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**Petition for Post-Certification Modification  
Tanager Battery Energy Storage System Project**

**Data Response Set 3B**

**Los Esteros Critical Energy Facility  
03-AFC-02C**

Submitted to  
**California Energy Commission**

Submitted by  
**Los Esteros Critical Energy Facility, LLC**

June 2026

**LOS ESTEROS CRITICAL ENERGY FACILITY (03-AFC-02C)**  
**Petition for Modification- Tanager BESS Project**  
**DATA RESPONSE SET 3B**

Los Esteros Critical Energy Facility, LLC, on behalf of Tanager Power, LLC, provides the following responses to the California Energy Commission (“CEC”) Staff’s Data Request Set 3. These responses address Data Requests A73, A75, A76, A78, and A79, and supplement *Data Response Set 3A*<sup>1</sup> for the Tanager Battery Energy Storage System (“BESS”) Project (“Project”).

The responses are grouped by individual discipline or topic area. Within each discipline area, the responses are presented in the same order as presented in CEC Staff’s Data Request Set 3<sup>2</sup> and are keyed to the Data Request numbers.

**WORKER SAFETY AND FIRE PROTECTION**

**BATTERY ENERGY STORAGE SYSTEM (BESS) TECHNOLOGY**

**DATA REQUESTS**

**A73.** *Provide a history of failure incidents involving at least one enclosure or multiple enclosures of the proposed BESS at a single facility, and a complete description of the proposed measures to prevent failure incidents for the proposed project (provided under confidential cover if trade secrets and commercially sensitive information are included).*

**RESPONSE:** The Project has reviewed the Electric Power Research Institute (“EPRI”) Battery Energy Storage System (“BESS”) Failure Incident Database for failure incidents, including the Hithium product proposed for this Project. There was no history of failures using this product involving at least one enclosure or multiple enclosures. Further, the Project team confirmed with the manufacturer that there are no known failure incidents.

The selected technology will incorporate the following measures to prevent failure incidents:

- Explosion control by means of exhaust ventilation, designed in accordance with NFPA 69: *Standard on Explosion Prevention Systems*. This protection would be equipped with an automatic ventilation system designed to remove flammable off-gases during thermal runaway events.
- Smoke/Gas Purge System.
- Battery Management System (BMS) to monitor datapoints, including voltage, current, state of charge and temperature to alert and prompt corrective actions for response to abnormal conditions. The Hithium Block uses a multi-level management structure,

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<sup>1</sup> TN: 269840, docketed May 5, 2026.

<sup>2</sup> TN: 269329, docketed March 26, 2026.

**LOS ESTEROS CRITICAL ENERGY FACILITY (03-AFC-02C)**  
**Petition for Modification- Tanager BESS Project**  
**DATA RESPONSE SET 3B**

managing at the individual module level, rack level and system level.

- Automatic Fire Detection and Alarm including smoke detectors, heat detectors, with A/V notifications.
- Electrical Fault Protection.

**WATER-BASED FIRE PROTECTION SYSTEMS FOR BESS PROJECT**

**DATA REQUESTS**

**A75.** *Please provide a fire water supply analysis to confirm adequate water supply. Provide a discussion of the project's worst-case fire flow requirements in GPM (gallons per minute) for each of the project's exposure hazards (e.g. transformer fire, BESS fire). Provide descriptions of all significant assumptions, methodologies, and computational methods used in arriving at those conclusions.*

**RESPONSE:** The Project conducted a Fire Water Hydraulic Study of the existing LECEF fire suppression system, modeled with the addition of a fire loop to provide additional hydrants for the Tanager BESS.

Under IFC Section 1207.8.1 the Project is considered an outdoor installation and does not require automatic fire suppression. In addition, the current practice for BESS fire suppression is containment and controlled burnout. Providing water for cooling to neighboring structures may be utilized. The minimum duration for containment of a fire is provided by IFC 1207.7.4 as 2-hours.

Based on the hydraulic study, the firewater system at the existing LECEF facility can provide adequate flow and volume of water to support the additional fire loops and hydrants for the Project.

The full report is available as Attachment DR-A75, Fire Water Hydraulic Study Report.

**A76.** *Please provide a schematic, equivalent to at least 30 percent design plans, and a complete description of the proposed fire protection systems for the proposed project, such as the fire water loop, fire water storage tanks, fire pumps, fire hydrants, etc.*

**RESPONSE:** The schematic of the fire loop and hydrant locations can be found in Attachment DR-A75, Appendix A.

**LOS ESTEROS CRITICAL ENERGY FACILITY (03-AFC-02C)**  
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**EMERGENCY RESPONSE AND EMERGENCY ACTION PLAN**

**DATA REQUESTS**

**A78.** *Please provide description of the emergency response training that will be offered to the local emergency management agencies during construction and operations of the proposed project. Provide a discussion of the content, frequency, and emergency scenarios to be covered in the training.*

**RESPONSE:** As discussed in Data Response A39, the LECEF facility has an existing ERP which includes emergency response policies, notifications and response. LECEF also coordinates routinely with the City of San Jose Fire Department. The LECEF ERP will be updated to include the Tanager BESS Project. (See also, Data Responses A30, A33, and A39.)

With respect to the ERP, the 2026 edition of NFPA 855 specifies integration of training within a comprehensive, site-specific Emergency Response Plan (“ERP”). This is consistent with the 2023 edition of NFPA 855, as adopted by the 2025 California Fire Code. Per Section 4.3.1 of NFPA 855, “emergency planning and training shall be provided by the owner of the ESS or their authorized representative so that ESS facility operations and maintenance personnel and emergency responders can address foreseeable hazards associated with the on-site systems.”

Training would be conducted, at minimum, prior to the BESS arriving on site, and prior to system commissioning.

Emergency responders from local agencies will be notified of annual training dates and locations, in accordance with NFPA 855 Section 4.3.2.2. The ERP will be reviewed and updated, as needed, each year and provided to emergency responders.

The Project will provide pre-scheduled opportunities for access to the site for emergency responders to familiarize themselves with the site, and provide guidance on fire and life safety features on site. Orientation to the following items from the ERP would be offered to the local emergency responders:

- Site access and safe staging locations;
- Emergency system shutdown and any unique fire suppression or fire alarm systems on site;
- Site equipment arrangement;
- Means of egress and safe refuge / rally points;

**LOS ESTEROS CRITICAL ENERGY FACILITY (03-AFC-02C)**  
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**DATA RESPONSE SET 3B**

- Location of first responder station on site;
- Location of portable fire extinguishers;
- Fire protection water supply, location of hydrants, and onsite water storage tank, if provided; and
- Location and visual and audible characteristics of fire and emergency alarms on site (e.g. amber horn strobe for gas events, clear horn strobe for fire events).

**A79.** *Please provide a complete description of the proposed emergency response training provided to project personnel (workers and management) during construction and operations should a failure incident involving the BESS occurs.*

**RESPONSE:** The Project intends to have separate construction and operational ERPs. Employees will be trained to implement the ERP for the respective phase and limited to defensive tactics only. The ERP based training would include the following items:

- Instructions for emergency shutdown of the BESS including location and appearance of emergency power off buttons and location of disconnects;
- Means of egress and safe refuge / rally points;
- Location of first responder station on site;
- Location of PPE, first aid kits, defibrillator, etc. on site;
- Notification table and emergency contact information:
  - General emergencies – dial 911
  - Closest fire station – non-emergency phone number and address
    - HAZMAT response would be provided by San José Fire Department Station 29
    - Non-HAZMAT response would likely be provided by San José Fire Department Station 25
  - Closest police department – non-emergency phone number and address
  - Closest hospital non-emergency phone number and address

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**DATA RESPONSE SET 3B**

- Remote operations center phone number
- BESS subject matter expert
- Location of portable fire extinguishers, and when it would be appropriate to use them; and
- Location and visual and audible characteristics of fire and emergency alarms on site.

**LOS ESTEROS CRITICAL ENERGY FACILITY (03-AFC-02C)  
PETITION FOR MODIFICATION - TANAGER BESS PROJECT  
DATA RESPONSE SET 3B**

**ATTACHMENT DR-A75**

**FIRE WATER HYDRAULIC STUDY REPORT**

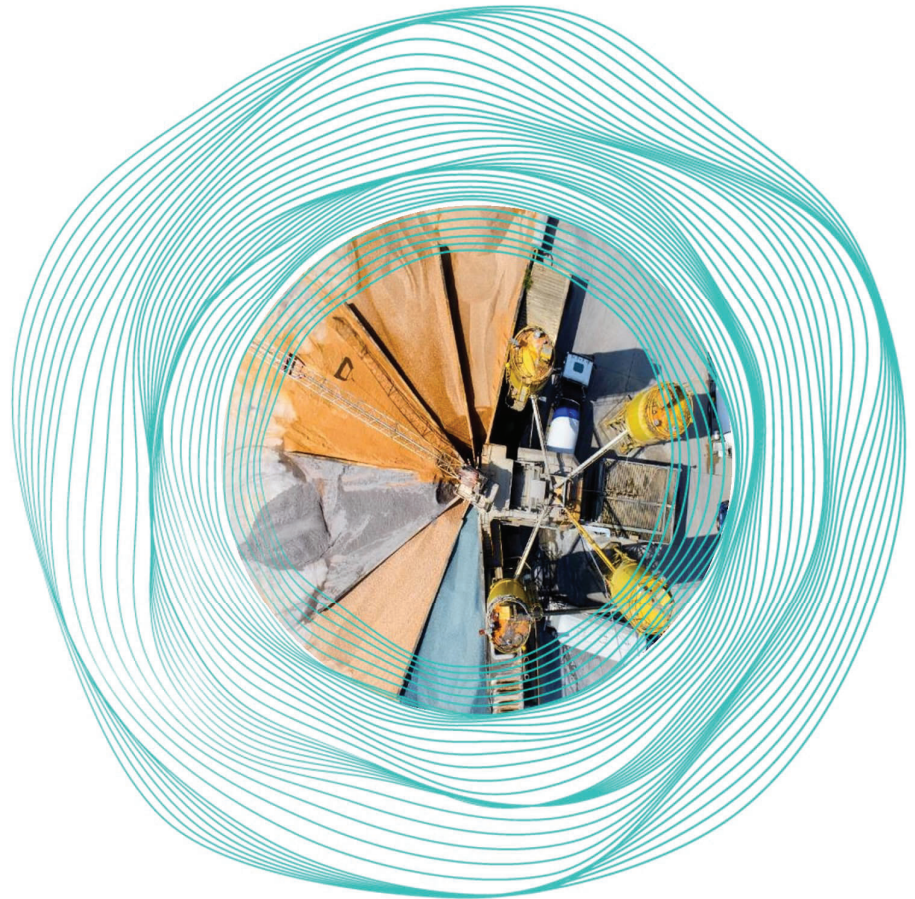


**CALPINE**

# **Fire Water Hydraulic Study Report**

## **Tanager Bess Project**

Document no. Rev B: 418008-00749-SR-REP-0001



22 June 2026

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## Synopsis

This report presents firewater demand evaluations and hydraulic calculations for Tanager Bess project

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PROJECT 418008-00749 - 418008-00749-SR-REP-0001: Fire Water Hydraulic Study Report - Tanager Bess Project							
Rev	Description	Originator	Reviewer	Worley Approver	Revision Date	Customer Approver	Approval Date
Rev A	Issued For Review	 Rohit Wankar	David Bock	Donald Dupont	05 February 2026		
Rev B	Issued For Approval	 Rohit Wankar	David Bock	Donald Dupont	22 June 2026		
							
							



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## 1. Introduction

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The purpose of this document is to present a Fire water demand evaluation and hydraulic analysis for the new Fire hydrants added in the Calpine Tanager Bess Project.

