HAZARDOUS MATERIALS MANAGEMENT
ATTACHMENT 1

CITY OF RIVERSIDE
PUBLIC UTILITIES

* Sensitive Receptor - Non-Conforming Use (occupied single residence with grounds utilized for dog kennel)

Riverside Energy Resource Center
RERC Units 3 & 4

City of Riverside

Aqueous Ammonia Transport Route

Scale 1:4,800

Feet

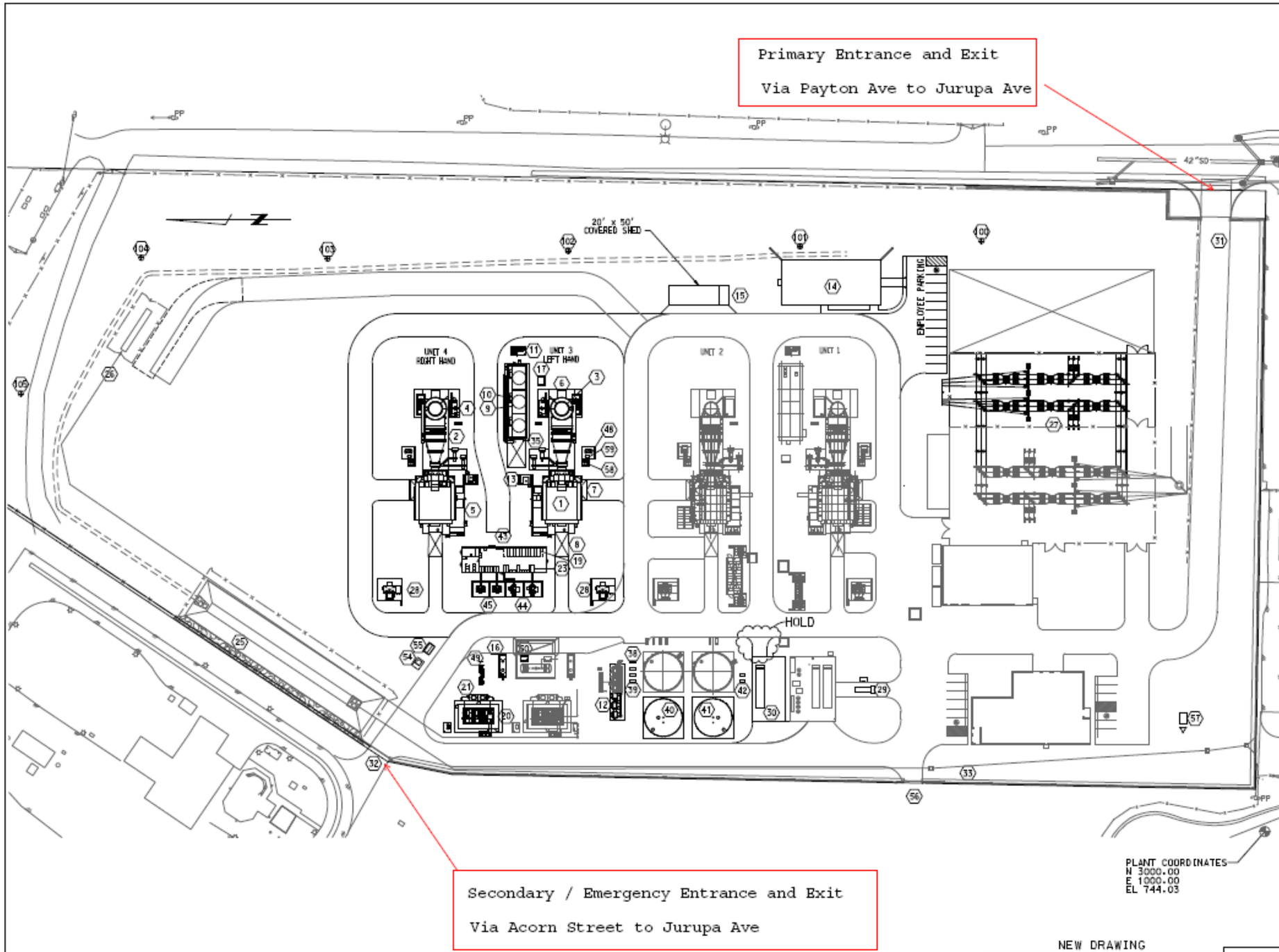
0 400 800 1,200 1,600

POWER ENGINEERS

R:\113560- RERC\DD\Applications\RERC 3&4 Transport Aqueous Ammonia 5-29-08

Data Response - 32B

HAZARDOUS MATERIALS MANAGEMENT
ATTACHMENT 2



ITEM	DESCRIPTION	NOTES
1	GAS TURBINE GENERATOR (GTG)	
2	EMISSIONS CONTROL MODULE & NCC	
3	EXHAUST STACK	
4	AMMONIA VAPORIZATION SKID	
5	GTG AUXILIARY SKID	
6	CEMS SHELTER	
7	TURBINE REMOVAL AREA	
8	GENERATOR REMOVAL AREA	
9	CHILLER PACKAGE	
10	COOLING TOWER (CT)	
11	COOLING TOWER CHEM FEED SKID	
12	AIR COMPRESSOR/DRYER/RECEIVER SKID	
13	GTG LUBE OIL FIN FAN COOLER	
14	SCHEDULING AND DISPATCH BUILDING	
15	WATER LABORATORY	
16	OIL/WATER SEPARATOR	
17	SIDE STREAM FILTRATION SKID	
18	NOT USED	
19	GTG CONTROL HOUSE	
20	FUEL GAS COMPRESSOR SKID	W/SOUND ENCLOSURE
21	FUEL GAS COMPRESSOR BYPASS COOLER	
22	NOT USED	
23	GTG SWITCHGEAR	
24	NOT USED	
25	STORM WATER RETENTION/INFILTRATION BASIN	
26	GAS METERING STATION	
27	SWITCHYARD	
28	GSU TRANSFORMER (2)	
29	BLACK START GENERATOR	
