the source
   - Attempt to contain the spill

C. Authorities to contact to report a spill
   - Foreman
   - Supervisor
D. Location to go in case of a spill:
   - If required or unsure of what to do; go directly to your nearest Assembly Area or where the ERC designates.

7.7.2 Record

A “Spill Reporting Form” must be completed anytime there is a spill larger than 5 gallons. Blank forms are available from the HSE Supervisor and the Environmental Engineer. Spill Reporting Forms will be used as a record to track all significant spills on areas under the control of the Abeinsa EPC Mojave. Any spill that results in a release of materials equal to or greater than the "Reportable Quantity", as specified in the Material Safety Data Sheet, must also be reported immediately to the local regulatory agency (San Bernardino County Fire Department), General Partnership and must be kept by the HSE Supervisor and the Environmental Engineer. Corrective actions will be implemented by management based on information contained on the Spill Reports.

8.0 Public Relations

A central spokesperson shall ensure that only informed and consistent information is made public regarding the activities. Additional details should follow to be clear on this communication.

8.1 Media Inquiry Procedure

All inquiries or requests for interviews from the news media (broadcast or print) shall be referred directly to the ABEINSA EPC Mojave Site Construction Director and immediately communicated to ASLLC (Frederick Redell, General Manager). ABEINSA EPC Mojave or subcontractor personnel receiving calls from reporters, regardless of the nature of their inquiry, should respond with the following statement:

“I appreciate your interest and would like to get you the information you need. All public information is handled from our
home office. Please leave me your telephone number and I can have someone get back with you as soon as possible.”

ABEINSA EPC Mojave or subcontractor personnel receiving media inquiries shall notify the ABEINSA EPC Mojave Site Construction Director immediately. ABEINSA EPC Mojave or subcontractor personnel should not provide a “no comment” statement, nor should they ask the reporter if they can make an “off the record” statement. “No comment” is normally interpreted as an admission of guilt, and all statements ABEINSA EPC Mojave personnel make to the media are considered authorized information.

9.0 Communication of Emergencies

1. A combination of radio devices, cell phones and air horns will be used to alert personnel on the project of an emergency situation until the Fire Protection and alarm system is in place. At that moment this plan will be updated in order to include the new situation.
2. Once notified, the emergency team will perform a call down to the Activity Manager’s and respective subcontractor groups.
3. H&S personnel will go to designated positions to disseminate appropriate communication up to and including initial and final area “sweeps” to ensure all personnel have been notified to the emergency.
4. Incident Command and H&S will collaborate and provide clear direction including the “all clear” by verbal, phone, radio, and finally with 3 - 10 second blasts of the air horn.
5. Use of air horns for bird control or non-emergency isolated communication will be short 1 second blast, preceded by verbal notification in the area of use and prior notice through phone, electronic device and/or radio to the S&H department and all other affected departments.

10.0 Appendix

6007-PEM-ATM-79-00-0001 – Appendix 01 – Emergency Phone List
6007-PEM-ATM-79-00-0001 – Appendix 02 – Area Search Team List
6007-PEM-ATM-79-00-0001 – Appendix 03 – Emergency Routes
Hi Steven,
The Submittal for HAZ-2-04-00, Revised HMBP chemicals added for chemical pipe cleaning, has been reviewed and approved by staff.
Thank you,
Dale R.

From: Steven.Pochmara@abeinsaepc.abengoa.com [mailto:Steven.Pochmara@abeinsaepc.abengoa.com]

Sent: Thursday, May 01, 2014 11:44 AM
To: Rundquist, Dale@Energy; Rundquist, Dale@Energy
Cc: pablo.schenone@abeinsaepc.abengoa.com; mercedes.macias@abeinsaepc.abengoa.com; larry.davis@abeinsaepc.abengoa.com; kristine.yates@abeinsaepc.abengoa.com; vernon.leeming@abeinsaepc.abengoa.com; enrique.valades@abeinsaepc.abengoa.com; lb Bruno@abeinsaepc.abengoa.com; Luis.Leal@abeinsaepc.abengoa.com; holmes.bas te t e s o l a r . a b e n g o a . c o m ; william.grisolia@solar.abengoa.com; Kathleen.Sullivan@solar.abengoa.com; frances.sanchez@solar.abengoa.com
Subject: HAZ-2-04-00

Good Morning Dale,
Please find attached a copy of the revised HMBP for review and approval. The revised plan now includes the chemicals that will be used for the chemical pipe cleaning process at the steam generator. Please contact me if you have any questions.

Regards,

Steven Pochmara - Permit Manager
Eco-Tip: Printing e-mails is usually a waste.

**********Internet Email Confidentiality Footer**********

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LETTER OF TRANSMITTAL

Date: April 25, 2014
Subject: Mojave Solar Project
Condition Number: WASTE-10
Reference: HTF Contaminated Soil Analysis
To: Mr. Dale Rundquist, CPM
California Energy Commission

WE ARE SENDING YOU

☑ Attached □ Under separate cover via ____________ the following items:

☐ Shop Drawings  ☐ Prints  ☐ Plans  ☐ Samples  ☐ Specifications
☐ Copy of Letter  ☐ Change Order

<table>
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<th>DESCRIPTION</th>
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<td>Spill Lab Results</td>
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THESE ARE TRANSMITTED as checked below:

☑ For Approval  □ Approved as submitted
□ For your use  □ Approved as noted
□ As requested  □ Returned for corrections
□ For review    □ For review and comment

REMARKS ________________________________

COPY TO: File SIGNED BY: Steven Pochmara
ABEINSA EPC
Subject: Mojave Solar Project (09-AFC-5C)
Condition No.: WASTE-10
Description: HTF Contaminated Soil Lab Results
Submittal No.: WASTE10-00-00

April 25, 2014

Mr. Dale Rundquist, CPM
California Energy Commission
1516 Ninth Street (MS-2000)
Sacramento, CA 95814
drundqui@energy.state.ca.us

Dear Mr. Rundquist,

Please see attached showing lab results for the HTF contaminated soil per condition of certification WASTE-10. Since there were numerous small spills (approximately 30), it was determined that a composite sample would best represent the situation. The sample is a composite of the initial HTF spills that occurred in the period of early March 2014 to early April 2014. Per the compliance, the results have also been sent to the DTSC. The results indicate an amount of 1,830 ppm of hydrocarbon, below the 10,000 ppm limit specified in the compliance.

Should you have any questions or need any additional information, please do not hesitate to contact me.

Sincerely,

Steven Pochmara
ABEINSA EPC
13911 Park Ave, Suite 208
Victorville, CA 92392
Cell: (480) 287-1419
Date: April 25, 2014

Mr. Mike Gurnee  
Environmental & Chemical Consulting, Inc.  
P.O. Box 3264  
Crestline, CA 92325  
Tel (909) 771-4842  Email: Mike@ECCInc.US

Project: Mojave Solar  
Lab I.D.: 140418-1

Dear Mr. Gurnee:

The **analytical results** for the soil sample, received by our lab on April 18, 2014, are attached. The sample was received chilled, intact and accompanying chain of custody record.

Enviro-Chem appreciates the opportunity to provide you and your company this and other services. Please do not hesitate to call us if you have any questions.

Sincerely,

[Signature]

Curtis Desilets  
Vice President/Program Manager

[Signature]

Andy Wang  
Laboratory Manager
LABORATORY REPORT

CUSTOMER: Environmental & Chemical Consulting, Inc.
P.O. Box 3264
Crestline, CA 92325
Tel (909) 771-4842 Email: Mike@ECCInc.US

PROJECT: Mojave Solar

DATE RECEIVED: 04/18/14
DATE ANALYZED: 04/24/14
DATE REPORTED: 04/25/14

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) ANALYSIS

METHOD: EPA 418.1
UNIT: mg/Kg = MILLIGRAM PER KILOGRAM = PPM

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COMMENTS:
DF = Dilution factor
PQL = Practical Quantitation Limit
Actual Detection Limit = PQL X DF
ND = Below The Actual Detection Limit or Non-Detected
TRPH = Total Recoverable Petroleum Hydrocarbons

DATA REVIEWED AND APPROVED BY: [Signature]
CAL-DHS ELAP CERTIFICATE No.: 1555
# QA/QC Report

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% RPD = Relative Percent Difference  
ACP % RPD = Acceptable Relative Percent Difference

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<td>80-120</td>
<td>3.74</td>
<td>94%</td>
<td>3.71</td>
<td>93%</td>
<td>#VALUE!</td>
</tr>
<tr>
<td>Chloride</td>
<td>mg/Kg</td>
<td>4/19/2014</td>
<td>140418-28</td>
<td>10.0</td>
<td>0.000</td>
<td>0-20</td>
<td>80-120</td>
<td>8.43</td>
<td>84%</td>
<td>8.39</td>
<td>84%</td>
<td>0.4%</td>
</tr>
<tr>
<td>COD</td>
<td>mg/Kg</td>
<td>7/12/2010</td>
<td>LCS1/2</td>
<td>10.0</td>
<td>0.000</td>
<td>0-20</td>
<td>80-120</td>
<td>8.53</td>
<td>84%</td>
<td>8.10</td>
<td>81%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Cr VI</td>
<td>mg/Kg</td>
<td>4/19/2014</td>
<td>LCS1/2</td>
<td>4.0</td>
<td>0.000</td>
<td>0-20</td>
<td>80-120</td>
<td>3.37</td>
<td>94%</td>
<td>3.46</td>
<td>87%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Cyanide</td>
<td>mg/lge</td>
<td>4/19/2014</td>
<td>140418-28</td>
<td>10.0</td>
<td>0.000</td>
<td>0-20</td>
<td>80-120</td>
<td>8.53</td>
<td>84%</td>
<td>8.10</td>
<td>81%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Fluoride</td>
<td>mg/Kg</td>
<td>4/19/2014</td>
<td>LCS1/2</td>
<td>4.0</td>
<td>0.000</td>
<td>0-20</td>
<td>80-120</td>
<td>3.37</td>
<td>91%</td>
<td>3.73</td>
<td>93%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Nitrate as N</td>
<td>mg/Kg</td>
<td>4/19/2014</td>
<td>140417-69</td>
<td>4.0</td>
<td>0.000</td>
<td>0-20</td>
<td>80-120</td>
<td>3.65</td>
<td>91%</td>
<td>3.73</td>
<td>93%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Nitrite as N</td>
<td>mg/Kg</td>
<td>8/25/2010</td>
<td>LCS3/4</td>
<td>667</td>
<td>0.00</td>
<td>0-20</td>
<td>80-120</td>
<td>567</td>
<td>85%</td>
<td>667</td>
<td>100%</td>
<td>15.0%</td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>mg/Kg</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Phenolics</td>
<td>mg/Kg</td>
<td>4/25/2014</td>
<td>LCS1/2</td>
<td>200</td>
<td>0.00</td>
<td>0-20</td>
<td>80-120</td>
<td>186</td>
<td>93%</td>
<td>189</td>
<td>95%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Sulfate</td>
<td>mg/Kg</td>
<td>4/18/2014</td>
<td>140418-28</td>
<td>3.00</td>
<td>0.00</td>
<td>0-20</td>
<td>80-120</td>
<td>2.82</td>
<td>94%</td>
<td>2.87</td>
<td>96%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Sulfide</td>
<td>mg/Kg</td>
<td>4/24/2014</td>
<td>LCS1/2</td>
<td>667</td>
<td>0.00</td>
<td>0-20</td>
<td>80-120</td>
<td>633</td>
<td>95%</td>
<td>644</td>
<td>97%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Sulfide, Reactive</td>
<td>mg/Kg</td>
<td>1/29/2010</td>
<td>100129-36</td>
<td>3.00</td>
<td>0.00</td>
<td>0-20</td>
<td>80-120</td>
<td>2.53</td>
<td>84%</td>
<td>2.63</td>
<td>88%</td>
<td>3.3%</td>
</tr>
<tr>
<td>EPA 1664A</td>
<td>mg/Kg</td>
<td>3/8/2010</td>
<td>LCS3/4</td>
<td>500</td>
<td>0.00</td>
<td>0-20</td>
<td>80-120</td>
<td>435</td>
<td>87%</td>
<td>425</td>
<td>85%</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

S.R. = Sample Results  
%RC = Percent Recovery  
ACP %RC = Accepted Percent Recovery

Analyst Signature:  
Final Reviewer: 

---
Hi Steven,
The Submittal for WASTE-10-01-00 (DTSC Approval for HTF Contaminated Soil) has been reviewed and approved by staff.