Tanager Bess is a 200MW 4-hour battery storage project, co-located with the existing Los Esteros Critical Energy Facility (LECEF) facility.

The objectives of this document are:

- To determine the adequacy of the existing firewater pumps for meeting the flow and pressure requirement for new fire hydrants added in the Tanager Bess Project.
- To check and confirm the line size estimated based on fire water demand calculation are met without exceeding the velocity criteria while meeting the residual pressure requirements.
- To verify the maximum firewater demand for individual firewater system and pipe sizing considering the most hydraulically demanding scenario.

Scope of this study includes new firewater ring main and new fire hydrants added for the Tanager Bess project.

### 1.1 Project Description

Tanager Bess is a 200MW 4-hour battery storage project, co-located with the existing Los Esteros Critical Energy Facility (LECEF) facility.

The BESS facility uses the Hithium Infinity Block Generation 2 BESS, a pre-assembled, NWI style lithium-ion BESS container with an energy capacity of 5,015 kWh.

Beginning of life - qty 189 Hithium 5015 kWh Container and qty 63 SMA SCS-UP-XT-US 3950; MVPS-4600-S2-US-10.

End of life - qty 42 Hithium 5015 kWh Container and qty 14 SMA SCS-UP-XT-US 3950; MVPS-4600-S2-US-10.

See Appendix-F for Details of BESS Enclosure.



## 2. Codes & Standards

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The Calpine Tanager Bess Project facilities shall be designed, constructed, and operated in accordance with all applicable laws, regulations, of the state. In addition, various internationally recognized codes, and standards (e.g., NFPA, BS, EI, IEC etc.) are also to be followed.

The order of precedence for compliance shall be.

1. State Standards, Regulations, Law, and statutory requirements
2. International Codes and Standards

Throughout this document, reference is made, wherever possible to the appropriate source documents. These should be consulted in full to understand their requirements.

In the event of an inconsistency, conflict or discrepancy between any of the requirements, the most stringent and safest requirement applicable to the project will prevail.

Document No.	Title
IFC-2024	International Fire Code – 2024
NFPA 855	Standard for the Installation of Stationary Energy Storage System - 2024

Table 2-1: List of Codes & Standards

### 3. Firewater Demand Evaluation

Firewater demand for project facility is evaluated based on the requirements of International Fire Code (IFC).

As energy storage capacity of Tanager Bess facility (200MW for 4 hours/ 800MWH) exceeds the threshold Electrical Energy System Storage (ESS) quantities prescribed in Table 1207.1.3, IFC Section 1207 requirements are applicable to Tanager Bess Facility.

<b>TECHNOLOGY</b>	<b>ENERGY CAPACITY<sup>a</sup></b>
Capacitor ESS	3 kWh
Flow batteries <sup>b</sup>	20 kWh
Lead-acid batteries, all types	70 kWh <sup>c</sup>
Lithium-ion batteries	20 kWh
Nickel-cadmium (Ni-Cd), nickel metal hydride (Ni-MH) and nickel zinc (Ni-Zn) batteries	70 kWh
Nonelectrochemical ESS <sup>d</sup>	70 kWh
Other battery technologies	10 kWh
Other electrochemical ESS technologies	3 kWh
Sodium nickel chloride batteries	70 kWh
Zinc manganese dioxide batteries (Zn-MnO <sub>2</sub> )	70 kWh

For SI: 1 kilowatt hour = 3.6 megajoules.

a. Energy capacity is the total energy capable of being stored (nameplate rating), not the usable energy rating. For units rated in amp-hours, kWh shall equal rated voltage times amp-hour rating divided by 1,000.

b. Shall include vanadium, zinc-bromine, polysulfide-bromide and other flowing electrolyte-type technologies.

c. Fifty gallons of lead-acid battery electrolyte shall be considered equivalent to 70 kWh.

d. Covers nonelectrochemical technologies such as flywheel and thermal ESS.

Fire Hydrants will be provided to provide cooling in case of a fire event. As per historical industry incidents associated with BESS facilities, it is observed that protocol for dealing with battery fires is to let it burn out while providing cooling for temperature control and monitoring its impact on neighbouring facilities and on environment. Fire hydrants can be utilised for this purpose.



## 4. Firewater storage capacity requirement

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IFC or NFPA 855 do not prescribe any firewater supply storage requirements directly.

However, IFC 1207.1.6.2 provided minimum duration of containment of fire. As per IFC 1207.1.6.2: Fire will be contained for the minimum duration of the fire-resistance rated separations identified in section 1207.7.4.

As per 1207.7.4 Fire-resistance rated separations, separation shall be provided by 2 hours fire barriers.

Therefore, interpreting both IFC 1207.1.6.2 and 1207.7.4, it is proposed that firewater supply of **2 hours duration** will be adequate to contain fire in Tanager Bess facility. Firewater tank usage for this duration would consist of 120,000 gallons.

## 5. Fire Water Demand

### 5.1 Firewater Demand Criteria

As per NFPA general guidelines and good industry practise, firewater flow analysis shall be based on the single major fire scenario and consider the maximum expected firewater demand for the worst scenario for the Tanager BESS facility. Separate, unrelated simultaneous incident in two or more Facility locations shall not be considered in the firewater system design.

The existing firewater pumps and storage tank design are based on firewater demand case of existing facility, and it is not included in this report.

### 5.2 Fire Risk Area

New Tanager Bess Facility is divided into 3 fire risk areas. Firewater demand for each Fire risk area is presented in below Table 4.1.

Fire Risk Area (FRA)	Fire Protection Equipment	Theoretical Firewater Demand (gpm)
FRA – North	2 Fire Hydrants	1000
FRA – South	2 Fire Hydrants	1000
FRA-Transformer area	2 Fire Hydrants	1000

Note: 2 fire hydrants operating simultaneously are considered adequate for providing cooling in case of a Fire event.

Table 5-1: Firewater Demand per Fire Risk Area

Considering single fire scenario, minimum firewater requirement of 1000gpm for FRA-North/FRA-South is the maximum expected demand/Worst-case demand for the facility. The firewater pumping capability of the facility is 2500gpm, which can supply 2500gpm of firefighting for approximately 3 hours.

### 5.3 Fire Hydrants

For Energy Storage System (ESS) battery plants in California, fire hydrant spacing must follow California Fire Code (CFC) Appendix C. For commercial/industrial facilities, hydrants should be placed an average of 300 to 400 feet apart (depending on building protection), with no point on the access road more than 400 feet from a hydrant.

#### Examples of Hydrant Flows for 4 ½” and 5” hydrants:

Combined Flow 5” (Heavy Hookup): When the hydrant is fully tapped using the 5” (example) connection in conjunction with gated 2.5” lines, it significantly reduces friction loss, allowing the system to achieve its maximum rated flow (often up to or exceeding 1,500 GPM depending on local infrastructure).



Combined Flow 4 ½" (Heavy Hookup): This classic fire hydrant configuration—featuring two 2 ½" hose outlets and one 4 ½" (example) large-diameter pump (steamer) connection—is designed to deliver water volumes typically ranging from 1,000 to 1,500+ gallons per minute (GPM), depending on the municipal water main pressure and system layout.

Firewater flow of 1500gpm can easily achieved with Fire hydrants, if needed.

## **5.4 Firewater Storage**

Considering worst case firewater demand of 1000 gpm, 2-hour water storage of 120000 gallons is considered adequate for Fire suppression of Tanager Bess facility. (Refer section 4 for code reference and details)

## **5.5 Firewater Equipment and Piping Design Assumptions**

1. Initial design is a 10" firewater loop that is connected to the main plant firewater system through two tie points located on the firewater network layout (418008-00749-SK-SR-0001). Fire Hydrants will be spaced around the new addition at a maximum spacing of 300ft.
2. Sectional valves will be installed to allow piping sections to limit the number of fire protection hydrants to be out of service.
3. The existing firewater storage tank contains 483,000 gallons.
4. Fire hydrants to consist of a pumper (size to be determined) connection and two-2 1/2" hose connections.
5. The current facility consists of two 2500 gpm firewater pumps and one 30 gpm jockey pump.



## 6. Hydraulic Calculation Approach

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### 6.1 Units of measurements

Unless otherwise specified, U.S. customary (English) units shall be used in this basis of design.

### 6.2 Software

Worley used Sunrise Systems Limited PIPENET Vision. Spray Sprinkler Module, version 1.11.0. PIPENET is an industry recognized, comprehensive hydraulic analysis of firewater systems software tool.

### 6.3 Water Supply

The firewater supply for the new firewater ring main will be provided from the existing LECEF Facility firewater ring main through two tie-ins to the new underground firewater distribution system.

### 6.4 Fire Pumping Systems

The Tanager Bess firewater network will be supplied by existing LECEF Facility firewater pump having 2500 gpm capacity with 125psig rated head. The secondary main pump is designated as a backup and intended for use only in the event of a failure to the primary pump.

### 6.5 Underground Firewater Distribution System

Modifications to the existing firewater main loop shall be sized to ensure a maximum velocity in any section of the system to not exceed 3 m/s (10 ft/s). The whole circulation (firewater) system shall be analysed hydraulically to ensure the minimum design flow and pressure is available at all outlets.

New underground firewater piping shall be High Density Polyethylene (HDPE), and ductile iron shall be used for transitions to aboveground where required.

### 6.6 Friction Loss

The Hazen-Williams equation is an empirical formula that gives an explicit expression for the frictional pressure loss.

The frictional losses are given by:

$$p = \frac{4.52Q^{1.85}}{C^{1.85}d^{4.87}}$$

where:

$p$  = frictional resistance (psi/ft of pipe)

$Q$  = flow (gpm)

$C$  = friction loss coefficient

$d$  = actual internal diameter of pipe (in.)



## 6.7 Pipe Roughness Coefficient (C-Factor)

C-factors for various piping segments are in accordance with the Hazen-Williams formula table in NFPA 13. Information pertaining piping material are shown in Table 2.1.