30	ZERO LIQUID DISCHARGE (ZLD) UNIT	
31	MAIN PLANT ENTRANCE	SLIDE GATE
32	EMERGENCY PLANT ENTRANCE	SLIDE GATE
33	PLANT PERIMETER FENCE (10' HIGH)	
34	NOT USED	
35	TEMPERING AIR FANS	
36	NOT USED	
37	NOT USED	
38	COOLING TOWER MAKEUP WATER PUMPS	
39	DEMINERALIZED WATER PUMPS	
40	DEMINERALIZED WATER TANK	(300,000 gal)
41	DEMINERALIZED WATER TANK	(300,000 gal)
42	RAW WATER PUMPS	
43	POWER DISTRIBUTION CENTER (PDC)	
44	4160V AUXILIARY TRANSFORMER (2)	
45	480V AUXILIARY TRANSFORMER (2)	
46	NOT USED	
47	NOT USED	
48	WATER WASH DRAIN TANK	
49	BALANCE OF PLANT NCC	
50	AQUEOUS AMMONIA FORWARDING SKID	
51	NOT USED	
52	NOT USED	
53	NOT USED	
54	ALTERNATE POWER TRANSFORMER	BY RPU
55	ALTERNATE POWER SUPPLY POWER PANEL	BY RPU
56	EQUIPMENT/PERSONNEL ACCESS GATE	
57	COMMUNICATIONS TOWER AND SHED	BY RPU
58	GTG FINAL FUEL FILTER SKID	
59	GTG FINAL FUEL FILTER DRAINS TANK	
100	ONL HABITAT	
101	ONL HABITAT	
102	ONL HABITAT	
103	ONL HABITAT	
104	ONL HABITAT	
105	ONL HABITAT	

NEW DRAWING

REV	DESCRIPTION	DR	DN	APP	DATE
0	ISSUED FOR CONSTRUCTION	JTS	RAK	KFH	04/04/08

POWER ENGINEERS

RIVERSIDE ENERGY RESOURCE CENTER UNITS 3&4

GENERAL ARRANGEMENT

SCALE 1" = 50'	DRAWN J. SMITH	DRAWING NO. ECGOM1101-01	CITY OF RIVERSIDE PUBLIC UTILITIES
DATE 03/05/08	CHECKED R. KELLER		
S.A.M. NO. 113560	APPROVED S. HUSLER	SHEET 1 OF 1	
		FILE NAME ECGOM1101-01_R0	