Thank you,

Dale R.

From: Steven.Pochmara@abepnsepc.abengo.com [mailto:Steven.Pochmara@abepnsepc.abengo.com]

Sent: Friday, May 16, 2014 11:32 AM
To: Rundquist, Dale@Energy; Rundquist, Dale@Energy
Cc: larry.davis@abeinsaepc.abengo.com; kirk.anderson@abeinsaepc.abengo.com;
manjunath.shivalingappa@abeinsaepc.abengo.com; vernon.lemming@abeinsaepc.abengo.com;
kristine.yates@abeinsaepc.abengo.com; holmes.bassette@solar.abengo.com;
Kathleen.Sullivan@solar.abengo.com; william.grisolia@solar.abengo.com
Subject: WASTE10-01-00 DTSC approval for HTF contaminated soil

Good Morning Dale,
I had sent this to you earlier this week but wanted to resend with an assigned number. Please see the response below per WASTE-10 from the DTSC indicating that they don’t consider the on site HTF contaminated soil hazardous. Let me know if staff has had a chance to review the lab results I sent on April 25, 2014, thanks.

Regards,

Steven Pochmara - Permit Manager

ABEINSA EPC
13911 Park Avenue, Suite 208
Victorville, CA 92392
Cell: +14802871419
Steven.Pochmara@teyma.abengo.com
www.teyma.com

--- Forwarded by Steven Pochmara/AbinsaEPC/Abengoa on 05/12/2014 11:39 AM ---
"Misemer, Mary@DTSC"
05/12/2014 11:14 AM

To: "Steven.Pochmara@abepnsepc.abengo.com" <Steven.Pochmara@abepnsepc.abengo.com>,
"vernon.lemming@abeinsaepc.abengo.com"
Subject: RE: MSDS for HT
Hi Steven,

After reviewing the MSDS, it looks like in it’s pure form, it can present an inhalation hazardous, but when you have that small amount mixed with a great deal of dire, it is reasonable to assume that the mixture will not exhibit the characteristic to be hazardous waste.

From: Steven.Pochmara@abeinsaepc.abengoa.com [mailto:Steven.Pochmara@abeinsaepc.abengoa.com]

Sent: Monday, May 12, 2014 8:13 AM
To: Misermer, Mary@DTSC
Cc: vernon.leeming@abeinsaepc.abengoa.com
Subject: RE: MSDS for HTF

Good Morning Mary,
Sorry for the confusion but the test that was submitted was for HTF contaminated soil, not for pure HTF. To date, we have approximately 20-55 gallon barrels of contaminated soil that was mixed with small HTF spills. All spills were cleaned up per regulations and the lab results I sent to you were samples from these barrels. Please let me know what the next steps are to proceed.

Regards,

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Cell: +14802871419
Steven.Pochmara@teyma.abengoa.com
www.teyma.com
Eco-Tip: Printing e-mails is usually a waste.

"Misermer, Mary@DTSC"
05/12/2014 08:02 AM

Send To:  *Steven.Pochmara@abeinsaepc.abengoa.com*  *<Steven.Pochmara@abeinsaepc.abengoa.com>*
cc:  
Subject:  RE: MSDS for HTF

Looks like it fails the Toxicity test for Inhalation 22CCR 66261.24(a)(5)
From the MSDS
From: Steven.Pochmara@abeinsaepc.abengoa.com
Sent: Friday, May 09, 2014 11:47 AM
To: Misemer, Mary@DTSC
Cc: vernon.leeming@abeinsaepc.abengoa.com; kirk.anderson@abeinsaepc.abengoa.com;
manjunath.shivalingappa@abeinsaepc.abengoa.com; larry.davis@abeinsaepc.abengoa.com
Subject: MSDS for HTF

Good Morning Mary,
Please find attached the MSDS for the HTF (Heat Transfer Fluid) as discussed on our phone call this morning. Please let me know if you require any further information.

Regards,
Steven Pochmara - Permit Manager

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13911 Park Avenue, Suite 208
Victorville, CA 92392
Cell: +14802871419
Steven.Pochmara@teyma.abengoa.com
www.teyma.com

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Mary Misemer at DTSC has received the file 9497_HTTF Soils 4-25-14.pdf that you sent.

Please do not respond to this email.
Good Morning Dale,

I had sent this to you earlier this week but wanted to resend with an assigned number. Please see the response below per WASTE-10 from the DTSC indicating that they don’t consider the on site HTF contaminated soil hazardous. Let me know if staff has had a chance to review the lab results I sent on April 25, 2014, thanks.

Regards,

Steven Pochmara - Permit Manager

---

**From:** Steven.Pochmara@abeinsaepc.abengoa.com [mailto:Steven.Pochmara@abeinsaepc.abengoa.com]
**Sent:** Monday, May 12, 2014 8:13 AM
**To:** Misemer, Mary@DTSC

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Cc: vernon.leeming@abeinsaepc.abengoa.com
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Regards,

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Steven.Pochmara@teyma.abengoa.com
www.teyma.com

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"Misemer, Mary@DTSC"
05/12/2014 08:02 AM

Send To:  "Steven.Pochmara@abeinsaepc.abengoa.com"  <Steven.Pochmara@abeinsaepc.abengoa.com>
cc:  RE: MSDS for HTF

Looks like it fails the Toxicity test for Inhalation 22CCR 66261.24(a)(5)
From the MSDS
11. TOXICOLOGICAL INFORMATION
This product has been tested for toxicity. Results from Solutia sponsored studies in the scientific literature are described below.
Acute animal toxicity data:
Oral: LD50, rat, 2,050 mg/kg, No more than slightly toxic
Dermal: LD50, rabbit, > 5,010 mg/kg, Practically nontoxic after skin application
Inhalation: LC50, rat, 2.66 mg/l, 4 h, Toxic based on animal inhalation exposure
Skin irritation: rabbit, Slightly irritating to skin, 24 h
Repeat dose toxicity: rat, inhalation, 13 weeks, Produced effects on body weight and/or organ weights in repeat dose studies.
Repeat dose toxicity: rat, gavage, 26 weeks, Produced effects on body weight and/or organ weights in repeat dose studies. Effects only observed at very high liver, spleen. Repeat dose toxicity: rat, diet, subchronic, Repeated oral exposure to changes in animal models. Target organs affected liver, kidneys Developmental changes observed in laboratory animals in the presence of maternal toxicity. Product name is Page 6.
Solutia Inc. Material Safety Data Sheet Date: 05/18/2012
Reference Number: 00000000211 Version 5.4/E

Mutagenicity: No genetic effects were observed in standard tests using bacteria. Components Data from Solutia studies and/or the available scientific literature do not been identified as hazardous chemicals under the criteria of the OSHA Hazard (910.1200) or the Canadian Hazardous Products Act are discussed below. Biologically active components are: headache, fatigue, nausea, indigestion, abdominal pain, tremor, central and peripheral nervous system, Slightly toxic following oral administration.

Practically nontoxic after skin application in animal studies.
Practically non irritating to skin (rabbit).
Slightly irritating to eyes (rabbit). No mortality or signs of toxicity at the highest level irritating to respiratory system in animal models. Produced effects on body weight and repeat dose studies.

From: Steven.Pochmara@abeinsaepc.abengoa.com [mailto:Steven.Pochmara@abeinsaepc.abengoa.com]

Sent: Friday, May 09, 2014 11:47 AM
To: Miserem, Mary@DTSC
Cc: vernon.leeming@abeinsaepc.abengoa.com; kirk.anderson@abeinsaepc.abengoa.com;
manjunath.shivalingappa@abeinsaepc.abengoa.com; larry.davis@abeinsaepc.abengoa.com
Subject: MSDS for HTF

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Regards,

Steven Pochmara - Permit Manager

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Report Date of
Number Incident
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Spill Location

Incident
Time

Contractor
Responsible

Product

beta/row/128J/3N
beta/row123J/3N
Beta/102I/4N
AE / row110d/3N
AE / row 110 B / 1N
AE / row 109 H / 3N
AE / row 109 H / 3N
AE / row 112 H/ 1N
AE/ row114H / 1N
AE / row 128H /3N
AE / row 128H/2N
AE/ row 144F /4S
AE / row 148G /1N
AE/row150H/5S
Beta/row70J/2N
AE/row160EF
AE/row 159G /valve1
AE/row 164G / HP1ma
AE/ row 168G/3N
Beta/ row 63J/1N
AE/ row 184H/S4
AE/row 192F/main line
AE/row 195H/4N
BE/row4G/main line
BE/row53E/1S
alpha unloading area
AW/row 61C/ML
AW/row64D/3 S
BE/ row 54E/1N
BE/row60E/2N
AW/60C / 5N
AW/59C/3N
AW/52D/2S
AW/37D/1N
BE/76E/3S
BE/row 122G/3N
BE/row 123 F /4 N
AW / row 25 B / 1 S
BE/ row 118 h / 3 S
BE/ 115 G/ 1S
BE/row 109 H / 3N
BE/row 105 E/4S
BE /row 93f / 4N
BE/row 3 main header
AW/row 16e/4N
Alpha overflow
BE/row 106D / 5S
BE/ row 106 C /5 N
BE / row 99C/5S
BE / row 72A /5N
BE / row 73 C / 5N
BE / row 68A /5 N
BE / row 63 a / 5N

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4.30 pm
3.15 pm
2.30 pm
2.05 pm
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Therminol VP1
Therminol VP1
Therminol VP1
Therminol VP1
Therminol VP1
Therminol VP1
Therminol VP1
Therminol VP1
Therminol VP1