Pipe Spec	Description	C-Factor
Table column heading	HDPE SDR 11	140

Table 6-1: C-factor

## 6.8 Firewater Network Layout

See Appendix A for new Firewater Layout (418008-00749-SK-SR-0001\_RA) and existing Firewater Layout (LE-P580002-R2) used as input to the Hydraulic Calculations.

## 7. Assumptions & Clarifications

The general assumptions that were applied are listed below.

1. The following codes were reviewed in this analysis; San Jose enforces regulations for Battery Energy Storage Systems (BESS) through the California Fire Code (specifically Chapter 12) and NFPA 855 standard. The IFC and NFPA frameworks are closely coordinated with IFC and NFPA 855. Firewater demand evaluation basis is considered as per International Fire Code (IFC). IFC Section 1201.1 states that Energy storage system regulated by Section 1207 shall comply with IFC and NFPA 855.
2. All new piping sizes, lengths and elevations are based on new tanager firewater plan (418008-00749-SK-SR-0001\_RA).
3. For existing piping sizes, lengths and elevations, existing piping tentative routing is obtained from fire protection piping supply header layout (LE-P580002-R2). Only existing main lines are considered for considering overall pressure drop across the network.
4. Firewater ring main tie-in points - two tie-in points are proposed from existing ring main for new Tanager Bess area.
5. The current hydraulic analysis was performed considering a K-Factor of the Fire Hydrant based on a flow of 500 gpm at 80 psig.
6. For hydraulic calculations, firewater pump curve is generated using following pump curve points as per NFPA 20 standard.

S.N.	Fire Pump Curve Points		Criteria
1	100% Rated Flow	2500 gpm	Rated Flow and pressure conditions
	100% Rated Head	289 ft / 125 psig	
2	0% Rated Flow	0 gpm	Maximum shut-off pressure allowed as per NFPA 20
	140% Rated Head	405 ft / 175 psig	
3	150% Rated Flow	3750 gpm	Standard firewater pump requirement of 150% rated flow at 65% rated head as per NFPA 20
	65% Rated Head	188 ft / 80 psig	

Table 7-1: Fire Pump Curve criteria

7. The ESS enclosures are not considered buildings. According to the California Fire Code (CFC), a building is defined as any structure used or intended for supporting or sheltering any use or occupancy. This definition aligns with both the California Building Code and Health and California Safety Code.
8. The concept of "worst-case firewater demand" does not come from a single code. It is established through a combination of codes, standards, and is considered good engineering practice. The IFC generally assumes a single fire event in defining demand and supply for buildings. The Tanager BESS Project does not include buildings. Industry practices such as API RP 2030 - Application of Fixed Water Spray Systems for Fire Protection in the Petroleum and Petrochemical Industries, for example, states firewater systems should be based on the largest credible fire scenario which is one major fire event at a time.  
It is not a code requirement but is consistent with recognized and generally accepted good engineering practice.



## 8. Calculation & Results

### 8.1 Hydraulic Calculation Results

Hydraulic Calculation summary is presented in Table 5.1

Fire Risk Area	Theoretical Fire Water Demand (gpm)	Hydraulic Calculation Results		Firewater Network size (inch)
		Actual Fire Water Demand (gpm)	Max. Velocity ((ft/s)	
FRA – North	1000	1239	8.8	10
FRA – South	1000	1236	8.8	10
FRA-Transformer	1000	1240	8.9	10

Table 8-1: Hydraulic Calculation Results

From the above results, it is seen that flow and velocity criteria are satisfied for FRA-North and FRA-South.

See Appendix B for PIPENET result schematic for FRA-North.

See Appendix C for PIPENET result schematic for FRA-South.

FRA South represents most remote area as per firewater demand perspective. PIPENET report for FRA South is represented in Appendix D.

### 8.2 Conclusions

Based on the assessment, following is concluded.

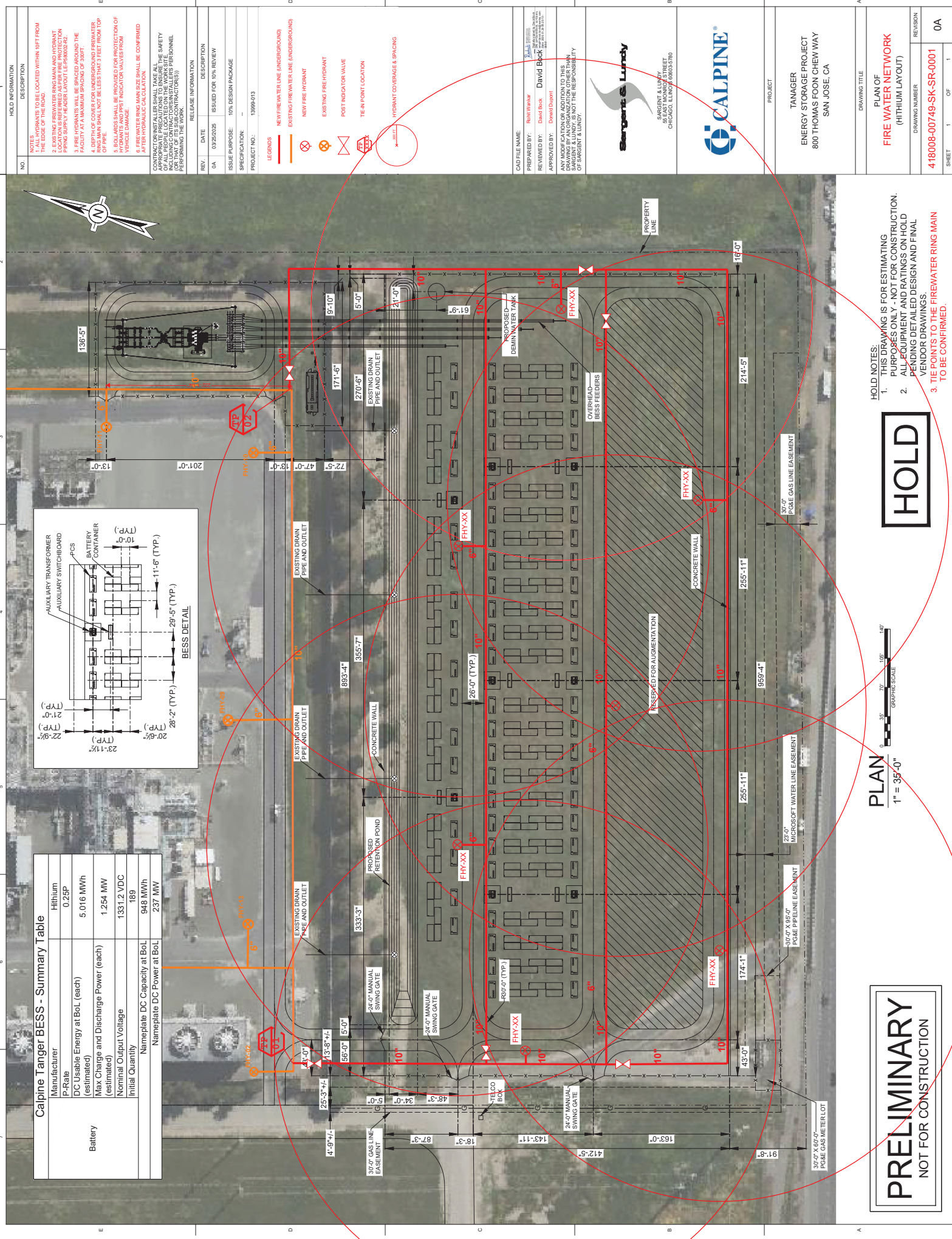
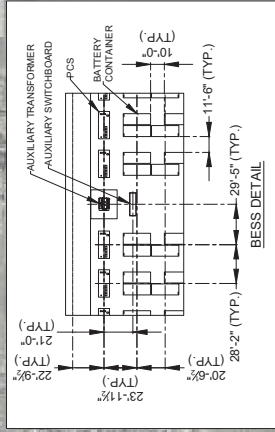
The calculated velocities in all new piping sections are well within the allowable maximum velocity criteria of 10ft/s. Therefore, it is concluded that firewater piping sizes are adequate to ensure minimum residual flow and pressure at the fire protection devices.

Existing Firewater pump with 2500 gpm capacity and 125 psig rated head is adequate to meet firewater demands of the new Tanager Bess project scope.



## **Appendix A. Firewater Network Drawings**

Calpine Tanger BESS - Summary Table	
Manufacturer	Hithium
P-Rate	0.25P
DC Usable Energy at BoL (each)	5.016 MWh
Max Charge and Discharge Power (each)	1.254 MW
Nominal Output Voltage	1331.2 VDC
Initial Quantity	189
Nameplate DC Capacity at BoL	948 MWh
Nameplate DC Power at BoL	237 MW

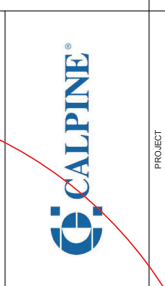
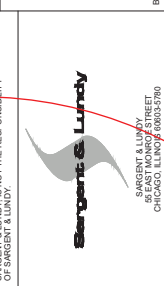


**NOTES:**  
 1. HYDRANTS TO BE LOCATED WITHIN 10FT FROM THE EDGE OF THE ROAD.  
 2. EXISTING FIREWATER RING MAIN AND HYDRANT TO BE MAINTAINED AND REPAIRED TO MEET ALL PRINCIPAL SUPPLY HEADS (AVOID IT BEING 400-20).  
 3. FIRE HYDRANTS WILL BE SPACED AROUND THE FACILITY AT A MAXIMUM SPACING OF 30FT.  
 4. DEPTH OF COVER FOR UNDERGROUND FIREWATER PIPES SHALL NOT BE LESS THAN 7 FEET FROM TOP OF FINISH GRADE.  
 5. BOLLARDS SHALL BE PROVIDED FOR PROTECTION OF HYDRANTS AND FIRST INDICATOR VALVES FROM VEHICLE DAMAGE.  
 6. FIREWATER MAIN SIZE SHALL BE CONFIRMED AFTER HYDRAULIC CALCULATION.  
 CONTRACTORS SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PERSONNEL INCLUDING CONTRACTORS, INSTALLERS, PERSONNEL, PERFORMING THE WORK.

REV	DATE	DESCRIPTION
0A	03/26/2025	ISSUED FOR 10% REVIEW
		ISSUE PURPOSE: 10% DESIGN PACKAGE
		SPECIFICATION: --
		PROJECT NO.: 1989-013

**LEGENDS:**  
 NEW FIREWATER LINE (UNDERGROUND)  
 EXISTING FIREWATER LINE (UNDERGROUND)  
 NEW FIRE HYDRANT  
 EXISTING FIRE HYDRANT  
 POST INDICATOR VALVE  
 TIE-IN POINT LOCATION  
 HYDRANT COVERAGE & SPACING

CAD FILE NAME:   
 PREPARED BY: **Rohit Verma**   
 REVIEWED BY: **David Beck**   
 APPROVED BY: **David Dupont**   
 ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.