HAZARDOUS MATERIALS MANAGEMENT
ATTACHMENT 3

FIRE DETECTION, ALARM AND PROTECTION SYSTEMS

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6 TESTING AND MAINTENANCE.....16

1. GENERAL

This document describes the general criteria that will be used for the design of the fire detection alarm protection, systems, life safety requirements, and equipment safeguards for the Riverside Energy Resource Center Project. RERC 3&4 Project, an extension of the existing facility

2 PROJECT DESCRIPTION

The Riverside Energy Resource Center RERC 3&4 Project shall be a 95 MW simple cycle plant based on two natural gas fueled Gas Turbine Generators (GTG) with inlet air chillers to increase the plant output. This power plant is intended for peaking operation initially and is anticipated to operate for approximately 1330 hours per year.

Design Weather and Seismic Data:

Site Ambient Temperatures:	Dry Bulb, ° F	Wet Bulb, ° F/or Relative Humidity%
Summer Design Day:	115 °F	72°F
Annual Average Design Day:	64.5 °F	56.1 °F
Operating Average Design Day:	72.2 °F	60%
Winter Design Day (for HVAC):	18 °F	100%
Winter Design Day (for piping and freeze protection design):	32 °F	100%
Annual Average Precipitation	10.1 Inches	
Annual Wind Velocity	5.6 MPH	
Extreme Wind Velocity	100 MPH	
Design Wind Velocity	70 MPH, Exposure	
Prevailing Wind Direction	From the west	
Seismic Criteria	Seismic Zone = 4 (per CBC 2001) Occupancy Category = 3 I = 1.0 ; Ip = 1.0	
24 Hour Maximum Snow Fall	NA	
Design Snow Load	NA	

In case of space conditioning equipment failure, indoor electrical equipment shall be capable of operating continuously from 50 °F to 90 °F with transients up to 110 °F.

3. CODES AND STANDARDS

The most recent edition of the following codes and standards, including all addenda, in effect at the time of purchase order issuance shall apply

CFC California Fire Code
CBC (2007) California Building Code
NEC National Electric Code

UBC Uniform Building Code
NFPA10 Portable Fire Extinguishers
NFPA12 Carbon Dioxide Extinguishing Systems
NFPA13 Installation of Sprinkler Systems
NFPA 14 Installation of Standpipe and Hose Systems
NFPA 15 Water Spray Fixed Systems for Fire Protection
NFPA24 Installation of Private Fire Service Mains and Their Appurtenances
NFPA30 Flammable and Combustible Liquids Code
NFPA37 Stationary Combustion Engines and Gas Turbines
NFPA54 National Fuel Gas Code
NFPA68 Explosion Venting
NFPA70 National Electrical Code
NFPA72 National Fire Alarm Code
NFPA 72E Automatic Fire Detectors
NFPA80 Fire Doors and Windows
NFPA 90B Warm Air Heating and Air Conditioning Systems
NFPA 101 Life Safety Code
NFPA850 Fire Protection For Electrical Generating Plants
National Fire Codes, Standard 85 B
ANSI American National Standards Institute
ASME American Society of Mechanical Engineers
ASTM American Society of Testing and Materials (ASTM)
AWWA American Water Works Association

4. FIRE PROTECTION DESIGN CRITERIA

The fire protection system shall be designed to provide adequate detection, warning, and means for controlling and extinguishing fires. It shall consist of a water piping servicing a hydrant systems, sprinkler and standpipe systems within the various plant structures and facilities. The water system shall be supplemented by portable extinguishes, and CO2 gaseous systems. The design will be by a firm licensed in the State Of California and installed by a contractor licensed and certified in the State of California for the installation of fire systems.

4.1 General

4.1.1 The fire protection system shall be designed with sufficient capacity for any single design basis fire. The area of the plant requiring the greatest degree of protection shall be classified as the largest single fire risk area, and the total fire capacity of the fire water system shall be based on meeting this requirement.