Quanity Soil Amt Removed
1/8 Gal.
1/8 Gal.
1/16 Gal
1/8 Gal.
1/8 Gal.
1/8 Gal.
1/8 Gal.
1/8 Gal.
1/8 Gal.
1/8 Gal.
1/8 Gal.
1/8 Gal.
1 Pint
1/8 Gal.
1/8 Gal.
1 Pint
1/2 Pint
1/2 Pint
1/2 Pint
1/4 pint
pint
quart
1/2 pint
1/2 quart
1 pint
1.5 gal
1 quart
1/2 pint
1 quart
1/2 quart
1/2 quart
1/2 pint
1/4 pint
1 pint
3/4 pint
1 1/2 pint
1/2 pint
1/2 quart
1/4 pint
1/2 pint
1/2 pint
5 drops
1/8 pint
3/4 quart
1/8 pint
1.5 gallon
1 pint
1/16 pint
1/16 pint
1ounce
1 ounce
2 ounces
1/2 pint

1 shovel
1 shovel
half shovel
2 Shovels
3 shovels
2 Shovels
2 Shovels
2 Shovels
2 Shovels
2 Shovels
1 shovel
2 Shovels
1 1/2 Shovels
1 Shovel
1 Shovel
2 Shovels
1/2 Shovel
2.5 shovels
1.5 shovels
1/2 shovel
1 shovel
3 shovels
1/2 shovel
3 shovels
2 shovels
10 shovels
4 shovels
1 shovel
4 shovels
2.5 shovels
2.5 sholvels
1.5 shovels
1/4 shovel
1 shovel
1 shovel
3 shovels
1 1/2 shovel
5 shovels
1/2 shovel
2 shovels
1 1/2 shovels
1/4 shovel
1 shovel
5 shavoel
1/4 shovel
8 shovels
1 shovel
1 shovel
1 shovel
3 pints
3 pints
1 quart
1.5 quarts


# Environmental Spill/Release Report

## Section I: General Information

<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Date Reported</th>
<th>Incident Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/1/14</td>
<td>5/1/14</td>
<td>11:15 am</td>
</tr>
</tbody>
</table>

Employee(s) Involved: Abacus

Contracting Company: Abacus

## Section II: Incident Description

<table>
<thead>
<tr>
<th>Name of the Material Spilled/Released</th>
<th>Therminol® VPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components in Materials:</td>
<td>%</td>
</tr>
<tr>
<td>Include CAS #’s when relevant.</td>
<td>ESH Chem</td>
</tr>
<tr>
<td>Diphenyl Ether</td>
<td>73.5</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>26.5</td>
</tr>
</tbody>
</table>

What was the time duration of the spill/release?

What was the quantity of the material spilled or released?

- [ ] Gallons
- [ ] Liters
- [ ] Pounds

What were the weather conditions at the time of the spill/release (wind direction, cloud cover, precipitation, temp, etc.)?

- Sunny

What was the spill released to?

- [ ] Air
- [ ] Irrigation Canals
- [ ] Storm Water
- [ ] Chemical Sewer
- [ ] Land
- [ ] Other: 

Is external agency required to be notified?

- [ ] Yes
- [ ] No

Did the spill/release exceed an air or NPDES permit and/or leave the site? If yes, please explain below.

- [ ] Yes
- [ ] No

Abacus was changing out a bad gauage on one of the HTF line. Abacus employee was told to the line had nitrogen and no HTF so he started taking the gauage off and empty HTF came out so they call me and my guys cleaned it up and get it fit. (The east side of the HTF over-flow area)

Provide a description of what happened (time line), corrective measures taken, and preventive measures:

- Dirt removed 1/2 quart
- Put into a 5gal bucket
- Dump into a 55gal barrel
- Taken to the LDU and put on secondary containment

Estimated cost of cleanup: TBD

---

Reviewed by: Eric Zuhike
Revision 00 – Revision Date.
**Environmental Spill/Release Report**

**Section III. Form Completion**

This Environmental Spill/Release Report was prepared by:

<table>
<thead>
<tr>
<th>Print Name</th>
<th>Company</th>
<th>Job Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terry Baker</td>
<td>Abeinsa EPC</td>
<td>H&amp;S Field Supervisor</td>
<td>5/1/14</td>
</tr>
</tbody>
</table>

Signature Name (handwritten or electronic signature is acceptable):

**Section IV. Notifications**

Forward all completed documentation to one or all of the following:

<table>
<thead>
<tr>
<th>*Required</th>
<th>Name</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Larry Davis</td>
<td>480.370.7063</td>
</tr>
<tr>
<td></td>
<td>OH&amp;S Manager</td>
<td><a href="mailto:Larry.Davis@abeinsa.com">Larry.Davis@abeinsa.com</a></td>
</tr>
<tr>
<td></td>
<td>Terry Baker</td>
<td>480.236.2954</td>
</tr>
<tr>
<td></td>
<td>OH&amp;S Site Supervisor</td>
<td><a href="mailto:Terry.Baker@abeinsa.com">Terry.Baker@abeinsa.com</a></td>
</tr>
<tr>
<td></td>
<td>Kirk Anderson</td>
<td>661.754.6180</td>
</tr>
<tr>
<td></td>
<td>Environmental Engineer</td>
<td><a href="mailto:Kirk.Anderson@abeinsa.com">Kirk.Anderson@abeinsa.com</a></td>
</tr>
<tr>
<td></td>
<td>Kristine Yates</td>
<td>661.754.6756</td>
</tr>
<tr>
<td></td>
<td>Logistics Coordinator</td>
<td><a href="mailto:Kristine.Yates@abeinsa.com">Kristine.Yates@abeinsa.com</a></td>
</tr>
</tbody>
</table>

*Required Environmental Spill/Release Reports.

**Section V. Abeinsa EPC Internal**

Is a PRR/IRP required?

| ☐ | Yes | ☑ | No |

If so, initiate the process and provide PRR/IRP number:

| ☐ | Yes | ☑ | No |
# Environmental Spill_Release Report

## Section I: General Information

<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Date Reported</th>
<th>Incident Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8/14</td>
<td>5/8/14</td>
<td>12:45 pm</td>
</tr>
</tbody>
</table>

**Employee(s) Involved:** Abeinsa Commissioning  
**Contracting Company:** Abeinsa Commissioning

## Section II: Incident Description

<table>
<thead>
<tr>
<th>Name of the Material</th>
<th>Spilled/Released</th>
<th>Components in Material(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Include CAS #’s when relevant.</td>
</tr>
<tr>
<td>Diphenyl Ether</td>
<td>78.5</td>
<td></td>
</tr>
<tr>
<td>Diphenyl</td>
<td>21.5</td>
<td></td>
</tr>
</tbody>
</table>

**What was the time duration of the spill/release?**

**What was the quantity of the material spilled or released?** 8 Gallons

**What were the weather conditions at the time of the spill/release (wind direction, cloud cover, precipitation, temp, etc.)?** Sunny

**What was the spill released to?**

- [ ] Land
- [x] Irrigation Canals
- [ ] Storm Water
- [ ] Other:

**Is external agency required to be notified?**

- [ ] Yes
- [x] No

**Did the spill/release exceed an air or NPDES permit and/or leave the site?**

- [ ] Yes
- [x] No

They were on row 1A, left draining the line of HTF fluid. They hooked the argon gas to the line at the main HTF line at the other end. Abacius pipe tester left the end argon gas and it was misting HTF from the argon line. They stop the argon gas and my guys clean it up and start

Provide a description of what happened (time line), corrective measures taken, and preventive measures:

**Location row 1A E,F,G, and H by main HTF line in field**

Direct removed 3 55gal barrels  
Shoveled into a 55gal barrel  
Taken to the LTBI and put on secondary containment

**Estimated cost of cleanup:** TBD
Environmental Spill/Release Report

Section III. Form Completion
This Environmental Spill/Release Report was prepared by:

<table>
<thead>
<tr>
<th>Print Name:</th>
<th>Company:</th>
<th>Job Title:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terry Baker</td>
<td>Abeinsa EPC</td>
<td>HS Field Supervisor</td>
<td>5/8/14</td>
</tr>
</tbody>
</table>

Sign Name (handwritten or electronic signature is acceptable): 

Section IV. Notifications:
Forward all Completed Documentation to one or all of the following:

<table>
<thead>
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<th>Phone</th>
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<td>480.370.7063</td>
<td></td>
</tr>
<tr>
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<td>OH&amp;S Site Supervisor</td>
<td><a href="mailto:Terry.Baker@abeinsa.com">Terry.Baker@abeinsa.com</a></td>
<td>480.236.2954</td>
<td></td>
</tr>
<tr>
<td>Kirk Anderson</td>
<td>Environmental Engineer</td>
<td><a href="mailto:Kirk.Anderson@abeinsa.com">Kirk.Anderson@abeinsa.com</a></td>
<td>661.754.6180</td>
<td></td>
</tr>
<tr>
<td>Kristine Yates</td>
<td>Logistics Coordinator</td>
<td><a href="mailto:Kristine.Yates@abeinsa.com">Kristine.Yates@abeinsa.com</a></td>
<td>661.754.6756</td>
<td></td>
</tr>
</tbody>
</table>

*Required Environmental Spill/Release Reports.

Section V. Abeinsa EPC:Internal
Is a PRR/IRP required?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

If so, initiate the process and provide PRR/IRP number:

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
# Environmental Spill/Release Report

## Section I. General Information

<table>
<thead>
<tr>
<th>Date of incident:</th>
<th>5/12/14</th>
<th>Date Reported:</th>
<th>5/12/14</th>
<th>Incident Time:</th>
<th>11:30am</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee(s) Involved:</td>
<td>Commissioning field AbeinsaEPC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contracting Company:</td>
<td>Commissioning field AbeinsaEPC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Section II. Incident Description

**Name of the Material Spilled Released:** Thermal VP-1

<table>
<thead>
<tr>
<th>Components in Material(s): Include CAS #’s when relevant.</th>
<th>%</th>
<th>ESH Chem</th>
<th>CERCLA Chem</th>
<th>RQlbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphenyl Ether</td>
<td>78.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biphenyl</td>
<td>20.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| What was the time duration of the spill/release? | | |
|------------------------------------------------|---|
| What was the quantity of the material spilled or released? | 10 | Gallons | | |

| What were the weather conditions at the time of the spill/release (wind direction, cloud cover, precipitation, temp, etc.)? | Sunny |

<table>
<thead>
<tr>
<th>What was the spill released to?</th>
<th>Air</th>
<th>Irrigation Canals</th>
<th>Storm Water</th>
<th>Chemical Sewer</th>
<th>Land</th>
<th>Other</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is external agency required to be notified?</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

They were removing the pipe at the end of the HTF main line. They said that it only had nitrogen in the line so they pulled it apart and HTF came out of both ends of the pipe. My guy cleaned the leak up and the Location row 128 AB (opposite the HTF main line in field.