PROJECT: **ENERGY STORAGE PROJECT**  
 TANGER  
 800 THOMAS FOON CHEW WAY  
 SAN JOSE, CA

DRAWING TITLE: **PLAN OF FIRE WATER NETWORK (HITHIUM LAYOUT)**

REVISION: **0A**

DRAWING NUMBER: **418008-00749-SK-SR-0001**

SHEET: **1 OF 1**

**HOLD NOTES:**  
 1. THIS DRAWING IS FOR ESTIMATING PURPOSES ONLY. NOT FOR CONSTRUCTION.  
 2. ALL EQUIPMENT AND RATINGS ON HOLD. PENDING DETAILED DESIGN AND FINAL VENDOR DRAWINGS.  
 3. TIE POINTS TO THE FIREWATER RING MAIN TO BE CONFIRMED.

**HOLD**

PLAN  
 1" = 35'-0"



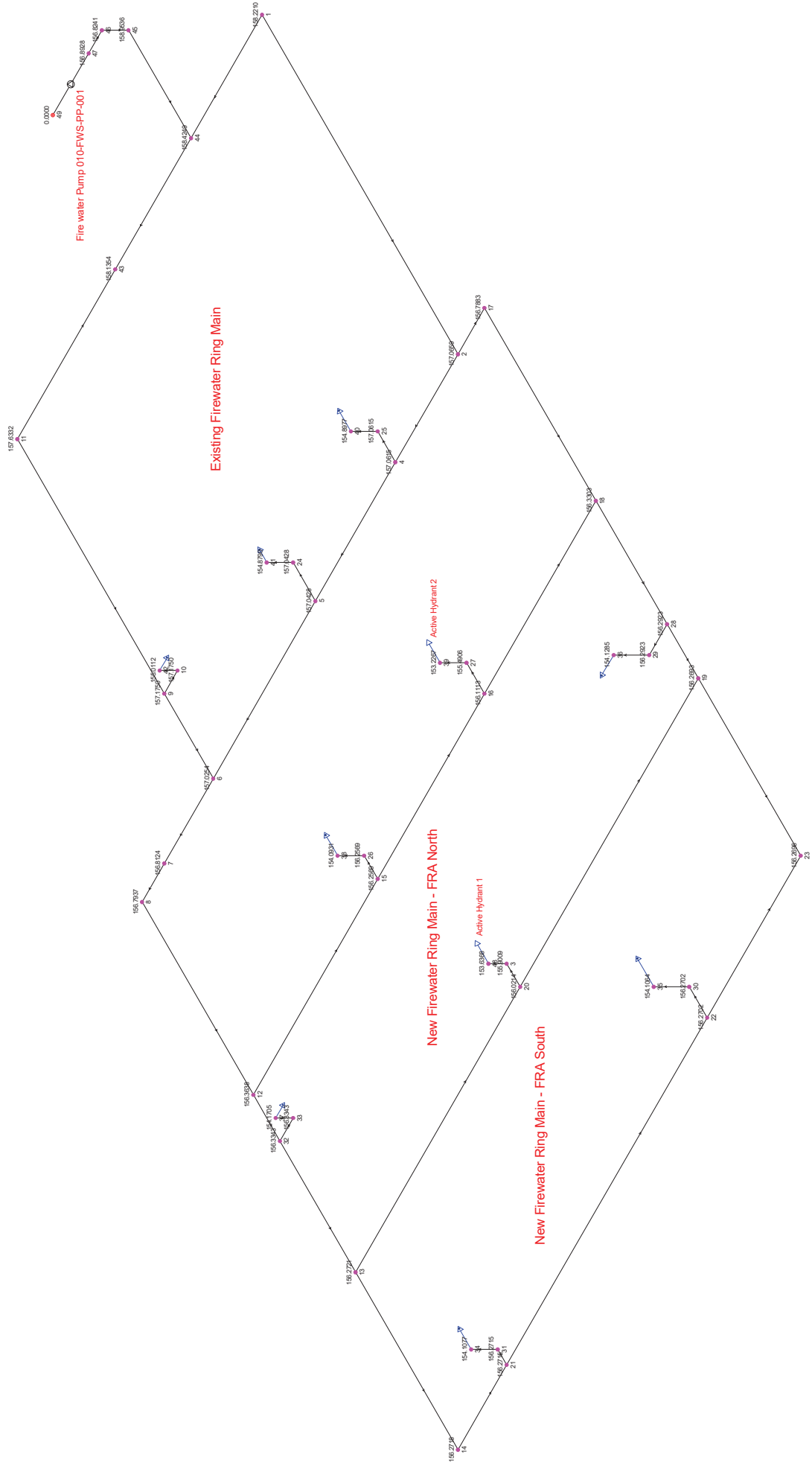
**PRELIMINARY**  
 NOT FOR CONSTRUCTION





## **Appendix B. Pipenet Result Schematic - FRA North**

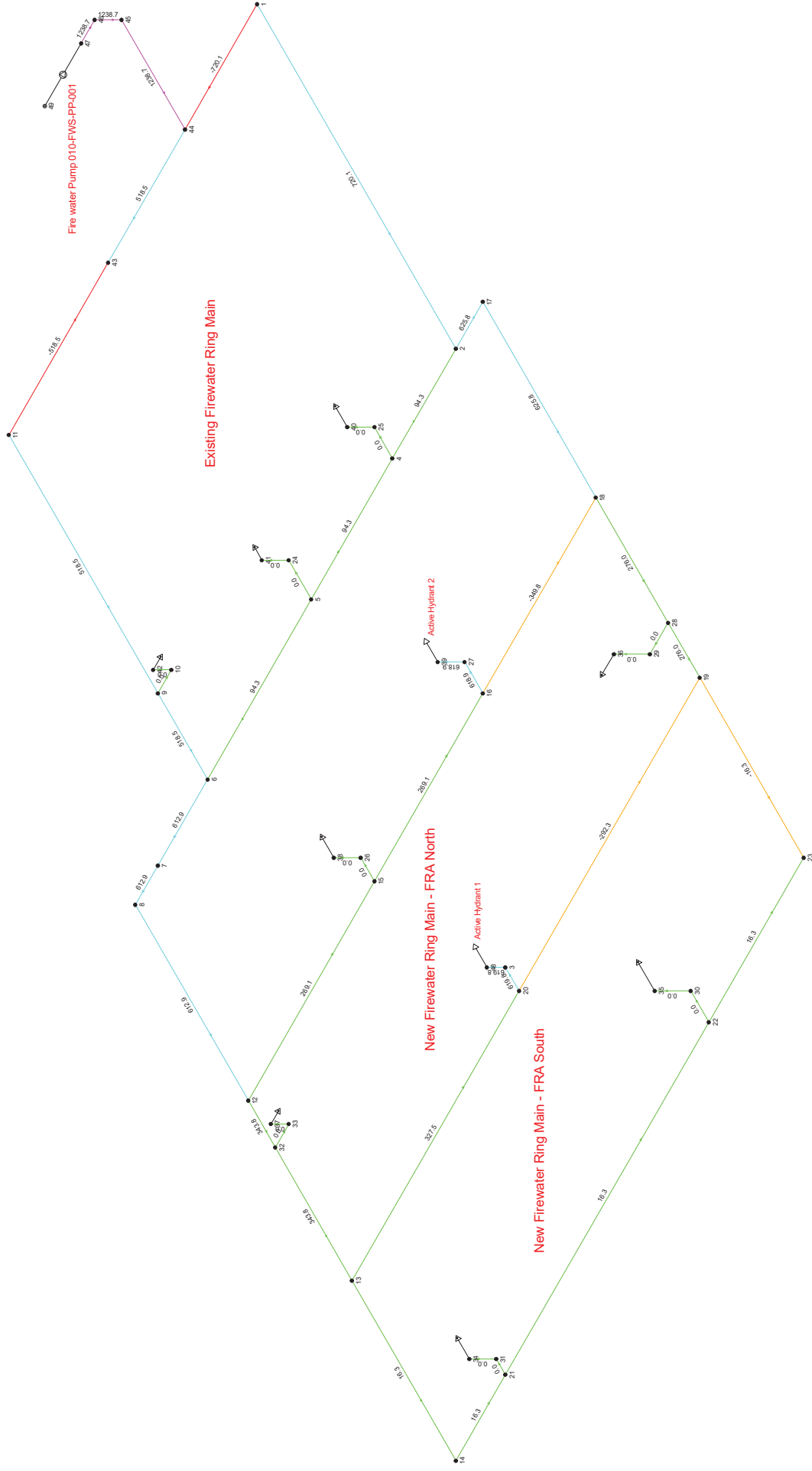
# Pipenet Schematic - FRA North - Pressure