4.1.2 Additional Knox Boxes shall be installed as required by local authorities.

4.1.3 The plant layout of equipment, structures and buildings shall minimize the propagation of fire to adjacent areas.

4.1.4 Portable hand held fire extinguishers shall be provided in all areas of the facility requiring manual suppression capability in accordance with NFPA 10 and local

building code rated for Class A fires (ordinary combustibles), Class "B" fires (flammable liquid or gas), and Class "C" fires (electrical). Each class of fire requires appropriate portable and/or fixed fire fighting equipment to be available for immediate use. The type of extinguisher shall be suitable for the class of fire hazard expected. Additionally, portable CO2 extinguishers shall be located in areas containing sensitive electrical equipment, such as the Gas Turbine Control House (CTCH), Power Distribution Center (PDC), Chiller, Battery Room, Distributed Control System Room, Gas Compressor Enclosure, as required by code.

4.1.5 Halogens shall not be used.

4.1.6 Fixed hose racks (or reels) shall be provided, for plant personnel use to provide quick application of water for fire suppression and equipment protection. Hose racks shall be equipped with 100 feet of single jacket hose, adjustable spray nozzle, and weather cover. In areas with potential for electrical fires, spray nozzles approved by UL for electrical fires shall be provided.

4.1.7 Each hose rack or reel shall consist of a complete hose rack assembly, including:

a. 100 ft. of 1-1/2" single jacket lined 300 lb. hose.
b. 1-1/2" adjustable stream brass nozzle.
c. 1-1/2" control valve.
d. Hose rack cover or cabinet.
e. Hose reel cover.

4.1.8 Strainers shall be provided for all systems utilizing sprinklers or nozzles with orifice or waterways less than 3/8 in. (9.5mm), and for any system where the water is likely to contain obstructive material. Mainline pipeline strainers shall be installed so as to be accessible for flushing or cleaning during emergency use.

4.1.9 Valves controlling water supplies to fire protection systems shall be locked in the open position. All locks shall be keyed alike.

4.1.10 All electrical equipment used in the areas where water based fire protection systems are used shall be water resistant to withstand water without damage.

4.1.11 Water Labratory Building

Automatic wet pipe sprinkler systems shall be provided for the Warehouse Building. Fire extinguishers and fire detection and alarm system suitable for use with the hazard shall be provided as required by local authorities.

4.1.12 PDC Control Shelter

No sprinklers shall be provided in this area. Fire extinguishers and fire detection and alarm system suitable for use with the hazard shall be provided. Fire alarm and trouble signals shall be transmitted to the main fire alarm control panel.

4.1.13 Main Combustion Turbine and Generator Enclosure

The fire protection system for the LM6000 utilizes flame, thermal and gas detectors in the generator and turbine enclosures to detect fire or fire-causing conditions. The system activates precautionary alarms or engine shutdown commands under specific conditions. Fire extinguishing carbon dioxide (CO_2) will be released into various compartments of the combustion turbine if flames are detected or temperatures rises above set limits. The system shall be automatically operated and designed for extinguishing of fires in enclosed, normally unoccupied areas.

A fire detection and alarm system shall be provided, suitable for use with the hazard. The alarm and detection system shall initiate all alarm functions and equipment shut down as necessary in accordance with NFPA 72. Detection systems which activate CO_2 suppression systems shall be "cross-zoned", to require a signal from at least one detector from two separate circuits to initiate release of the agent.

The fire alarm system shall initiate both local and remote alarms, and shall also report alarm and trouble conditions to the main fire alarm control panel.

4.1.14 Combustion Turbine Auxiliary Skid Enclosure

No Sprinklers shall be provided in this area. Fire extinguishers and fire detection and alarm system suitable for use with the hazard shall be provided as required by local authorities.

4.1.15 Fuel Gas Compressor Open Structure (Sound Panels)

No sprinklers shall be provided in this area. Fire extinguishers and fire detection and alarm system suitable for use with the hazard shall be provided as required by local authorities.

4.2 Layout

Adequate spacing shall be provided between equipment and facilities, so that in the event of fire or explosion neither will be endangered, and the potential for personnel exposures is kept to a minimum.

4.2.1 Fire area boundaries shall be based on consideration of:

a. Types, quantity, density and locations of combustible material

b. Location and configuration of plant equipment

c. Use of fire detection and suppression systems

4.2.2 If a fire area is defined as a detached structure, it shall be separated from other structures by a minimum of 30 feet.