<table>
<thead>
<tr>
<th>Dirt removed</th>
<th>455 gal barrel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Put into</td>
<td>25 gal bucket</td>
</tr>
<tr>
<td>Dump into</td>
<td>55 gal barrel</td>
</tr>
<tr>
<td>Taken to the LTU and put on Secondary containment</td>
<td></td>
</tr>
</tbody>
</table>

Estimated cost of cleanup: TBD
Environmental Spill/Release Report

Section III. Form Completion
This Environmental Spill/Release Report was prepared by:

<table>
<thead>
<tr>
<th>Print Name:</th>
<th>Company:</th>
<th>Job Title:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terry Baker</td>
<td>Abeinsa EPC</td>
<td>H&amp;S Field Supervisor</td>
<td>5/12/14</td>
</tr>
</tbody>
</table>

Sign Name (handwritten or electronic signature is acceptable):

Section IV. Notifications-
Forward all Completed Documentation to one or all of the following:

<table>
<thead>
<tr>
<th>*Required</th>
<th>Larry Davis</th>
<th>Larry <a href="mailto:Davis@abeinsaepc.abengoa.com">Davis@abeinsaepc.abengoa.com</a></th>
<th>480.370.7063</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terry Baker</td>
<td><a href="mailto:Terry.Baker@abeinsaepc.abengoa.com">Terry.Baker@abeinsaepc.abengoa.com</a></td>
<td>480.236.2954</td>
</tr>
<tr>
<td></td>
<td>Kirk Anderson</td>
<td><a href="mailto:Kirk.Anderson@abeinsaepc.abengoa.com">Kirk.Anderson@abeinsaepc.abengoa.com</a></td>
<td>661.754.6180</td>
</tr>
<tr>
<td></td>
<td>Kristine Yates</td>
<td><a href="mailto:Kristine.Anderson@abeinsaepc.abengoa.com">Kristine.Anderson@abeinsaepc.abengoa.com</a></td>
<td>661.754.6756</td>
</tr>
</tbody>
</table>

*Required Environmental Spill/Release Reports.

Section V. Abeinsa EPC Internal

<table>
<thead>
<tr>
<th>Is a PRR/IRP required?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If so, initiate the process and provide PRR/IRP number:

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Environmental Spill/Release Report

Section I. General Information
- Date of Incident: 5/14/14
- Date Reported: 5/14/14
- Incident Time: 11:00 am
- Employee(s) Involved: ABEINS\# ABEINS\# Commissioning
- Contracting Company: ABEINS\# ABEINS\# Commissioning

Section II. Incident Description
- Name of the Material Spilled/Released: Diaphenyl Ether
- Components in Material(s): Include CAS # when relevant.
  - ESH Chem: 73.5%
  - CERCLA Chem: 26.5%

What was the time duration of the spill/release?
- Duration: 3 1/2
- Unit: Gallons

What were the weather conditions at the time of the spill/release (wind direction, cloud cover, precipitation, temp, etc.)?
- Conditions: Sunny

What was the spill released to?
- Air: No
- Chemical Sewer: Yes
- Irrigation Canals: No
- Land: Yes
- Storm Water: No
- Other: No

Is external agency required to be notified?
- Yes: Yes
- No: No

Did the spill/release exceed an air or NPDES permit and/or leave the site? If yes, please explain below.
- Description: Commissioning was draining line on row 101 ABCD. Commissioning took up the argon gas and my guys was watch the end by the gate. The Commissioning employees left the argon took up unattended and running. My lead Trent went to check argon gas and the line came off. Trent stop it and the guys clean it up and check it.

Provide a description of what happened (time line), corrective measures taken, and preventive measures:
- Location: Row 101 ABCD by HTF main line in the field
- Description: Dirt removed 1.5 gal barrel
- Put into a 5 gal bucket
- Dump into a 55 gal barrel
- Taken to the HTF and put on secondary containment

Estimated cost of cleanup: TBD
# Environmental Spill/Release Report

## Section III. Form Completion

This Environmental Spill/Release Report was prepared by:

<table>
<thead>
<tr>
<th>Print Name:</th>
<th>Company:</th>
<th>Job Title:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terry Baker</td>
<td>Abeinsa EPC</td>
<td>Hasfield supervisor</td>
<td>5/14/14</td>
</tr>
</tbody>
</table>

Sign Name (handwritten or electronic signature is acceptable):

[Signature]

---

## Section IV. Notifications

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</thead>
<tbody>
<tr>
<td></td>
<td>Larry Davis</td>
<td><a href="mailto:Larry.Davis@abeinsaepc.abengoa.com">Larry.Davis@abeinsaepc.abengoa.com</a></td>
<td>480.370.7063</td>
</tr>
<tr>
<td></td>
<td>Terry Baker</td>
<td><a href="mailto:Terry.Baker@abeinsaepc.abengoa.com">Terry.Baker@abeinsaepc.abengoa.com</a></td>
<td>480.236.2954</td>
</tr>
<tr>
<td></td>
<td>Kirk Anderson</td>
<td><a href="mailto:Kirk.Anderson@abeinsaepc.abengoa.com">Kirk.Anderson@abeinsaepc.abengoa.com</a></td>
<td>661.754.6180</td>
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<tr>
<td></td>
<td>Kristine Yates</td>
<td><a href="mailto:Kristine.Anderson@abeinsaepc.abengoa.com">Kristine.Anderson@abeinsaepc.abengoa.com</a></td>
<td>661.754.6756</td>
</tr>
</tbody>
</table>

*Required Environmental Spill/Release Reports.

---

## Section V. Abeinsa EPC Internal

<table>
<thead>
<tr>
<th>Is PR/IR required?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐</td>
<td>☑</td>
</tr>
</tbody>
</table>

If so, initiate the process and provide PR/IR number:

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☑</td>
</tr>
</tbody>
</table>
## Environmental Spill/Release Report

### Section I. General Information
- **Date of Incident:** 5/14/14  
- **Date Reported:** 5/14/14  
- **Incident Time:** 11:00 am  
- **Employee(s) Involved:** Abeinsa EPC Commissioning  
- **Contracting Company:** Abeinsa EPC Commissioning

### Section II. Incident Description

<table>
<thead>
<tr>
<th>Name of the Material Spilled/Released:</th>
<th>Thermol O VP-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components in Material(s): Include CAS #s when relevant.</td>
<td>%</td>
</tr>
<tr>
<td>Diphenyl Ether</td>
<td>73.5</td>
</tr>
<tr>
<td>Biphenyl</td>
<td>26.5</td>
</tr>
</tbody>
</table>

- **What was the time duration of the spill/release?** 1/2 hour
- **What was the quantity of the material spilled or released?** 1/2 gallons
- **What were the weather conditions at the time of the spill/release (wind direction, cloud cover, precipitation, temp, etc.)?** Sunny
- **What was the spill released to?** Chemical sewer, land
- **Is external agency required to be notified?** Yes

**Comissioning employees brought a 3" hose from alpha HTF overflow area to beta HTF overflow area. They put the 3" hose out of the back of the buggy in beta outside of the dirt by the HTF overflow area in the northeast corner. My guys cleaned up the leak and streaked it.

**Provide a description of what happened (time line), corrective measures taken, and preventive measures:**

- Location beta HTF overflow area in northeast corner on the dirt.
- Dump removed 19 gal into a 5 gal bucket.
- Taken to the LTU and put on secondary containment.

**Estimated cost of cleanup:** TBD
# Environmental Spill/Release Report

## Section III. Form Completion
The Environmental Spill/Release Report was prepared by:

<table>
<thead>
<tr>
<th>Print Name</th>
<th>Company</th>
<th>Job Title</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Terry Baker</td>
<td>Abeinsa EPC</td>
<td>Headfield Supervisor</td>
<td>5/14/14</td>
</tr>
</tbody>
</table>

Sign Name (handwritten or electronic signature is acceptable):

![Signature]

## Section IV. Notifications-
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<td></td>
<td>Kirk Anderson</td>
<td><a href="mailto:Kirk_Anderson@abeinsaepc_abengoa.com">Kirk_Anderson@abeinsaepc_abengoa.com</a></td>
<td>661.754.6180</td>
</tr>
<tr>
<td></td>
<td>Kristine Yates</td>
<td><a href="mailto:Kristine_Anderson@abeinsaepc_abengoa.com">Kristine_Anderson@abeinsaepc_abengoa.com</a></td>
<td>661.754.6756</td>
</tr>
</tbody>
</table>

*Required Environmental Spill/Release Reports.

## Section V. Abeinsa EPC Internal

<table>
<thead>
<tr>
<th>Is a PRR/IRP required?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td></td>
</tr>
</tbody>
</table>

If so, initiate the process and provide PRR/IRP number:

<table>
<thead>
<tr>
<th>[ ]</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td></td>
</tr>
</tbody>
</table>
Environmental Spill/Release Report

Section I. General Information

Date of Incident: 5-19-14  
Date Reported: 5-19-14  
Incident Time: 10:00 AM

Employee(s) Involved:  
Renam Woods  
Dillon Cobb

Contracting Company: DMI

Section II. Incident Description

Name of the Material Spilled/Released: Gas

Components in Material(s):  
Include CAS #’s when relevant.

<table>
<thead>
<tr>
<th>%</th>
<th>ESH Chem</th>
<th>CERCLA Chem</th>
<th>RQlbs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What was the time duration of the spill/release?  
SECONDS

What was the quantity of the material spilled or released?  
1/2 CUP

☐ Gallons  ☐ Liters  ☐ Pounds

What were the weather conditions at the time of the spill/release (wind direction, cloud cover, precipitation, temp, etc.)?  
Hot and dry

What was the spill released to?  
☐ Air  ☐ Chemical Sewer  ☑ Irrigation Canals  ☐ Storm Water  ☐ Land  ☐ Other:

Is external agency required to be notified?  
☐ Yes  ☑ No

Did the spill/release exceed an air or NPDES permit and/or leave the site? If yes, please explain below:  
Yes  ☑ No

Provide a description of what happened (time line), corrective measures taken, and preventative measures:  
Gas can spilled some gas in bed of buggy then dripped out of corner, lined buggy bed with plastic so gas cannot escape. Not topping cans off.

Estimated cost of cleanup:  

Reviewed by: Eric Zuhlke
Revision 00 – Revision Date:
### Section III. Form Completion

This Environmental Spill/Release Report was prepared by:

<table>
<thead>
<tr>
<th>Print Name:</th>
<th>Company:</th>
<th>Job Title:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank Rich</td>
<td>O.M.I.</td>
<td>Safety</td>
<td>5-17-14</td>
</tr>
</tbody>
</table>

Sign Name (handwritten or electronic signature is acceptable):

![Signature]

### Section IV. Notifications

Forward all Completed Documentation to one or all of the following:

**Required**
- Larry Davis
  - OH&S Manager
  - Larry.Davis@abeinsaepc.abengoa.com
  - 480.370.7063
- Terry Baker
  - OH&S Site Supervisor
  - Terry.Baker@abeinsaepc.abengoa.com
  - 480.236.2954
- Kirk Anderson
  - Environmental Engineer
  - Kirk.Anderson@abeinsaepc.abengoa.com
  - 661.754.6180
- Kristine Yates
  - Logistics Coordinator
  - Kristine.Yates@abeinsaepc.abengoa.com
  - 661.754.6756

*Required Environmental Spill/Release Reports.