Calpine Tanager Bess Firewater Hydraulic Study

Pressure (psi G)	Color
< 30	Red
< 60	Yellow
< 120	Blue
> 150	Purple

# Pipenet Schematic - FRA North - Volumetric Flow

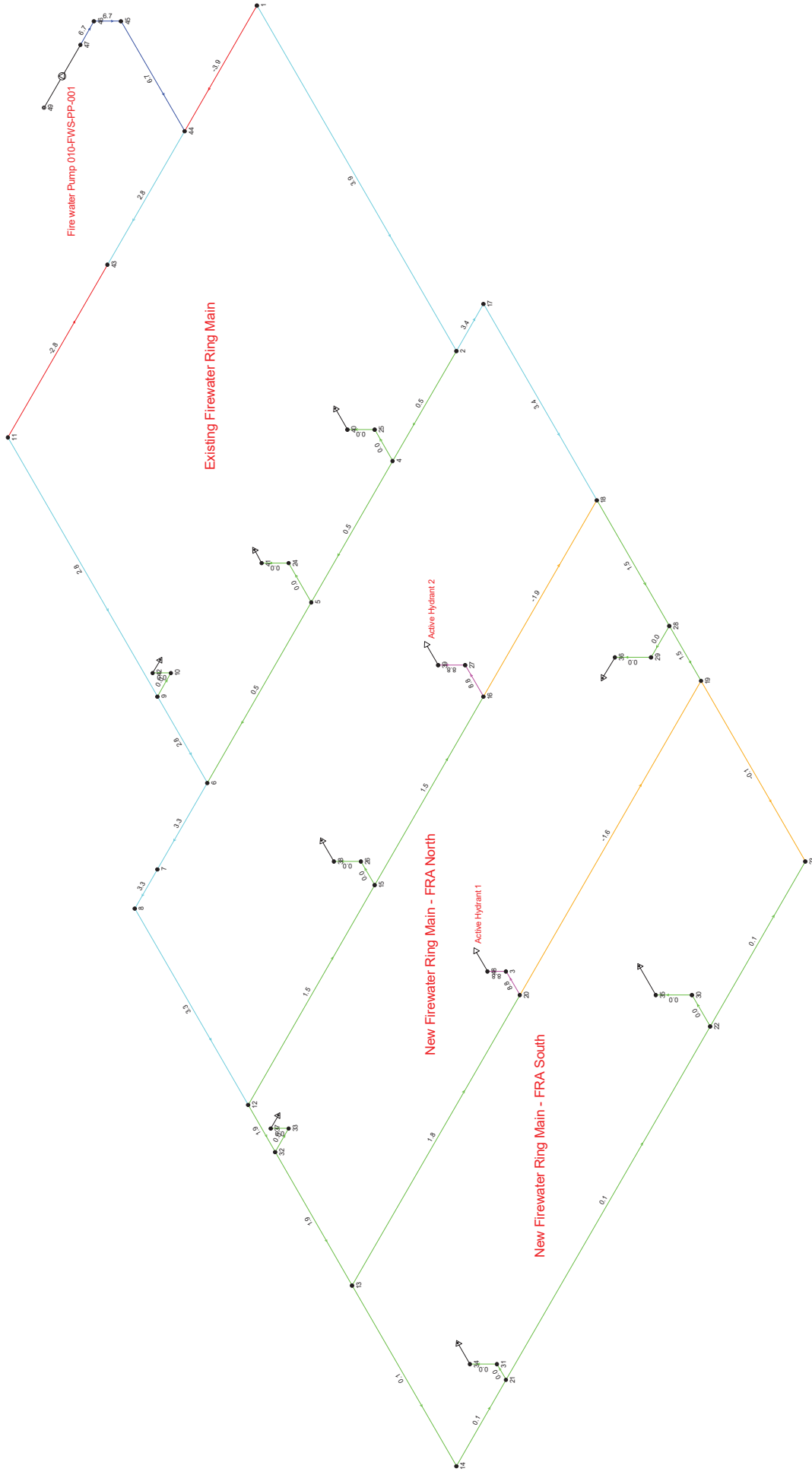


Calpine Tanager Bess Firewater Hydraulic Study

PIPENET Schematic Thursday, February 05, 2026 Page 1 of 1



# Pipenet Schematic - FRA North - Pipe Velocity



Calpine Tanager Bess Firewater Hydraulic Study

PIPENET Schematic Thursday, February 05, 2026 Page 1 of 1

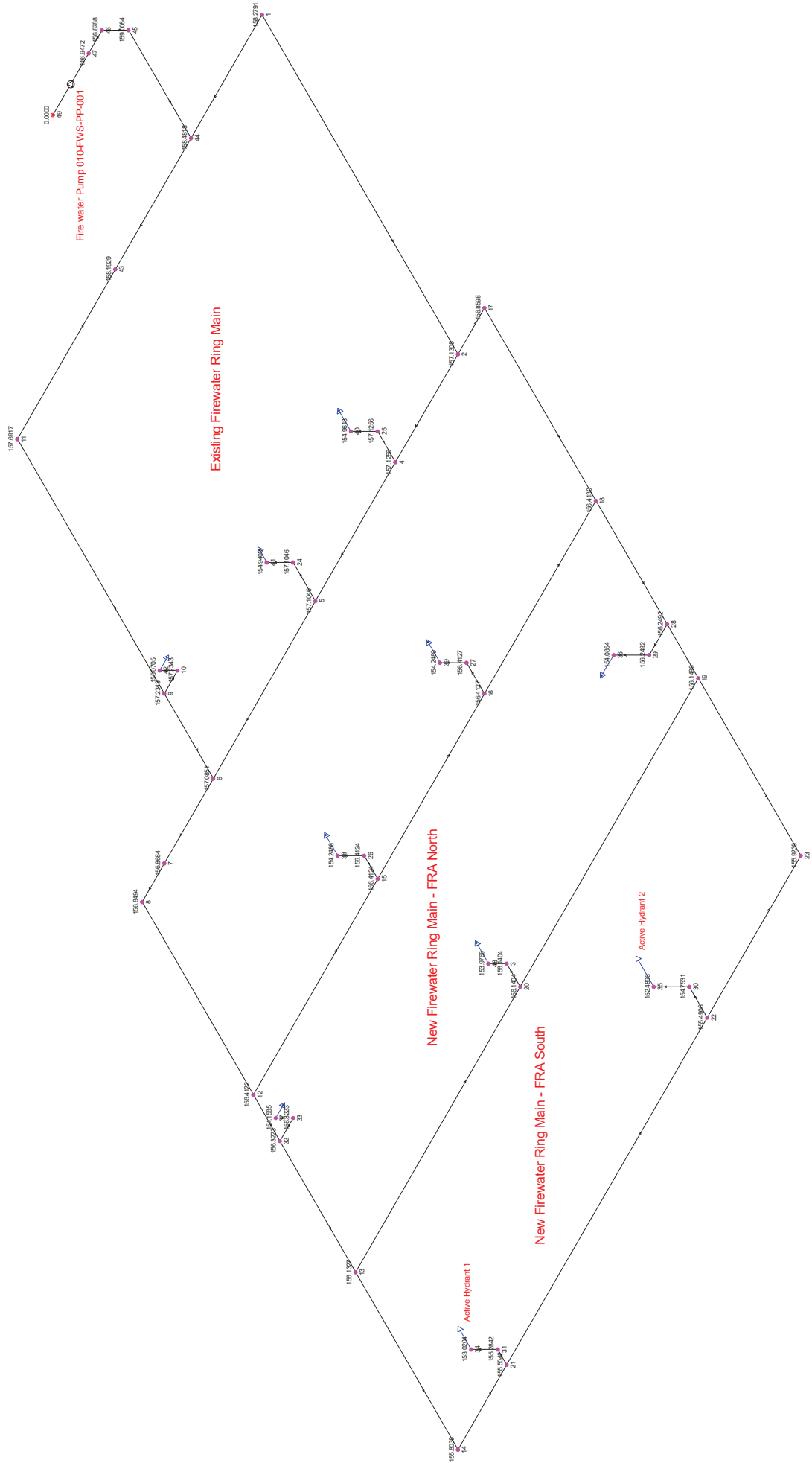






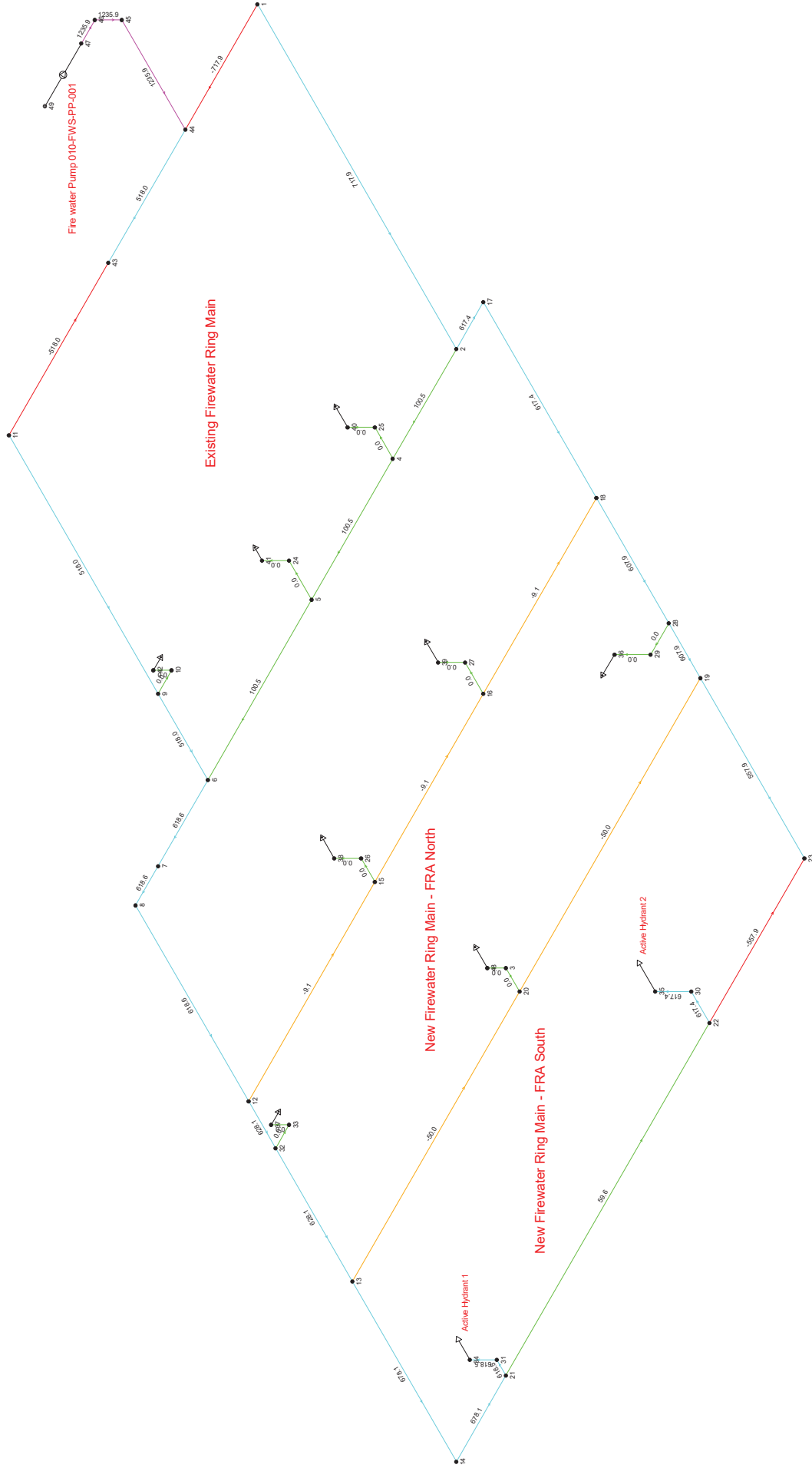
## **Appendix C. Pipenet Result Schematic - FRA South**

# Pipenet Schematic - FRA South - Pressure



Pressure (psi G)	Color
< 30	Red
< 60	Yellow
< 90	Green
< 120	Cyan
< 150	Blue
> 150	Purple