4.2.3 Fire barriers separating fire areas shall be a minimum of two hours fire resistance rating.

4.2.4 Rooms with major concentrations of electrical equipment shall be separated from adjacent areas.

4.2.5 Battery rooms shall be separated from adjacent areas.

4.2.6 Storage areas for flammable and combustible liquids shall be separated from adjacent areas.

4.2.7 Office buildings shall be separated from adjacent areas.

4.2.8 Outdoor oil-insulated transformers shall be separated from each other and adjacent structures either by:

a. Two (2)-hour rated firewall shall be provided in accordance with NFPA 850 figure 3-1.4.3 and sect 3-1.4.4. As a minimum, the firewall shall be extended 1 ft. above the top of the transformer casing and oil conservator tank, and 2 ft. beyond the width of the transformer and cooling radiators.

b. Spatial separation based on oil capacity, in accordance with NFPA 850, table 3-1.4.3

4.2.9 All openings in fire barriers shall be provided with fire door assemblies, fire dampers, penetration seals, or other approved means to maintain the integrity and rating of the fire barrier.

4.2.10 Penetration seals provided for electrical and piping openings shall meet the requirements for a "F" rating, when tested in accordance with ASTM E814.

4.2.11 Fire door assemblies, fire dampers, and fire shutters used in two hour rated barriers shall be rated not less than 1 hours.

4.2.12 Fire Suppression Water hydrants shall be provided. Hydrant spacing in the system shall allow access for effective fire truck operation, while maintaining minimum exposure to personnel. Maximum spacing between hydrants shall be 300 ft. Fire Suppression Water shall be available to all areas of the plant, using 300 feet of hose.

4.2.13 Roadway Access

a. Access shall be provided to all around plant area and wide enough for emergency vehicles.

b. Adequate turning radius shall be provided for a fire truck or other mobile equipment to clear pipe supports and equipment.

4.3 Utility Systems

4.3.1 Banks of above ground cable and tubing shall not be routed through high fire hazard

areas such as flammable liquid storage area.

4.3.2 Electrical equipment installed in classified hazardous areas shall be approved for use, in accordance with NFPA 70, National Electric Code.

4.3.3 Fire barriers penetrated by HVAC ducts shall be provided with fire dampers compatible with the rating of the barrier, unless the duct is protected throughout its length by a fire barrier at least equal to the penetrated barrier.

4.3.4 Safety showers shall be installed in areas where acid or other eye or skin irritants will be stored or handled.

4.4 Drainage System

4.4.1 Provisions shall be made in all fire areas of the plant for removal of all liquids to safe areas or for containment in the fire area without flooding of equipment and without endangering other areas. Drainage and prevention of equipment flooding shall be accomplished by one of the following:

a. Floor drains
b. Floor trenches
c. Open doorways or other wall openings
d. Curbs for containing or directing drainage
e. Pits, sumps, and sump pumps

4.4.2 Secondary containment for hazardous materials liquids and solids shall comply with California fire code section 8003.1.3

4.4.2.1 Secondary containment for indoor hazardous materials storage areas shall be designed to contain a spill from the largest vessel plus the design flow volume of fire-protection water calculated to discharge from the fire-extinguishing system over the minimum required system design area or area of the room or area of the room or area in which the storage is located, whichever is smaller, for a period of 20 minutes.

4.4.2.2 Secondary containment for outdoor storage areas shall be designed to contain a spill from the largest individual vessel. If the area is open to rainfall, secondary containment shall be designed to include the volume of a 24-hour rainfall as determined by a 25-year storm.

4.4.2.3 The storm drainage system shall be sized to accommodate the total fire water run-off, based on the largest single fire area and the volume of a 24-hour rainfall as determined by a 25-year storm.

5.0 FIRE SUPPRESSION WATER DISTRIBUTION SYSTEM

5.1 Fire Suppression Water Supply

5.1.1 Fire Protection water is supplied by City Water from the main fire line located at Acorn Street. The hose connection for City of Riverside Fire Department system charging

shall be relocated to outside main entrance on Payton Avenue.

5.1.2 The water supply for the permanent fire protection installation shall be based on the largest fixed fire Suppression Water demand, plus a minimum of 500 gpm hose allowance, for a minimum duration of 2 hours.