### Section V. Abeinsa EPC Internal

<table>
<thead>
<tr>
<th>Is a PRR/RP required?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

If so, initiate the process and provide PRR/RP number:

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
Environmental Spill/Release Report

**Section I. General Information**

<table>
<thead>
<tr>
<th>Date of Incident:</th>
<th>5/20/14</th>
<th>Date Reported:</th>
<th>5/20/14</th>
<th>Incident Time:</th>
<th>8:00 a.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee(s) Involved:</td>
<td>Germaine Dominguez</td>
<td>Contracting Company:</td>
<td>Abacus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Section II. Incident Description**

Name of the Material | **Diesel Fuel**
--- | ---
Spilled/Released:

<table>
<thead>
<tr>
<th>Components in Material(s):</th>
<th>ESH Chem</th>
<th>CERCLA Chem</th>
<th>RQ lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Diesel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear Diesel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What was the time duration of the spill/release?

What was the quantity of the material spilled or released?

What were the weather conditions at the time of the spill/release (wind direction, cloud cover, precipitation, temp, etc.)?

<table>
<thead>
<tr>
<th>20 mph Winds SW</th>
<th>Sunny</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some Clouds, 70°</td>
<td></td>
</tr>
</tbody>
</table>

What was the spill released to?

- [ ] Air
- [ ] Chemical Sewer
- [ ] Irrigation Canals
- [ ] Land
- [ ] Storm Water
- [ ] Other:

Is external agency required to be notified?

- [ ] Yes
- [ ] No

Did the spill/release exceed an air or NPDES permit and/or leave the site? If yes, please explain below.

- [ ] Yes
- [ ] No

Did you spill, contaminate, or damage any property?

- [ ] Yes

Estimated cost of cleanup:

Some fuel was spilled during refueling activities of equipment and did not have spill containment in place. Correction included excavation and storage of contaminated soil, prevention includes spill containment pans and also will use construction films to protect soil from further spills.
# Environmental Spill/Release Report

## Section III. Form Completion

This Environmental Spill/Release Report was prepared by:

<table>
<thead>
<tr>
<th>Print Name</th>
<th>Company</th>
<th>Job Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>George O'Brien</td>
<td>Abacor</td>
<td>Equipment Manager</td>
<td>5/20/14</td>
</tr>
</tbody>
</table>

Sign Name (handwritten or electronic signature is acceptable):


## Section IV. Notifications-

Forward all Completed Documentation to one or all of the following:

<table>
<thead>
<tr>
<th>*Required</th>
<th>Name</th>
<th>Email</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Larry Davis</td>
<td>OH&amp;S Manager</td>
<td><a href="mailto:Larry.Davis@abeinsaecp.abengoa.com">Larry.Davis@abeinsaecp.abengoa.com</a></td>
<td>480.370.7063</td>
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<tr>
<td>Terry Baker</td>
<td>OH&amp;S Site Supervisor</td>
<td><a href="mailto:Terry.Baker@abeinsaecp.abengoa.com">Terry.Baker@abeinsaecp.abengoa.com</a></td>
<td>480.236.2954</td>
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<tr>
<td>Kirk Anderson</td>
<td>Environmental Engineer</td>
<td><a href="mailto:Kirk.Anderson@abeinsaecp.abengoa.com">Kirk.Anderson@abeinsaecp.abengoa.com</a></td>
<td>661.754.6180</td>
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<td>Kristine Yates</td>
<td>Logistics Coordinator</td>
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</table>

*Required Environmental Spill/Release Reports.

## Section V. Abeinsa EPC Internal

<table>
<thead>
<tr>
<th>Is a PRR/IRP required?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

If so, initiate the process and provide PRR/IRP number:

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
# Environmental Spill/Release Report

## Section I. General Information

<table>
<thead>
<tr>
<th>Date of Incident:</th>
<th>5/29/14</th>
<th>Date Reported:</th>
<th>5/29/14</th>
<th>Incident Time:</th>
<th>10:20 am</th>
</tr>
</thead>
</table>

**Employee(s) Involved:** Abeinsa Commissioning in the field

**Contracting Company:** Abeinsa Commissioning in the field

## Section II. Incident Description

**Name of the Material Spilled/Released:** Thermiof R

**Components in Material(s):**

- Diphenyl Ether: 73.5%
- Biphenyl: 26.5%

**What was the time duration of the spill/release?**

**What was the quantity of the material spilled or released?** 28 gallons

**What were the weather conditions at the time of the spill/release (wind direction, cloud cover, precipitation, temp, etc.)?** Sunny

**What was the spill released to?**

- [x] Land
- [ ] Irrigation Canals
- [ ] storms water
- [ ] other

**Is external agency required to be notified?**

- [ ] Yes
- [x] No

**Did the spill/release exceed an air or NPDES permit and/or leave the site?**

- [ ] Yes
- [x] No

---

Commissioning was filling loops in beta at row AB, C and D. The was down by the main HTF header pipe and no one way by the end of the row by the tot the valve was open the hose came out of the tot and went into the ground. The shut valve my guys started clean it up.

Provide a description of what happened (time line), corrective measures taken, and preventive measures:

- Dirt removed 22 barrels
- Put into a 55 gallon barrel

**Taken to the LIU and put on Secondary Containment**

**Estimated cost of cleanup:** $700
# Environmental Spill/Release Report

## Section III. Form Completion

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<table>
<thead>
<tr>
<th>Print Name:</th>
<th>Company:</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Terry Baker</td>
<td>Abeinsa EPC</td>
<td>HAS Field Supervisor</td>
<td>5/29/14</td>
</tr>
</tbody>
</table>

Sign Name (handwritten or electronic signature is acceptable):

![Signature]

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<table>
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<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

---

Reviewed by: Eric Zuhike
Revision 00 – Revision Date:
1. Fiber rolls: total installed 24,730ft. Maintenance during the month of May included repairing approximately 25 feet on the North side of Beta East.
2. Swales: total installed 16219 ft. No maintenance required during the month of May.
3. Street sweeping and construction entrances maintenance. Sweeping duties performed weekly and as necessary.
4. Trash collection being taken care of on a daily basis.
5. 5 concrete washout station (2 in beta and 3 in alpha).
6. Dust control - Watering the site with trucks on a daily basis.
7. 0 inches of sand build up on straw wattle
## CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM

### CORRECTIONS REQUIRED PRIOR TO NEXT INSPECTION?
- **YES**
- **NO**
- **N/A**

### PROJECT INFORMATION

<table>
<thead>
<tr>
<th>DID #</th>
<th>6</th>
<th>B</th>
<th>3</th>
<th>6</th>
<th>C</th>
<th>3</th>
<th>6</th>
<th>1</th>
<th>7</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
</table>

**NAME:** Mojave Solar Project  
**ADDRESS:** 42134 Harper Lake Rd, Hinkley, CA 92347  
**CONTRACTOR:** Abener Teyma Mojave  
**ON-SITE CONTACT:** Alberto Salas

### INSPECTION INFORMATION

<table>
<thead>
<tr>
<th>DATE:</th>
<th><strong>MAY 20</strong></th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME:</td>
<td>2:30</td>
<td></td>
</tr>
</tbody>
</table>

**STORM ACTIVITY:**  
- **RAIN >1/2**: None  
- **WIND >15 mph**: None  

**TEMPERATURE:**  
- **LOW**: 50°  
- **HIGH**: 85°

### INSPECTION CHECKLIST

#### Stormwater Pollution Prevention Plan

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>X</td>
<td></td>
<td></td>
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</tbody>
</table>

#### Soil Stabilization Practices

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>X</td>
<td></td>
<td>Alpha West: H.T.P. PIPE INSTALLATION</td>
</tr>
<tr>
<td>9.</td>
<td>X</td>
<td></td>
<td>Alpha East: POWER BLOCK CONST.</td>
</tr>
<tr>
<td>10.</td>
<td>X</td>
<td></td>
<td>Beta West: H.T.P. PIPE INSTALLATION</td>
</tr>
<tr>
<td>11.</td>
<td>X</td>
<td></td>
<td>Beta East: POWER BLOCK CONST.</td>
</tr>
</tbody>
</table>

#### Sediment Control Practices

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Discharge Risk Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td>X</td>
<td></td>
<td>Alpha West: NONE</td>
</tr>
<tr>
<td>13.</td>
<td>X</td>
<td></td>
<td>Alpha East: MINOR</td>
</tr>
<tr>
<td>14.</td>
<td>X</td>
<td></td>
<td>Beta West: NONE</td>
</tr>
<tr>
<td>15.</td>
<td>X</td>
<td></td>
<td>Beta East: MINOR</td>
</tr>
</tbody>
</table>

### Sediment Discharges

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Minor</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Tracking Controls

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Discharge Risk Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.</td>
<td>X</td>
<td></td>
<td>Alpha West: NONE</td>
</tr>
<tr>
<td>20.</td>
<td>X</td>
<td></td>
<td>Alpha East: MINOR</td>
</tr>
<tr>
<td>21.</td>
<td>X</td>
<td></td>
<td>Beta West: NONE</td>
</tr>
<tr>
<td>22.</td>
<td>X</td>
<td></td>
<td>Beta East: MINOR</td>
</tr>
<tr>
<td>23.</td>
<td>X</td>
<td></td>
<td>Gamma West: NONE</td>
</tr>
<tr>
<td>24.</td>
<td>X</td>
<td></td>
<td>Gamma East: MINOR</td>
</tr>
<tr>
<td>25.</td>
<td>X</td>
<td></td>
<td>Gamma South: NONE</td>
</tr>
<tr>
<td>26.</td>
<td>X</td>
<td></td>
<td>Gamma North: MINOR</td>
</tr>
</tbody>
</table>

### Additional Notes:
- Supplemental Form Attached? **YES**
- "CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM" is the only form in use for inspections documentation for this project.
MOJAVE SOLAR PROJECT
CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM, continued...