# Pipenet Schematic - FRA South - Volumetric Flow



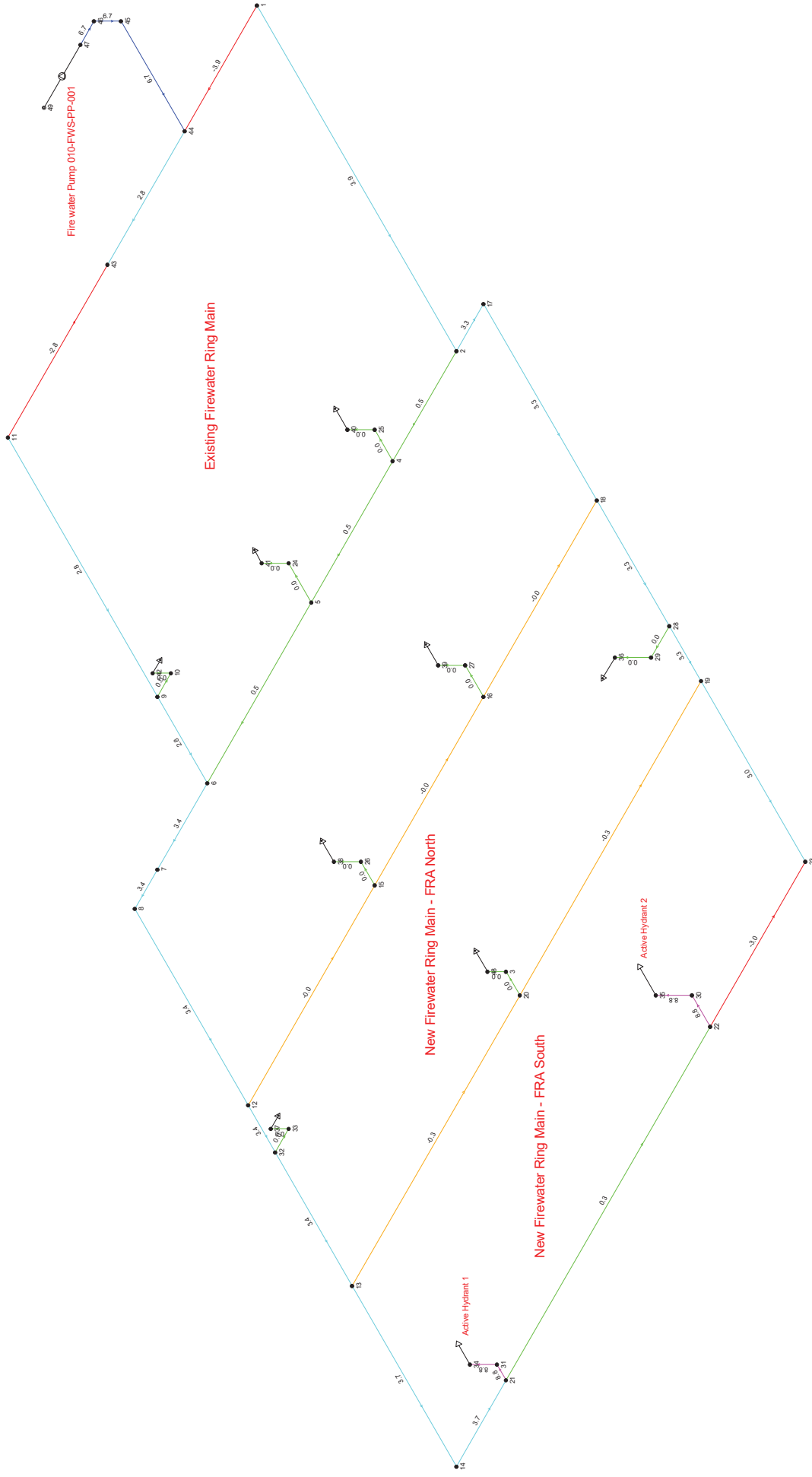
Calpine Tanager Bess Firewater Hydraulic Study

PIPENET Schematic Thursday, February 05, 2026 Page 1 of 1

Pipe vol. flow (US.gal/min)

< -400	< 0	< 400
< 800	< 1200	> 1200

# Pipenet Schematic - FRA South - Pipe Velocity

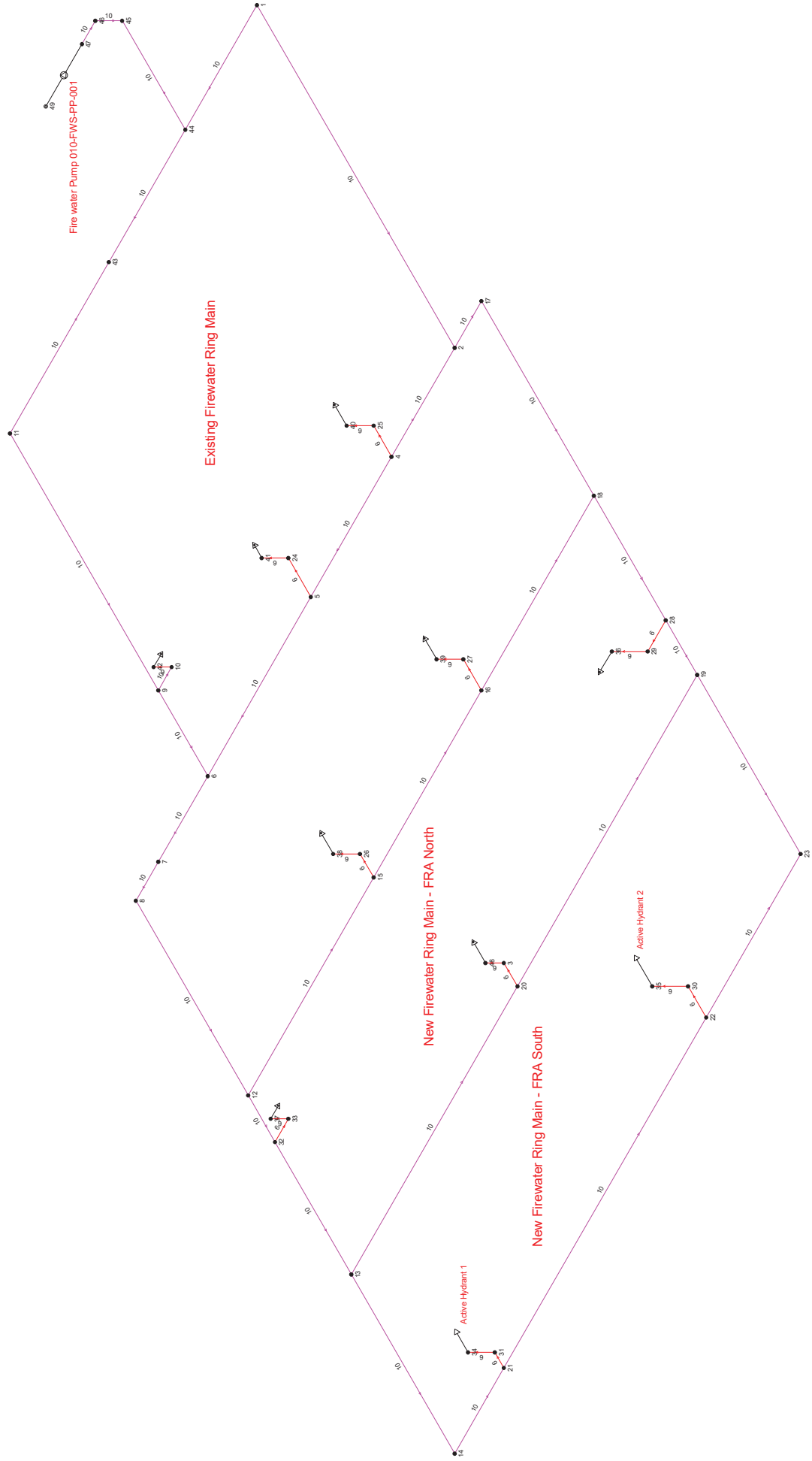


Calpine Tanager Bess Firewater Hydraulic Study

PIPENET Schematic Thursday, February 05, 2026 Page 1 of 1

Pipe velocity (ft./sec)	Color
< -2.5	Red
< 5	Blue
< 0	Yellow
> 7.5	Purple

# Pipenet Schematic - FRA South - Pipe Bore



Calpine Tanager Bess Firewater Hydraulic Study

PIPENET Schematic Thursday, February 05, 2026 Page 1 of 1

Pipe bore (in)	Color
< 6.75	Red
< 7.5	Yellow
< 8.25	Green
< 9	Cyan
> 9.75	Purple



## **Appendix D. Pipenet Report – FRA South**

=====  
=====

PIPENET SPRAY/SPRINKLER MODULE

=====  
=====

VERSION 1.11.0

=====  
=====

Results for : Calpine Tanager Bess Firewater Hydraulic Study

Licence Owner from key:

Licence Type: Network

Key number: Unavailable

MUS Date: 02/03/2028

=====  
=====

11:35 on 5-Feb-2026

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-----  
CONTROL INFORMATION  
-----

Convergence accuracy = 1.00E-03  
Maximum no. of iterations = 200  
Elevation Check Tolerance = 1.64 ft  
Warnings Control Option = 0  
\*\*\*\*\* Diagnostic level = 2

FLUID SYSTEM  
-----

Fluid Class = 1 (Liquid )  
Density = 62.32 lb/cu.ft  
Viscosity = 2.419 lb/ft hr



-----  
-----  
AVAILABLE PIPE SIZES AND MAXIMUM VELOCITIES USED FOR PIPE SIZING  
-----

HDPE P3GFPE  
Not lined

Nom.Bore	Act.Diam	Max.Vel.	Nom.Bore	Act.Diam	Max.Vel.	Nom.Bore
Act.Diam	Max.Vel.		Act.Diam	Max.Vel.		Act.Diam
(in )	(in )	(ft/s )	(in )	(in )	(ft/s )	(in )
(in )	(ft/s )		(in )	(ft/s )		(in )

-----

3.0000	2.8250	10.0000
4.0000	3.6330	10.0000
6.0000	5.3520	10.0000
8.0000	6.9670	10.0000
10.0000	8.6780	10.0000
12.0000	10.2930	10.0000
14.0000	11.3020	10.0000
16.0000	12.9100	10.0000
18.0000	14.5300	10.0000
20.0000	16.1400	10.0000
24.0000	19.3700	10.0000

-----  
 PIPE CONFIGURATION  
 -----

Pipe Label Fitt.eq.lnth	Input Node	Output Node	Nom.Bore (in )	Length (ft )	Elevation (ft )	C Factor (ft
1 0.000	1	2	10.00	459.0	0.000	140.0
2 0.000	3	48	6.000	5.000	5.000	140.0
3 0.000	2	4	10.00	75.00	0.000	140.0
4 0.000	4	5	10.00	318.0	0.000	140.0
5 0.000	5	6	10.00	297.0	0.000	140.0
6 0.000	6	7	10.00	114.0	0.000	140.0
7 0.000	7	8	10.00	10.00	0.000	140.0
8 0.000	9	6	10.00	109.0	0.000	140.0
9 0.000	9	10	10.00	50.00	0.000	140.0
10 0.000	11	9	10.00	334.0	0.000	140.0
11 0.000	8	12	10.00	230.0	0.000	140.0
12 0.000	12	32	10.00	46.00	0.000	140.0
13 0.000	13	14	10.00	146.0	0.000	140.0
14 0.000	12	15	10.00	262.0	0.000	140.0
15 0.000	15	16	10.00	357.0	0.000	140.0
16 0.000	2	17	10.00	143.0	0.000	140.0
17 0.000	16	18	10.00	331.0	0.000	140.0
18 0.000	17	18	10.00	236.0	0.000	140.0
19 0.000	13	20	10.00	428.0	0.000	140.0
20 0.000	18	28	10.00	89.00	0.000	140.0
21 0.000	20	19	10.00	522.0	0.000	140.0
22 0.000	14	21	10.00	133.0	0.000	140.0
23 0.000	21	22	10.00	539.0	0.000	140.0
24 0.000	22	23	10.00	276.0	0.000	140.0
25 0.000	19	23	10.00	144.0	0.000	140.0
26 0.000	5	24	6.000	77.00	0.000	140.0
27 0.000	4	25	6.000	47.00	0.000	140.0
28	15	26	6.000	33.00	0.000	140.0