5.1.3 Fire Suppression Water supply shall not be less than 2150 gpm.

5.1.4 An adequate and reliable water supply shall be provided, and capable of supplying the required design rate.

5.1.5 Velocity in fire Suppression Water distribution system piping shall not exceed ten feet per second (10 ft/sec).

5.2 Fire Suppression Water

5.2.1 Adequate fire Suppression Water supply shall be provided.

5.2.2 Fire Suppression Water distribution shall be designed in accordance with NFPA 24 requirement.

5.2.3 Water supply shall be sized based on the single largest fire risk area, to provide a two hours supply.

5.2.4 All materials and equipment shall be UL listed or FM approved for fire protection services.

5.2.5 Supply piping, fittings and connections for hose standpipes, sprinkler systems, and standpipes shall be schedule 40 black steel with screwed or grooved mechanical joints. Dry pipe shall be schedule 40 galvanized steel with screwed or grooved mechanical joints.

5.3 Underground Fire Suppression Water System

5.3.1 A fire Suppression Water transposition drawing shall be prepared which represents the total fire protection system, for approval by the authority having jurisdiction.

5.3.2 The fire Suppression Water supply system shall provide water supply to any point from with sufficient sectional valves provided to allow isolation of any section. Isolation valves shall be provided so that no section shall include more than 3000 lineal feet of main, or 6 branch connections (branch connections are individual take-offs from the fire main that serve hydrants, hose reels or sprinkler systems). In general, adequate valving shall be provided to maintain at least one source of fire protection water (either automatic or manual) for each building or area. Post indicator valves shall be at least 40 feet from the building or structure, where possible.

5.3.3 The underground fire Suppression Water system shall be designed to withstand a system working pressure of not less than 150 psi. All system components shall U.L. listed and/or FM approved for the use intended.

5.3.4 General requirements for the installation of thrust blocks, tie rods, valve pits, monitor nozzles, and hydrants shall be as required by NFPA 24 and local codes.

5.3.5 Underground fire Suppression Water isolation valves controlling water supplies shall be post indicator type, and shall be locked open. All locks shall be operable with a common key. Guard posts shall be provided as required to protect post indicators from damage.

5.3.6 In areas where post indicators are not practical (e.g., roadways and access areas), key operated valves and valve boxes shall be provided.

5.3.7 Hydrant shutoff valve shall be a 6-inch key operated valve and valve boxes (adjustable roadway boxes).

5.3.8 Underground fire Suppression Water piping materials shall be PVC AWWAC900 or UL Listed or FM approved, HDPE meeting the requirements of AWWA C900-89. Underground piping shall be provided with an approved restraint system in accordance with NFPA
24.

5.3.9 Connections shall be made with cast iron or ductile iron rubber gasketed push-on joints, meeting the requirements of AWWA C111-80.

5.3.10 Riser materials between underground piping and above grade connections shall be ductile iron. Riser piping assembly shall be restrained with approved mechanical assemblies or with self-restraining gaskets, in accordance with NFPA 24 or AWWA C605-94.

5.3.11 All tees, bends, plugs, caps, and hydrant branches shall be restrained against movement by thrust blocks or approved mechanical assemblies, in accordance with NFPA 24.

5.3.12 Depth of cover for underground piping shall be not less than 3 ft., or 1 ft. below the local frost line, whichever is greater. Depth of cover shall be a minimum of 3 ft. for piping under roadways , and a minimum of 4 ft. for piping under railroad tracks.

5.3.13 Piping shall not be installed under buildings, except branch lines to sprinkler system risers.

5.3.14 Minimum pipe size for underground fire Suppression Water piping shall be (6) inches, except that branch lines to individual fire protection systems may be (4) inches.

5.3.15 All hydrants shall be rated to provide a minimum of 500 gpm, dry barrel type and shall be U.L. listed and/or FM approved. Hydrants shall be red in color, consist of a 6" inlet connection, with one 4" pumper connection and two - 2'W hose connections. Hose threads shall be compatible with local fire department requirements, or provided with adapters.

5.3.16 For the hydrants located near the roads, it shall be located between three feet (3'-0") and six feet (6'-0") from the edge of the road shoulder or curb. Where a shoulder or curb is not provided, the hydrants shall be located between five feet (5'-0") and six feet (6'-O") from the edge of the road. Guard posts shall be provided as required to protect hydrants from operating vehicles. The extension of the existing fire hydrant loop is

shown on dwg. xxxxxx

6.0 FIRE DETECTION AND ALARM SYSTEMS

6.1 General

6.1.1 The purpose of the plant fire detection and alarm systems is to detect hazardous conditions at an early stage, to initiate warning signals, and initiate automatic action, as required by the authority having jurisdiction, local codes and NFPA requirements.