Wind Erosion Controls

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>29. Are wind erosion controls properly implemented?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>30. Are current BMPs adequately preventing wind erosion?</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Wind Erosion Violations

<table>
<thead>
<tr>
<th>Violation Type</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>32. Additional water needed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Dust tracking out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Stockpile protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Loading/unloading of soil/materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Airborne or tracked-out lime or cement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Stripped pad</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

31. Complete the Wind Erosion Violations Section. CHECK ALL THAT APPLY.

Comments:

Non-Stormwater Management

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>38. Are BMPs for non-stormwater discharges properly implemented?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>40. Is there evidence that there has been a non-stormwater discharge?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>41. Any non-visible pollutant sampling required?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>42. Complete the Non-Stormwater Corrections Section. CHECK ALL THAT APPLY.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Non-Stormwater Corrections

<table>
<thead>
<tr>
<th>Requiring Maintenance?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>43. Concrete/stucco washout in place?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Paint washout in place?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Vehicle maintenance in place?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Hydrant flushing protection in place?</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>47. Sampling locations noted in SWPPP?</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Waste & Disposal Management

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>48. Are there containers for construction waste and debris?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>49. Is construction debris in waste containers?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>50. Is waste adequately covered?</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>51. Are the current waste management BMPs adequate?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Waste & Disposal Corrections

<table>
<thead>
<tr>
<th>Requiring Maintenance?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>52. Are portable toilets located 50 ft. from drain inlets?</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>53. Are portable toilets placed behind sidewalks?</td>
<td>N/A</td>
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<tr>
<td>54. Does advanced water treatment meet discharge standards?</td>
<td>N/A</td>
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</table>

Comments:

Materials Storage

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>55. Are materials protected from weather?</td>
<td>X</td>
<td></td>
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<td>56. Are materials stored away from drain inlets?</td>
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Materials Storage

<table>
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<tr>
<th>Requiring Maintenance?</th>
<th>Yes</th>
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<tbody>
<tr>
<td>57. Are hazardous materials placed in secondary containment?</td>
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Comments:

Conclusions

<table>
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<tr>
<th>Question</th>
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<th>No</th>
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</thead>
<tbody>
<tr>
<td>58. Site in compliance?</td>
<td>X</td>
<td></td>
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</table>

Comments:

Acknowledgement of Inspection

Charles Walker, CBO Site Inspector, Bureau Veritas
Alberto Salas, Activity Manager SWPPP, Abener Teyma Mojave
CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM

CORRECTIONS REQUIRED PRIOR TO NEXT INSPECTION?  YES  NO  N/A

PROJECT INFORMATION

**NAME:** Mojave Solar Project
**ADDRESS:** 42134 Harper Lake Rd, Hinkley, CA 92347
**CONTRACTOR:** Abenei Teyma Mojave
**ON-SITE CONTACT:** Alberto Salas

<table>
<thead>
<tr>
<th>PRE-STORM</th>
<th>POST-STORM</th>
<th>WEEKLY</th>
<th>EXTENDED STORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIN &gt;1/2&quot;</td>
<td>None</td>
<td>Light</td>
<td>Moderate</td>
</tr>
<tr>
<td>WIND &gt;15mph</td>
<td>None</td>
<td>Light</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATE:</th>
<th>TIME:</th>
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<tbody>
<tr>
<td>May 8, 2014</td>
<td>9:30</td>
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<table>
<thead>
<tr>
<th>TEMPERATURE:</th>
<th>LOW</th>
<th>HIGH</th>
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</thead>
<tbody>
<tr>
<td>56°</td>
<td>86°</td>
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</table>

INSPECTION INFORMATION

**DATE:** May 8, 2014  **TIME:** 9:30

**NAME:** Mojave Solar Project
**ADDRESS:** 42134 Harper Lake Rd, Hinkley, CA 92347
**CONTRACTOR:** Abenei Teyma Mojave
**ON-SITE CONTACT:** Alberto Salas

**TEMPERATURE:** LOW 56°  HIGH 86°

**INSPECTION CHECKLIST**

**Stormwater Pollution Prevention Plan**

1. Is the SWPPP binder and/or DESCP on site and accessible? [X]
2. Does the site have a WID No.? [X]
3. Does the SWPPP address the minimum BMP requirements? [X]
4. Are amendments to the SWPPP clearly documented and dated? [X]
5. Is the current SWPPP complete? [X]
6. Does the SWPPP include a current map accurately indicating BMPs installed at the site? [X]
7. Is routine BMP inspection and maintenance documentation on file? [X]

**Soil Stabilization Practices**

8. Are BMPs implemented on inactive disturbed areas? [X] Alpha West H.T.P. PIPE INSTALLATION
9. Are implemented BMPs effectively stabilizing soil? [X] Alpha East POWER BLOCK CONSTRUCTION
   Are BMP materials stockpiled and available for use? [X] Beta West H.T.P. PIPE INSTALLATION
10. Was any erosion observed? [X] Beta East POWER BLOCK CONSTRUCTION

**Sediment Control Practices**

11. Are sediment control BMPs in place and maintained? [X] Alpha West NONE
12. Are sediment BMPs placed to protect the downstream perimeter of the site? [X] Alpha East MINER
13. Are the BMPs adequately controlling sediment? [X] Beta West NONE
14. Are the storm drain inlets protected? N/A Beta East MINER

**Sediment Discharges**

15. Is there evidence that sediment was discharged previously from the site? [X]
16. Is sediment currently being discharged from the site? [X]
17. Where is sediment currently being discharged? Check all that apply:
   - None
   - Minor
   - Major
   - Minor
   - Major

19. Other
20. Creek
21. Drain inlet
22. Gutter
23. Drainage Outfall
24. Wetland
25. Vernal Pool
26. Drainage swale

**Tracking Controls**

18. Are adjacent roads and construction entrances free of sediment? [X]
19. Are current BMPs effectively preventing tracking of sediment? [X]

**Discharge Risk Potential**

15. Is there evidence that sediment was discharged previously from the site? [X]
16. Is sediment currently being discharged from the site? [X]
17. Where is sediment currently being discharged? Check all that apply:
   - None
   - Minor
   - Major
   - Minor
   - Major

19. Other
20. Creek
21. Drain inlet
22. Gutter
23. Drainage Outfall
24. Wetland
25. Vernal Pool
26. Drainage swale
## Wind Erosion Controls

| 29. Are wind erosion controls properly implemented? | X | 32. Additional water needed. | No |
| 30. Are current BMPs adequately preventing wind erosion? | X | 33. Dust tracking out | N/A |

31. Complete the Wind Erosion Violations Section. CHECK ALL THAT APPLY.

### Non-Stormwater Management

| 38. Are BMPs for non-stormwater discharges properly implemented? | X |
| 40. Is there evidence that there has been a non-stormwater discharge? | X |
| 41. Any non-visible pollutant sampling required? | X |
| 42. Complete the Non-Stormwater Corrections Section. CHECK ALL THAT APPLY. | N/A |

### Non-Stormwater Corrections

| 43. Concrete/succo washout in place? | X | 44. Paint washout in place? | X | 45. Vehicle maintenance in place? | X | 46. Hydrant flushing protection in place? | N/A |

### Waste & Disposal Management

| 48. Are there containers for construction waste and debris? | X |
| 49. Is construction debris in waste containers? | X |
| 50. Is waste adequately covered? | X |
| 51. Are the current waste management BMPs adequate? | X |

### Waste & Disposal Corrections

| 52. Are portable toilets located 50 ft. from drain inlets? | N/A |
| 53. Are portable toilets placed behind sidewalks? | N/A |
| 54. Does advanced water treatment meet discharge standards? | N/A |

### Materials Storage

| 55. Are materials protected from weather? | X |
| 56. Are materials stored away from drain inlets? | X |

### Materials Storage

| 57. Are hazardous materials placed in secondary containment? | X |

### Conclusions

| 58. Site in compliance? | X |

### Acknowledgement of Inspection

Charles Walker, CBO Site Inspector, Bureau Veritas
Alberto Salas, Activity Manager SWPPP, Abener Teyma Mojave
# CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM

**CORRECTIONS REQUIRED PRIOR TO NEXT INSPECTION?**  
- YES  
- NO  
- N/A

## PROJECT INFORMATION

<table>
<thead>
<tr>
<th>DID #</th>
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- **NAME:** Mojave Solar Project  
- **ADDRESS:** 42134 Harper Lake Rd, Hinkley, CA 92347  
- **CONTRACTOR:** Abener Teyma Mojave  
- **ON-SITE CONTACT:** Alberto Salas

### INSPECTION INFORMATION

<table>
<thead>
<tr>
<th></th>
<th>PRE-STORM</th>
<th>POST-STORM</th>
<th>WEEKLY</th>
<th>EXTENDED STORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIN &gt;1/2&quot;</td>
<td>None</td>
<td>Light</td>
<td>Moderate</td>
<td>Heavy</td>
</tr>
<tr>
<td>WIND &gt;15mph</td>
<td>None</td>
<td>Light</td>
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<td>Heavy</td>
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<tr>
<td>TEMPERATURE</td>
<td>LOW</td>
<td>69°F</td>
<td>HIGH</td>
<td>95°F</td>
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</table>

## INSPECTION CHECKLIST

### Stormwater Pollution Prevention Plan

1. Is the SWPPP binder and/or DESCP on site and accessible?  
   - Yes  
   - No  
   - **Comments:** Supplemental Form Attached?  

2. Does the site have a WDID No.?  
   - Yes  
   - No  

3. Does the SWPPP address the minimum BMP requirements?  
   - Yes  
   - No  

4. Are amendments to the SWPPP clearly documented and dated?  
   - Yes  
   - No  

5. Is the current SWPPP complete?  
   - Yes  
   - No  

6. Does the SWPPP include a current map accurately indicating BMPs installed at the site?  
   - Yes  
   - No  

7. Is routine BMP inspection and maintenance documentation on file?  
   - Yes  
   - No  

### Soil Stabilization Practices

8. Are BMPs implemented on inactive disturbed areas?  
   - Yes  
   - No  
   - **Comments:** Alpha West  

9. Are implemented BMPs effectively stabilizing soil?  
   - Yes  
   - No  
   - **Comments:** Beta West  

10. Are BMP materials stockpiled and available for use?  
    - Yes  
    - No  
    - **Comments:** Beta East

11. Was any erosion observed?  
    - Yes  
    - No  

### Sediment Control Practices

12. Are sediment control BMPs in place and maintained?  
    - Yes  
    - No  
    - **Comments:** Alpha West  

13. Are sediment BMPs placed to protect the downstream perimeter of the site?  
    - Yes  
    - No  
    - **Comments:** Alpha East  

14. Are the BMPs adequately controlling sediment?  
    - Yes  
    - No  
    - **Comments:** Beta West  

15. Are the storm drain inlets protected?  
    - Yes  
    - No  
    - **Comments:** Beta East

### Sediment Discharges

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Minor</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Is there evidence that sediment was discharged previously from the site?</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>17. Is sediment currently being discharged from the site?</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>18. Where is sediment currently being discharged? Check all that apply:</td>
<td>N/A</td>
<td>Minor</td>
<td>Major</td>
</tr>
</tbody>
</table>

### Tracking Controls

- Are adjacent roads and construction entrances free of sediment?  
  - Yes  
  - No  
- Are current BMPs effectively preventing tracking of sediment?  
  - Yes  
  - No  

### Discharge Risk Potential

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Minor</th>
<th>Major</th>
</tr>
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<tbody>
<tr>
<td>19. Other</td>
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<td>Major</td>
</tr>
<tr>
<td>20. Creek</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>21. Drain inlet</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>22. Gutter</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>23. Drainage Outfall</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>24. Wetland</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>25. Vernal Pool</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>26. Drainage swale</td>
<td>None</td>
<td>Minor</td>
<td>Major</td>
</tr>
</tbody>
</table>