0.000						
29	16	27	6.000	31.00	0.000	140.0
0.000						
30	28	19	10.00	54.00	0.000	140.0
0.000						
31	28	29	6.000	41.00	0.000	140.0
0.000						
32	22	30	6.000	37.00	0.000	140.0
0.000						
33	21	31	6.000	11.00	0.000	140.0
0.000						
34	32	13	10.00	97.00	0.000	140.0
0.000						
35	32	33	6.000	16.00	0.000	140.0
0.000						
36	31	34	6.000	5.000	5.000	140.0
0.000						
37	30	35	6.000	5.000	5.000	140.0
0.000						
38	29	36	6.000	5.000	5.000	140.0
0.000						
39	33	37	6.000	5.000	5.000	140.0
0.000						
40	26	38	6.000	5.000	5.000	140.0
0.000						
41	27	39	6.000	5.000	5.000	140.0
0.000						
42	25	40	6.000	5.000	5.000	140.0
0.000						
43	24	41	6.000	5.000	5.000	140.0
0.000						

PIPE CONFIGURATION

Pipe Label Fitt.eq.lnth	Input Node	Output Node	Nom.Bore (in )	Length (ft )	Elevation (ft )	C Factor	(ft
44 0.000	10	42	6.000	5.000	5.000	140.0	
45 0.000	1	44	10.00	81.00	0.000	140.0	
46 0.000	11	43	10.00	366.0	0.000	140.0	
47 0.000	44	43	10.00	211.0	0.000	140.0	
48 0.000	45	44	10.00	77.00	0.000	140.0	
49 0.000	46	45	10.00	5.000	-5.000	140.0	
50 0.000	47	46	10.00	10.00	0.000	140.0	
51 0.000	20	3	6.000	6.000	0.000	140.0	

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (ft )
---------------	---------------	----------------------------

- Fitting types are :
- 1 -- 45 Deg Elbow
  - 2 -- 90 Deg Standard Elbow
  - 3 -- 90 Deg Long Radius Elbow
  - 4 -- Tee or Cross (Flow Turned Thro 90 Deg)
  - 5 -- Gate Valve
  - 6 -- Swing Check Valve
  - 7 -- Non-Return Valve
  - 8 -- Ball Valve
  - 9 -- Butterfly Valve

-----  
-----  
NOZZLE CONFIGURATION  
-----

Nozzle Label	Input Node	Nozzle Type	K-Factor	Req Flow (US.g/min)	Min Press (psi G )	Max Press (psi G )
--						
1 0.15000E+03	42	1	50.0000	500.0000	0.10000E+03	
2 0.15000E+03	41	1	50.0000	500.0000	0.10000E+03	
3 0.15000E+03	40	1	50.0000	500.0000	0.10000E+03	
4 0.15000E+03	39	1	50.0000	500.0000	0.10000E+03	
5 0.15000E+03	38	1	50.0000	500.0000	0.10000E+03	
6 0.15000E+03	37	1	50.0000	500.0000	0.10000E+03	
7 0.15000E+03	36	1	50.0000	500.0000	0.10000E+03	
8 0.15000E+03	35	1	50.0000	500.0000	0.10000E+03	
9 0.15000E+03	34	1	50.0000	500.0000	0.10000E+03	
10 0.15000E+03	48	1	50.0000	500.0000	0.10000E+03	

Nozzle types are :  
1 -- Hydrant

PUMP CONFIGURATION

Pump Min flow Label (US.g/min)	Input		ON	Output Sensor Node Type	Pump Descriptor	Coeffs. of Press Drop (psi )			
	Max flow Node (US.g/min)					Cubic	Quadratic	Linear	Constant
1 0.00	49 3.500E+03		YES	47 None	010-FWS-PP-0 N.A.	N.A.	-4.267E-06	-9.333E-03	175.

01

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (US.g/min)	Pipe Type	Act. Bore (in )	Nom. Size (in )	Pipe Group
1	1	2	717.9054	10	8.6780	10.0000	*
2	3	48	0.0000	10	5.3520	6.0000	*
3	2	4	100.5242	10	8.6780	10.0000	*
4	4	5	100.5242	10	8.6780	10.0000	*
5	5	6	100.5242	10	8.6780	10.0000	*
6	6	7	618.5620	10	8.6780	10.0000	*
7	7	8	618.5620	10	8.6780	10.0000	*
8	9	6	518.0378	10	8.6780	10.0000	*
9	9	10	0.0000	10	8.6780	10.0000	*
10	11	9	518.0378	10	8.6780	10.0000	*
11	8	12	618.5620	10	8.6780	10.0000	*
12	12	32	628.0640	10	8.6780	10.0000	*
13	13	14	678.0697	10	8.6780	10.0000	*
14	12	15	-9.1189	10	8.6780	10.0000	*
15	15	16	-9.1189	10	8.6780	10.0000	*
16	2	17	617.3812	10	8.6780	10.0000	*
17	16	18	-9.1189	10	8.6780	10.0000	*
18	17	18	617.3812	10	8.6780	10.0000	*
19	13	20	-50.0058	10	8.6780	10.0000	*
20	18	28	607.8793	10	8.6780	10.0000	*
21	20	19	-50.0058	10	8.6780	10.0000	*
22	14	21	678.0697	10	8.6780	10.0000	*
23	21	22	59.5613	10	8.6780	10.0000	*
24	22	23	-557.8735	10	8.6780	10.0000	*
25	19	23	557.8735	10	8.6780	10.0000	*
26	5	24	0.0000	10	5.3520	6.0000	*
27	4	25	0.0000	10	5.3520	6.0000	*
28	15	26	0.0000	10	5.3520	6.0000	*
29	16	27	0.0000	10	5.3520	6.0000	*
30	28	19	607.8793	10	8.6780	10.0000	*
31	28	29	0.0000	10	5.3520	6.0000	*
32	22	30	617.4347	10	5.3520	6.0000	*
33	21	31	618.5084	10	5.3520	6.0000	*
34	32	13	628.0640	10	8.6780	10.0000	*
35	32	33	0.0000	10	5.3520	6.0000	*
36	31	34	618.5084	10	5.3520	6.0000	*
37	30	35	617.4347	10	5.3520	6.0000	*
38	29	36	0.0000	10	5.3520	6.0000	*
39	33	37	0.0000	10	5.3520	6.0000	*

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (US.g/min)	Pipe Type	Act. Bore (in )	Nom. Size (in )	Pipe Group
40	26	38	0.0000	10	5.3520	6.0000	*
41	27	39	0.0000	10	5.3520	6.0000	*
42	25	40	0.0000	10	5.3520	6.0000	*
43	24	41	0.0000	10	5.3520	6.0000	*
44	10	42	0.0000	10	5.3520	6.0000	*
45	1	44	-717.9054	10	8.6780	10.0000	*
46	11	43	-518.0378	10	8.6780	10.0000	*
47	44	43	518.0378	10	8.6780	10.0000	*
48	45	44	1235.9432	10	8.6780	10.0000	*
49	46	45	1235.9432	10	8.6780	10.0000	*
50	47	46	1235.9432	10	8.6780	10.0000	*
51	20	3	0.0000	10	5.3520	6.0000	*

A \* indicates that this is a SET diameter

Pipe Materials are :

Pipe Type	Lining Type	Thickness(in )
10 -- HDPE P3GFPE	Not Lined	

FLOW IN PIPES

Pipe Flowrate Label (US.g/min)	Input Velocity Node (ft/s )	Output Node	Nom.Bore (in )	Inlet Pr. (psi G )	Outlet Pr. (psi G )	Drop in Pr. (psi )	Frict. Loss (psi )
1	1	2	10.00	158.3	157.1	1.149	1.149
717.9	3.894						
2	3	48	6.00	156.1	154.0	2.164	1.0252E-05
0.000	0.000						
3	2	4	10.00	157.1	157.1	4.9438E-03	4.9438E-03
100.5	0.5453						
4	4	5	10.00	157.1	157.1	2.0950E-02	2.0950E-02
100.5	0.5453						
5	5	6	10.00	157.1	157.1	1.9547E-02	1.9547E-02
100.5	0.5453						
6	6	7	10.00	157.1	156.9	0.2167	0.2167
618.6	3.355						
7	7	8	10.00	156.9	156.8	1.8997E-02	1.8997E-02
618.6	3.355						
8	9	6	10.00	157.2	157.1	0.1492	0.1492
518.0	2.810						
9	9	10	10.00	157.2	157.2	0.000	0.000
0.000	0.000						
10	11	9	10.00	157.7	157.2	0.4574	0.4574
518.0	2.810						
11	8	12	10.00	156.8	156.4	0.4372	0.4372
618.6	3.355						
12	12	32	10.00	156.4	156.3	8.9920E-02	8.9920E-02
628.1	3.407						
13	13	14	10.00	156.1	155.8	0.3289	0.3289
678.1	3.678						
14	12	15	10.00	156.4	156.4	-2.1362E-04	2.1362E-04
-9.119	-4.9464E-02						
15	15	16	10.00	156.4	156.4	-2.8992E-04	2.8992E-04
-9.119	-4.9464E-02						
16	2	17	10.00	157.1	156.9	0.2707	0.2707
617.4	3.349						
17	16	18	10.00	156.4	156.4	-2.5940E-04	2.5940E-04
-9.119	-4.9464E-02						
18	17	18	10.00	156.9	156.4	0.4468	0.4468
617.4	3.349						
19	13	20	10.00	156.1	156.1	-7.7515E-03	7.7515E-03
-50.01	-0.2712						
20	18	28	10.00	156.4	156.2	0.1637	0.1637
607.9	3.297						
21	20	19	10.00	156.1	156.1	-9.4757E-03	9.4757E-03
-50.01	-0.2712						
22	14	21	10.00	155.8	155.5	0.2996	0.2996
678.1	3.678						
23	21	22	10.00	155.5	155.5	1.3535E-02	1.3535E-02
59.56	0.3231						
24	22	23	10.00	155.5	155.9	-0.4332	0.4332
-557.9	-3.026						
25	19	23	10.00	156.1	155.9	0.2260	0.2260
557.9	3.026						
26	5	24	6.00	157.1	157.1	0.000	0.000
0.000	0.000						
27	4	25	6.00	157.1	157.1	0.000	0.000
0.000	0.000						