6.1.2 A Main Fire Alarm Control Panel (MFCP) shall be provided in the _____, and will supervise all automatic and manual fixed fire suppression systems, and manual fire alarm pull stations and shall initiate appropriate responses to alarm signals (e.g. audible and visual alarms, system discharge, etc..) and send an alarm signal to the (MFCP) panel in the existing control room in the Plants Administration Building.

6.1.3 A Local Fire Alarm Control Panel (LFCP) shall be provided as needed for areas having fire detection and alarm system, which require local indication. The LFCP also supervises all automatic and manual fixed fire suppression systems, detection systems, manual fire alarm pull stations alarm bells, supervisory switches, post indicator valves, pressure switches, etc. The LFCP shall initiate appropriate responses to alarm signals (e.g., audible and visual alarms, system discharge, etc..) and also provide fire and trouble signals to MFCP.

6.1.4 A manual alarm system, consisting of fire alarm pull stations, shall be provided in high risk areas, inside building control rooms, cable spreading room, outside hazardous areas near the combustion turbine and along escape routes of occupied buildings.

6.1.5 Electrical equipment in areas with potentially hazardous atmospheres shall be designed and installed in accordance with the requirements of NFPA 70.

6.1.6 Automatic fire detection systems may be used to supplement or to actuate extinguishing systems. Automatic fire detectors shall comply with the requirements of NFPA 72.

6.1.7 Smoke detectors shall be located in accordance with NFPA 72, and its spacing shall be based on threshold fire size, expected growth rate, and ceiling height in accordance with NFPA 72, Chapter 5.

a. Ionization detectors shall be used in enclosed areas where a flaming type of fire could occur (general office area, storage areas, warehouses, workshops, etc.).

b. Photoelectric detectors shall be used in areas where a smoldering type of fire could occur (control rooms, electrical rooms or buildings, switch houses, substations, etc.).

c. Combination smoke and heat detectors may be substituted for smoke

detectors, where appropriate.

6.1.8 Heat actuated detectors shall be used when the speed of detection is not a prime consideration, and the space is sufficiently confined to insure that heat build-up would be rapid, or ambient conditions do not permit the use of other devices. Heat detectors shall be used in areas where rapid heat build-up can be expected. Heat detectors may also be used in environments suitable for other detectors (high dust, dirt, or moisture levels) and to minimize potential false alarm signals.

a. Fixed temperature detectors shall be used where slowly developing fires can be expected (equipment and battery rooms, combustion turbine and gas compressor enclosures, kitchen areas).

b. Rate-of-rise detectors shall be used in areas where rapidly developing fires can be expected, and in areas where compensation is necessary for normal variations in ambient temperature conditions.

6.1.9 Fire detection and alarm systems shall meet the requirements of NFPA 70 (National Electric Code), NFPA 72 (National Fire Alarm Code) and local code requirement.

6.1.10 All circuits within each enclosure where a termination is made shall be identified. Identification method shall consist of plastic-coated self sticking markers or by heat-shrink type sleeves. Attachment of markers shall be in a manner, which does not permit accidental detachment.

6.1.11 All terminations shall be made with insulating torque compression lugs.

6.2 Central Fire Alarm System

6.2.1 The facility central fire alarm system shall consist of a Main Fire Alarm Control Panel (MFCP) to supervise all automatic and manual fixed fire suppression and detection systems and provide common fire, system actuated and trouble signals from the Local Fire Alarm Panel (LFCP). The plants overall Fire Protection/Detection system shall be of the Intelligent/Addressable type.

6.2.2 Alarm signals shall be initiated in response to activation of water flow or pressure switches from local fire protection systems. Trouble signals shall be initiated in response to activation of tamper switches, faulty devices, or break in supervisory circuits.

6.2.3 All supervisory circuits shall be closed loop type to identify wiring faults or system malfunctions, and will be annunciated by a trouble signal at fire alarm panels.