**DATE:** 05/15/2014  
**TIME:** 11:00
**MOJAVE SOLAR PROJECT**

**CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM, continued...**

### Wind Erosion Controls

<table>
<thead>
<tr>
<th>Wind Erosion Controls</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are wind erosion controls properly implemented?</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Are current BMPs adequately preventing wind erosion?</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Complete the Wind Erosion Violations Section. CHECK ALL THAT APPLY.</td>
<td></td>
<td></td>
</tr>
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</table>

### Wind Erosion Violations

<table>
<thead>
<tr>
<th>Wind Erosion Violations</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional water needed.</td>
<td></td>
<td>n</td>
</tr>
<tr>
<td>Dust tracking out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stockpile protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading/unloading of soil/materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airborne or tracked-out lime or cement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stripped pad</td>
<td></td>
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**Comments:**

### Non-Stormwater Management

<table>
<thead>
<tr>
<th>Non-Stormwater Management</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are BMPs for non-stormwater discharges properly implemented?</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Are BMPs adequate for managing non-stormwater discharges?</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Is there evidence that there has been a non-stormwater discharge?</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Any non-visible pollutant sampling required?</td>
<td></td>
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</tr>
<tr>
<td>Complete the Non-Stormwater Corrections Section. CHECK ALL THAT APPLY.</td>
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### Non-Stormwater Corrections

<table>
<thead>
<tr>
<th>Non-Stormwater Corrections</th>
<th>Yes</th>
<th>No</th>
<th>Maintenance Needed</th>
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<tbody>
<tr>
<td>Concrete/stucco washout in place?</td>
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<td>x</td>
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</tr>
<tr>
<td>Paint washout in place?</td>
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<td>x</td>
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</tr>
<tr>
<td>Vehicle maintenance in place?</td>
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<tr>
<td>Hydrant flushing protection in place?</td>
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<td>Sampling locations noted in SWPPP?</td>
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**Comments:**

### Waste & Disposal Management

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<th>Waste &amp; Disposal Management</th>
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<tbody>
<tr>
<td>Are there containers for construction waste and debris?</td>
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<td>x</td>
</tr>
<tr>
<td>Is construction debris in waste containers?</td>
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<td>x</td>
</tr>
<tr>
<td>Is waste adequately covered?</td>
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<td>x</td>
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<tr>
<td>Are the current waste management BMPs adequate?</td>
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<td>x</td>
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**Comments:**

### Materials Storage

<table>
<thead>
<tr>
<th>Materials Storage</th>
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<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are materials protected from weather?</td>
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</tr>
<tr>
<td>Are materials stored away from drain inlets?</td>
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<td>x</td>
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**Comments:**

### Conclusions

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Site in compliance?</td>
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<td>x</td>
</tr>
</tbody>
</table>

**Comments:**

### Acknowledgement of Inspection

Charles Walker, CBO Site Inspector, Bureau Veritas

Alberto Salas, Activity Manager SWPPP, Abener Teyma Mojave
## Construction Site Stormwater Runoff Control Inspection Form

### Correction Required Prior to Next Inspection?
- **Yes**
- **No**
- N/A

### Project Information
- **DID #**
  - 6
  - 8
  - 3
  - 6
  - C
  - 3
  - 6
  - 1
  - 7
  - 2
  - 1
- **Date:** 05/29/2014
- **Time:** 1:30 PM
- **Name:** Mojave Solar Project
- **Address:** 42134 Harper Lake Rd, Hinkley, CA 92347
- **Contractor:** Abenec Taymo Mojave
- **On-Site Contact:** Alberto Salas

### Inspection Information
- **Pre-storm:** Rain >1/2" - None
- **Post-storm:** Light - Moderate
- **Weekly:** Wind >15mph - None
- **Extended Storm:** Moderate - Heavy
- **Temperature:** Low - 570
- **High:** 70

### Stormwater Pollution Prevention Plan
<table>
<thead>
<tr>
<th>Yes</th>
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<tbody>
<tr>
<td>1. Is the SWPPP binder and/or DESCP on site and accessible?</td>
<td>X</td>
</tr>
<tr>
<td>2. Does the site have a WDID No.?</td>
<td>X</td>
</tr>
<tr>
<td>3. Does the SWPPP address the minimum BMP requirements?</td>
<td>X</td>
</tr>
<tr>
<td>4. Are amendments to the SWPPP clearly documented and dated?</td>
<td>X</td>
</tr>
<tr>
<td>5. Is the current SWPPP complete?</td>
<td>X</td>
</tr>
<tr>
<td>6. Does the SWPPP include a current map accurately indicating BMPs installed at the site?</td>
<td>X</td>
</tr>
<tr>
<td>7. Is routine BMP inspection and maintenance documentation on file?</td>
<td>Y</td>
</tr>
</tbody>
</table>

### Soil Stabilization Practices
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Are BMPs implemented on inactive disturbed areas?</td>
<td>X</td>
<td>Alpha West - A.T.F. PIPE INSTALLATION</td>
</tr>
<tr>
<td>9. Are implemented BMPs effectively stabilizing soil?</td>
<td>X</td>
<td>Alpha East - POWER BLOCK CONSTR.</td>
</tr>
<tr>
<td>Are BMP materials stockpiled and available for use?</td>
<td>X</td>
<td>Beta West - A.T.F. PIPE INSTALLATION</td>
</tr>
<tr>
<td>11. Was any erosion observed?</td>
<td>X</td>
<td>Beta East - POWER BLOCK CONSTR.</td>
</tr>
</tbody>
</table>

### Sediment Control Practices
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Are sediment control BMPs in place and maintained?</td>
<td>X</td>
</tr>
<tr>
<td>13. Are sediment BMPs placed to protect the downstream perimeter of the site?</td>
<td>X</td>
</tr>
<tr>
<td>14. Are the BMPs adequately controlling sediment?</td>
<td>X</td>
</tr>
<tr>
<td>15. Are the storm drain inlets protected?</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Discharge Risk Potential

| 16. Is there evidence that sediment was discharged previously from the site? | None |
| 17. Is sediment currently being discharged from the site? | Minor |
| 18. Where is sediment currently being discharged? Check all that apply: | Major |
| 19. Other | Minor |
| 20. Creek | Major |
| 21. Drain inlet | |
| 22. Gutter | Minor |
| 23. Drainage Outfall | Major |
| 24. Wetland | |
| 25. Vernal Pool | Minor |
| 26. Drainage swale | Major |

### Tracking Controls
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>21. Are adjacent roads and construction entrances free of sediment?</td>
<td>N/A</td>
</tr>
<tr>
<td>22. Are current BMPs effectively preventing tracking of sediment?</td>
<td>N/A</td>
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</table>
# MOJAVE SOLAR PROJECT
CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM, continued...

## Wind Erosion Controls

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Wind Erosion Violations</th>
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<tbody>
<tr>
<td></td>
<td>X</td>
<td>32. Additional water needed.</td>
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<td></td>
<td>X</td>
<td>33. Dust tracking out</td>
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<td></td>
<td></td>
<td>34. Stockpile protection</td>
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<td></td>
<td></td>
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<td></td>
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<td>36. Airborne or tracked-out lime or cement</td>
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<td>37. Stripped pad</td>
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Comments:

## Non-Stormwater Management

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Non-Stormwater Corrections</th>
<th>Yes</th>
<th>No</th>
<th>Maintenance Needed</th>
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<tbody>
<tr>
<td>X</td>
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<td>43. Concrete/stucco washout in place?</td>
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</tr>
<tr>
<td></td>
<td>X</td>
<td>44. Paint washout in place?</td>
<td>Y</td>
<td>No</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45. Vehicle maintenance in place?</td>
<td>X</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>46. Hydrant flushing protection in place?</td>
<td></td>
<td>Y/NA</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

## Waste & Disposal Management

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Waste &amp; Disposal Corrections</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td>52. Are portable toilets located 50 ft. from drain inlets?</td>
<td>N/NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>53. Are portable toilets placed behind sidewalks?</td>
<td>N/NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>54. Does advanced water treatment meet discharge standards?</td>
<td>N/NA</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

## Materials Storage

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>57. Are hazardous materials placed in secondary containment?</td>
<td>X</td>
</tr>
</tbody>
</table>

Comments:

### Conclusions

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Comments:

### Acknowledgement of Inspection

Charles Walker, CBO Site Inspector, Bureau Veritas

Alberto Salas, Activity Manager SWPPP, Abener Teyma McPaw
### CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM

**CORRECTIONS REQUIRED PRIOR TO NEXT INSPECTION:**
- **YES**
- **NO**
- **N/A**

#### PROJECT INFORMATION
- **DID #**
  - 6 B 3 6 C 3 6 1 7 2 1
- **DATE:** 05/29/2014
- **TIME:** 8:30 AM
- **NAME:** Mojave Solar Project
- **ADDRESS:** 42134 Harper Lake Rd, Hinkley, CA 92347
- **CONTRACTOR:** Abener Tayma Mojave
- **ON-SITE CONTACT:** Alberto Salas
- **TEMPERATURE:** LOW 68° HIGH 94°

#### INSPECTION INFORMATION
- **PRE-STORM**
  - **RAIN >1/2"**
    - None
  - **WIND >15mph**
    - None

- **POST-STORM**
  - **Rain**
    - Light
  - **Wind**
    - Moderate
  - **Storm Activity:**
    - DEFICIENCIES:
  - **Discharge Risk Potential:**
    - **Minor**
    - **Major**

#### INSPECTION CHECKLIST

<table>
<thead>
<tr>
<th>Stormwater Pollution Prevention Plan</th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is the SWPPP binder and/or DESCP on site and accessible?</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Does the site have a WDID No.?</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Does the SWPPP address the minimum BMP requirements?</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Are amendments to the SWPPP clearly documented and dated?</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Is the current SWPPP complete?</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Does the SWPPP include a current map accurately indicating BMPs installed at the site?</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Is routine BMP inspection and maintenance documentation on file?</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soil Stabilization Practices</th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Are BMPs implemented on inactive disturbed areas?</td>
<td>X</td>
<td></td>
<td>Alpha West H.T. PIPE INSTALLATION</td>
</tr>
<tr>
<td>9. Are implemented BMPs effectively stabilizing soil?</td>
<td>X</td>
<td></td>
<td>Alpha East POWER BLOCK CONST</td>
</tr>
<tr>
<td>Are BMP materials stockpiled and available for use?</td>
<td>X</td>
<td></td>
<td>Beta West H.T. PIPE INSTALLATION</td>
</tr>
<tr>
<td>11. Was any erosion observed?</td>
<td>X</td>
<td></td>
<td>Beta East POWER BLOCK CONST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sediment Control Practices</th>
<th>Yes</th>
<th>No</th>
<th>Discharge Risk Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Are sediment control BMPs in place and maintained?</td>
<td>X</td>
<td></td>
<td>Alpha West NONE</td>
</tr>
<tr>
<td>13. Are sediment BMPs placed to protect the downstream perimeter of the site?</td>
<td>X</td>
<td></td>
<td>Alpha East MINOR</td>
</tr>
<tr>
<td>14. Are the BMPs adequately controlling sediment?</td>
<td>X</td>
<td></td>
<td>Beta West NONE</td>
</tr>
<tr>
<td>15. Are the storm drain inlets protected?</td>
<td>N/A</td>
<td></td>
<td>Beta East MINOR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sediment Discharges</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Is there evidence that sediment was discharged previously from the site?</td>
</tr>
<tr>
<td>17. Is sediment currently being discharged from the site?</td>
</tr>
<tr>
<td>18. Where is sediment currently being discharged? Check all that apply:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tracking Controls</th>
<th>Yes</th>
<th>No</th>
<th>Discharge Risk Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Are current BMPs effectively preventing tracking of sediment?</td>
<td>X</td>
<td></td>
<td>Minor</td>
</tr>
</tbody>
</table>

---

**NOTE:** The "CONSTRUCTION SITE STORMWATER RUNOFF CONTROL INSPECTION FORM" is the only form in use for inspections documentation for this project.
## Wind Erosion Controls

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Wind Erosion Violations</th>
</tr>
</thead>
<tbody>
<tr>
<td>30. Are current BMPs adequately preventing wind erosion?</td>
<td></td>
<td>X</td>
<td>33. Dust tracking out</td>
</tr>
<tr>
<td>31. Complete the Wind Erosion Violations Section. CHECK ALL THAT APPLY.</td>
<td></td>
<td></td>
<td>34. Stockpile protection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35. Loading/unloading of soil/materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>36. Airborne or tracked-out lime or cement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>37. Stripped pad</td>
</tr>
</tbody>
</table>

Comments:

## Non-Stormwater Management

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Non-Stormwater Corrections</th>
</tr>
</thead>
<tbody>
<tr>
<td>38. Are BMPs for non-stormwater discharges properly implemented?</td>
<td></td>
<td>X</td>
<td>43. Concrete/stucco washout in place?</td>
</tr>
<tr>
<td>39. Are BMPs adequate for managing non-stormwater discharges?</td>
<td></td>
<td>X</td>
<td>44. Paint washout in place?</td>
</tr>
<tr>
<td>40. Is there evidence that there has been a non-stormwater discharge?</td>
<td></td>
<td>X</td>
<td>45. Vehicle maintenance in place?</td>
</tr>
<tr>
<td>41. Any non-visible pollutant sampling required?</td>
<td></td>
<td>X</td>
<td>46. Hydrant flushing protection in place?</td>
</tr>
<tr>
<td>42. Complete the Non-Stormwater Corrections Section. CHECK ALL THAT APPLY.</td>
<td></td>
<td></td>
<td>47. Sampling locations noted in SWPPP?</td>
</tr>
</tbody>
</table>

Comments:

## Waste & Disposal Management

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Waste &amp; Disposal Corrections</th>
</tr>
</thead>
<tbody>
<tr>
<td>48. Are there containers for construction waste and debris?</td>
<td></td>
<td>X</td>
<td>52. Are portable toilets located 50 ft. from drain inlets?</td>
</tr>
<tr>
<td>49. Is construction debris in waste containers?</td>
<td></td>
<td>X</td>
<td>53. Are portable toilets placed behind sidewalks?</td>
</tr>
<tr>
<td>50. Is waste adequately covered?</td>
<td></td>
<td>X</td>
<td>54. Does advanced water treatment meet discharge standards?</td>
</tr>
<tr>
<td>51. Are the current waste management BMPs adequate?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

## Materials Storage

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>55. Are materials protected from weather?</td>
<td></td>
<td>X</td>
<td>57. Are hazardous materials placed in secondary containment?</td>
<td></td>
</tr>
<tr>
<td>56. Are materials stowed away from drain inlets?</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:

## Conclusions

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>58. Site in compliance?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

## Acknowledgement of Inspection

Charles Walker, CBO Site inspector, Bureau Veritas

Alberto Salas, Activity Manager SWPPP, Abener Teyma Mojave
Mojave Solar LLC
42134 Harper Lake Rd
Hinkley CA 92374

5/14/2014

Subject: Well Completion Report # e0212671

Please find attached a revised well completion report, which replaces report #e0212671 with e0213211. If you have any questions or concerns regarding this please contact me directly.

Sincerely,

[Signature]
Cynthia E Lee

Layne Christensen Company
1717 W. Park Ave
Redlands CA 92373

909 390-2833
cindy.lee@layne.com
# Well Completion Report

**State of California**

**Well Completion Report**

Refer to Instruction Pamphlet
No. e0213211

---

### Geologic Log

<table>
<thead>
<tr>
<th>Depth from Surface Feet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Sand</td>
</tr>
<tr>
<td>50</td>
<td>Clay w/some cobble, brown</td>
</tr>
<tr>
<td>60</td>
<td>Clay, brown, dense</td>
</tr>
<tr>
<td>90</td>
<td>Clay, brown dense, some silt</td>
</tr>
<tr>
<td>110</td>
<td>Clay, brown, dense, silt trace sand</td>
</tr>
<tr>
<td>120</td>
<td>Clay, brown, dense</td>
</tr>
<tr>
<td>130</td>
<td>Clay, brown, dense, silt</td>
</tr>
<tr>
<td>140</td>
<td>Poorly graded M-C Sand, w/trace silt</td>
</tr>
<tr>
<td>150</td>
<td>F-M Sand, w/some clay, brown</td>
</tr>
<tr>
<td>160</td>
<td>F Sand, w/some clay, trace gravel</td>
</tr>
<tr>
<td>170</td>
<td>F Sand, w/clay and silt, brown</td>
</tr>
<tr>
<td>200</td>
<td>C Sand, w/some gravel, little clay</td>
</tr>
<tr>
<td>220</td>
<td>M-C Sand, w/some gravel, little clay</td>
</tr>
<tr>
<td>230</td>
<td>F-C Sand, w/little gravel, trace silt and clay</td>
</tr>
<tr>
<td>280</td>
<td>Clay w/sand, little gravel</td>
</tr>
<tr>
<td>300</td>
<td>C Sand w/gravel</td>
</tr>
<tr>
<td>320</td>
<td>C Sand w/gravel, little clay</td>
</tr>
<tr>
<td>330</td>
<td>C Sand w/gravel, trace pebble and clay</td>
</tr>
<tr>
<td>350</td>
<td>M-C Sand w/gravel, trace clay</td>
</tr>
<tr>
<td>380</td>
<td>F Sand w/clay and silt, trace gravel</td>
</tr>
<tr>
<td>400</td>
<td>F-C Sand w/clay and silt, trace gravel</td>
</tr>
<tr>
<td>410</td>
<td>M-C Sand w/clay and silt, trace gravel</td>
</tr>
<tr>
<td>440</td>
<td>M-C Sand w/less clay, sticky</td>
</tr>
<tr>
<td>450</td>
<td>Clay w/silt, trace sand, sticky, brown</td>
</tr>
<tr>
<td>460</td>
<td>Clay w/silt, trace sand, trace basalt, sticky, brown</td>
</tr>
<tr>
<td>470</td>
<td>Basalt, black</td>
</tr>
</tbody>
</table>

**Total Depth of Boring**  508  Feet  
**Total Depth of Completed Well**  485  Feet

---

### Well Owner

- **Name:** Mojave Solar LLC  
- **Mailing Address:** 42134 Harper Lake Rd  
- **City:** Hinkley  
- **State:** CA  
- **Zip:** 92374

---

### Well Location

- **Address:** 42134 Harper Lake Road  
- **City:** Hinkley  
- **County:** San Bernardino

**Latitude:** 33.000  
**Longitude:** 117.180  
**Datum:** NAD27  
**APN Book:** 0490  
**Page:** 121  
**Parcel:** 49

---

### Location Sketch

- **Activity:** New Well  
- **Planned Uses:** Water Supply

---

### Water Level and Yield of Completed Well

- **Depth to first water:** 132  (Feet below surface)  
- **Water Level:** 132  (Feet)  
- **Date Measured:** 04/15/2014  
- **Estimated Yield:** 1,400  (GPM)  
- **Test Length:** 72.0  (Hours)  
- **Total Drawdown:** 37  (Feet)

---

### Casings

<table>
<thead>
<tr>
<th>Depth from Surface Feet</th>
<th>Borehole Diameter (Inches)</th>
<th>Material</th>
<th>Type</th>
<th>Wall Thickness (Inches)</th>
<th>Outside Diameter (Inches)</th>
<th>Screen Type</th>
<th>Slot Size if Any (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
<td>HSLA</td>
<td>Conductor</td>
<td>0.375</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>180</td>
<td>HSLA</td>
<td>Blank</td>
<td>0.375</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>380</td>
<td>HSLA</td>
<td>Screen</td>
<td>0.312</td>
<td>2.8</td>
<td>Louver</td>
<td>0.070</td>
</tr>
<tr>
<td>380</td>
<td>400</td>
<td>HSLA</td>
<td>Blank</td>
<td>0.312</td>
<td>2.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>450</td>
<td>HSLA</td>
<td>Screen</td>
<td>0.312</td>
<td>2.8</td>
<td>Louver</td>
<td>0.060</td>
</tr>
<tr>
<td>450</td>
<td>480</td>
<td>HSLA</td>
<td>Blank</td>
<td>0.312</td>
<td>2.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Annular Material

- **Depth from Surface Feet:**  
  - 0: Cement Seal  
  - 140: Tube  
  - 140: Gravel Pack  
  - 385: Gravel Pack

---

### Attachments

- Geologic Log
- Well Construction Diagram
- Geophysical Log(s)
- Soil/Water Chemical Analyses
- Other

---

### Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

**Name:** Layne Christensen  
**Person, Firm or Corporation:** 1717 W. Park Ave  
**City:** Redlands  
**State:** CA  
**Zip:** 92373

**Signed:** 5/14/2014  
**Data Signed:** C-57 License Number
# Barstow Road Yard

## Water Load Count

<table>
<thead>
<tr>
<th>Trucks</th>
<th>Date</th>
<th>Loads</th>
<th>Road Number</th>
<th>Activity Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>19608</td>
<td>5/12/2014</td>
<td>6</td>
<td>403500010</td>
<td>5445</td>
</tr>
<tr>
<td>19601</td>
<td>5/12/2014</td>
<td>6</td>
<td>403500010</td>
<td>5445</td>
</tr>
<tr>
<td>19608</td>
<td>5/13/2014</td>
<td>6</td>
<td>403500010</td>
<td>5445</td>
</tr>
<tr>
<td>19601</td>
<td>5/13/2014</td>
<td>6</td>
<td>403500010</td>
<td>5445</td>
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<tr>
<td>19608</td>
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<td>5445</td>
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<td>19601</td>
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<tr>
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<td>5/27/2014</td>
<td>6</td>
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<td>6</td>
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<td>5445</td>
</tr>
<tr>
<td>19601</td>
<td>5/29/2014</td>
<td>5</td>
<td>403500010</td>
<td>5445</td>
</tr>
</tbody>
</table>

Total of loads: 51

Each load equals 4,000 gallons

**204,000 gallons of water used this week**