6.2.4 Visual alarms shall be provided at strategic points in the plant area and at the fire alarm panel.

6.2.5 Audible alarm horns shall be provided at strategic points in the plant area, and at the fire alarm panel. Audible alarms shall be compatible with the environment in which they are located, to insure the signal is clearly audible above ambient noise levels. Typical audible alarms are:

Type	Location / Service
Bells	Inside & outside buildings (sprinkler systems)
Horns	Inside & outside protected areas (carbon dioxide)
Sirens	Facility area (general alarm - fire, gas, etc.)
Buzzer	MFCP and LFCP control panels

6.2.6 The MFCP and LFCP shall be provided with 120V A.C. power. In case of power failure, battery back-up capability shall provide a minimum of 24 hours emergency power supply. Loss of the main power supply shall cause the initiation of a trouble signal at the fire alarm panel.

6.2.7 The MFCP shall be installed in the Control Room or other constantly monitored location, and shall display the following system functions, as a minimum:

a. System status
b. Power on
c. System trouble
d. Typical Zone

Type	Function
Alarm	Detector alarm, Water flow, Agent discharge, Manual pull i
Trouble	Circuit fault, Low air , Control valve closed

6.3 Local Fire Detection and Alarm Systems

6.3.1 Local control panels shall monitor and control fire suppression, fire detection systems. All LFCP shall provide common fire, system actuated, and trouble signal to MFCP.

6.3.2 Local control panels shall monitor detection systems, provide interface signals, activate local alarms, initiate release of suppression systems, and report trouble and fire alarm signals to the central MFCP.

6.3.3 Local control panels shall be provided with 24-hour back-up power supply.

1 Common Fire and Trouble signal alarms shall be provided on MFCP. Signals shall be DPDT with the sensing power (24V DC) from the BOP Plant Control Panel.

TESTING AND MAINTENANCE

7.1 General

7.1.1 All fire protection systems shall be tested in accordance with applicable NFPA, local, and other requirements identified by Project specifications.

7.1.2 All testing shall be conducted by experienced personnel, and witnessed by client representatives and local authority.

7.1.3 Reasonable time shall be allowed between issue of test notification and the formal test (approximately 10 working days).

7.1.4 Test results shall be recorded, and shall include signatures by the responsible supervisor, technician, or engineer conducting the tests and witnessed by local governing authority (Fire Marshal or designee) A log shall be maintained of all persons attending the tests.

7.1.5 A formal test report shall be issued to the Client and local authority.

7.2 Fire Suppression Water Distribution System

7.2.1 All piping shall be flushed in accordance with NFPA 24.

7.2.2 All piping shall be hydrostatically tested in accordance with NFPA 24, or other identified requirements.

7.2.3 Prior to formal testing, all operating parts shall be functionally tested to verify proper operation, both individually and as a system.

7.2.4 A "Certificate of Completion" and test results shall be provided, identifying the building or area, system type and function, project number, date and purchase order.

7.2.5 The installing contractor shall submit complete maintenance procedures, a maintenance schedule, and an inspection schedule for all equipment and systems.

7.3 Plant Fire Protection Systems

7.3.1 All piping shall be flushed in accordance with NFPA 13.

7.3.2 All piping shall be hydrostatically tested in accordance with applicable NFPA standards, or other identified requirements.

7.3.3 Prior to formal testing, all operating parts of each system shall be functionally tested to verify proper operation, both individually and as a system.

7.3.4 CO2 system shall be tested in accordance with the NFPA 12.

7.3.5 A "Certificate of Completion" and test results shall be provided, identifying the building or area, system type and function, project number, date and purchase order.

7.3.6 The installing contractor shall submit complete maintenance procedures, a maintenance schedule, and an inspection schedule for all equipment and systems.

7.4 Fire Alarm and Detection Systems

7.4.1 Prior to formal testing, all operating parts of each system shall be functionally tested to verify proper operation, both individually and as a system.

7.4.2 A "Certificate of Completion" and test results shall be provided, identifying the building or area, system type and function, project number, date and purchase order.

7.4.3 The installing contractor shall submit complete maintenance procedures, a maintenance schedule, and an inspection schedule for all equipment and systems.

7.4.4 Testing of water flow alarm devices, supervisory switches, fire detectors, and solenoids shall include the entire circuit between the devices and the FCP terminal. Devices shall be actuated and resistance checks made at the junction box to verify the integrity of end of-line devices and wiring.