28	15	26	6.00	156.4	156.4	0.000	0.000
0.000	0.000						
29	16	27	6.00	156.4	156.4	0.000	0.000
0.000	0.000						
30	28	19	10.00	156.2	156.1	9.9350E-02	9.9350E-02
607.9	3.297						
31	28	29	6.00	156.2	156.2	0.000	0.000
0.000	0.000						
32	22	30	6.00	155.5	154.8	0.7375	0.7375
617.4	8.805						
33	21	31	6.00	155.5	155.3	0.2200	0.2200
618.5	8.821						
34	32	13	10.00	156.3	156.1	0.1896	0.1896
628.1	3.407						
35	32	33	6.00	156.3	156.3	0.000	0.000
0.000	0.000						
36	31	34	6.00	155.3	153.0	2.264	0.1000
618.5	8.821						
37	30	35	6.00	154.8	152.5	2.263	9.9681E-02
617.4	8.805						
38	29	36	6.00	156.2	154.1	2.164	1.0252E-05
0.000	0.000						
39	33	37	6.00	156.3	154.2	2.164	1.0252E-05
0.000	0.000						
40	26	38	6.00	156.4	154.2	2.164	1.0252E-05
0.000	0.000						
41	27	39	6.00	156.4	154.2	2.164	1.0252E-05
0.000	0.000						

FLOW IN PIPES

Pipe Flowrate Label (US.g/min)	Input Velocity Node (ft/s )	Output Node	Nom.Bore (in )	Inlet Pr. (psi G )	Outlet Pr. (psi G )	Drop in Pr. (psi )	Frict. Loss (psi )
42 0.000	25 0.000	40	6.00	157.1	155.0	2.164	1.0252E-05
43 0.000	24 0.000	41	6.00	157.1	154.9	2.164	2.0266E-05
44 0.000	10 0.000	42	6.00	157.2	155.1	2.164	2.0266E-05
45 -717.9	1 -3.894	44	10.00	158.3	158.5	-0.2027	0.2027
46 -518.0	11 -2.810	43	10.00	157.7	158.2	-0.5012	0.5012
47 518.0	44 2.810	43	10.00	158.5	158.2	0.2889	0.2889
48 1236.	45 6.704	44	10.00	159.0	158.5	0.5266	0.5266
49 1236.	46 6.704	45	10.00	156.9	159.0	-2.130	3.4185E-02
50 1236.	47 6.704	46	10.00	156.9	156.9	6.8390E-02	6.8390E-02
51 0.000	20 0.000	3	6.00	156.1	156.1	0.000	0.000

FLOW THROUGH NOZZLES

Nozzle FlowDens Label US.g/min/ft	Input Label **2 )	Inlet Press (psi G )	Req. Flow (US.g/min)	Flowrate (US.g/min)	% Deviation	Req. FlowDens (
1	42	0.15507E+03	500.0000	0.0000 *	-100.00	
2	41	0.15494E+03	500.0000	0.0000 *	-100.00	
3	40	0.15496E+03	500.0000	0.0000 *	-100.00	
4	39	0.15425E+03	500.0000	0.0000 *	-100.00	
5	38	0.15425E+03	500.0000	0.0000 *	-100.00	
6	37	0.15416E+03	500.0000	0.0000 *	-100.00	
7	36	0.15409E+03	500.0000	0.0000 *	-100.00	
8	35	0.15249E+03	500.0000	617.4333	23.49	
9	34	0.15302E+03	500.0000	618.5070	23.70	
10	48	0.15398E+03	500.0000	0.0000 *	-100.00	

Note: A \* after a value indicates that this is a specification

-----  
FLOW THROUGH PUMPS  
-----

Pump Req.	Setting (%)	Flowrate (US.g/min)	Inlet Pr. (psi G )	Outlet Pr. (psi G )	Press Drop (psi )	NPSHA (ft )	Cavitation Parameter	Power
1	100.0	1236.	0.000	156.9	156.9	33.37	9.2003E-02	

Note: The calculation of NPSHA and cavitation parameter is based on the vapour pressure of water at 60 F (15.6 C) --> -14.44 psi G

-----  
-----  
  
FLOW AT INLETS  
-----

Inlet Node	Pressure (psi G )	Flowrate (US.g/min)	Equivalent K-factor (US.g/min , psi G )
49	0.000	* 1236.	0.0000

Note: A \* after a value indicates that this is a specification

-----  
-----  
Materials Take-off  
-----

Pipe lengths  
-----

HDPE P3GFPE

Nom. Size	Tot. Length	Nom. Size	Tot. Length	Nom. Size	Tot. Length	Nom. Size	Tot. Length	Nom. Size
Size	Tot. Length	Size	Tot. Length	Size	Tot. Length	Size	Tot. Length	Size
(in )	(ft )	(in )	(ft )	(in )	(ft )	(in )	(ft )	(in )
(ft )		(ft )		(ft )		(ft )		(ft )

-----

-----  
-----  
6.000 349.0  
10.000 6549.

-----  
-----  
Materials Take-off  
-----

Nozzles  
-----

Type ----	K-Factor -----	Number -----
Hydrant	50.0000	10

-----  
-----  
Materials Take Off  
-----

Fittings  
-----

Fitting Nominal Size (in )	1	2	Fitting Type						9
			3	4	5	6	7	8	

-----

Fitting Types are :

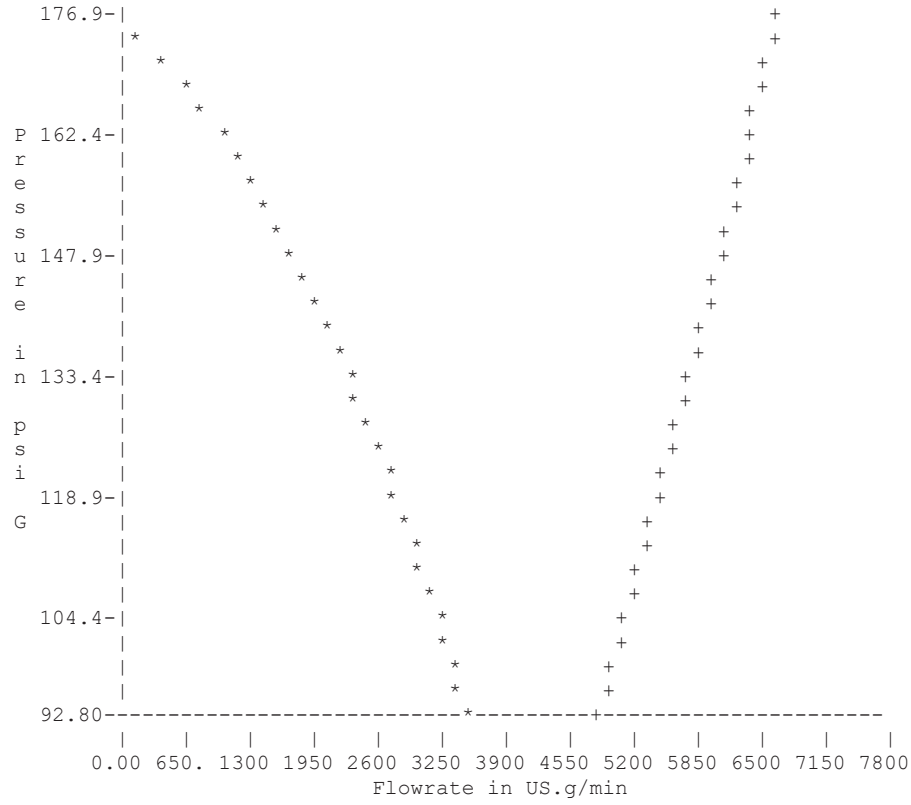
- |                               |                        |                       |
|-------------------------------|------------------------|-----------------------|
| 1 -- 45 Deg Elbow             | 4 -- Tee or Cross      | 7 -- Non-Return Valve |
| 2 -- 90 Deg Standard Elbow    | 5 -- Gate Valve        | 8 -- Ball Valve       |
| 3 -- 90 Deg Long Radius Elbow | 6 -- Swing Check Valve | 9 -- Butterfly Valve  |

All fittings are as specified by user - no additional fittings have been generated automatically.

Other Equipment  
-----

Type -----	Number -----
Pumps	1

SUPPLY DEMAND GRAPH



-----  
-----  
Explanation of Supply/Demand Graph  
-----

+ marks the composite demand curve  
\* marks the composite supply curve

Operating pumps are: 1  
Open nozzles are : 8 9

Datum is positioned at height of pump 1

IMPORTANT NOTICE

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Your attention is drawn to the need to maintain adequate standards. SUNRISE SYSTEMS Ltd has itself taken steps to ensure that this program produces valid results when properly used. Users are reminded of their responsibilities in the application of program results and, in particular, you should ensure that pertinent output documents are examined and approved by qualified staff prior to use.

-----

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COMMENTS

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Analysis Converged in 5 Iterations

-----  
-----  
WARNINGS  
-----

\*\*\* WARNING - Nozzle 8 above maximum operating pressure  
\*\*\* WARNING - Nozzle 9 above maximum operating pressure

=====

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Calpine Tanager Bess Firewater Hydraulic Study

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## **Appendix E. IFC Code Energy Storage Systems**

## Appendix – E - IFC Codes – Energy Storage Systems

### IFC Clause 1202 – Definitions (Referred in Section-3 Fire Water Demand Evaluation)

#### CHAPTER

# 12

## ENERGY SYSTEMS

#### User notes:

##### About this chapter:

Chapter 12 was added to address the current energy systems found in this code, and is provided for the introduction of a wide range of systems to generate and store energy in, on and adjacent to buildings and facilities. The expansion of such energy systems is related to meeting today's energy, environmental and economic challenges. Ensuring appropriate criteria to address the safety of such systems in building and fire codes is an important part of protecting the public at large, building occupants and emergency responders. More specifically, this chapter addresses standby and emergency power, portable generators, photovoltaic systems, fuel cell energy systems and energy storage systems.

#### SECTION 1201—GENERAL

**1201.1 Scope.** The provisions of this chapter shall apply to the installation, operation, maintenance, repair, retrofitting, testing, commissioning and decommissioning of energy systems used for generating or storing energy, including but not limited to energy storage systems under the exclusive control of an electric utility or lawfully designated agency. It shall not apply to equipment associated with the generation, control, transformation, transmission, or distribution of energy installations that is under the exclusive control of an electric utility or lawfully designated agency. Energy storage systems regulated by Section 1207 shall comply with this chapter, as appropriate, and [NFPA 855](#).

**1201.2 Electrical wiring and equipment.** Electrical wiring and equipment used in connection with energy systems shall be installed and maintained in accordance with this chapter, Section 603 and [NFPA 70](#).

**1201.3 Mixed system installation.** Where mixed systems are approved, the aggregate nameplate kWh energy of all energy storage systems in a fire area shall not exceed the maximum quantity specified for any of the energy systems in this chapter. Where required by the fire code official, a hazard mitigation analysis shall be provided and approved in accordance with Section 104.2.2 to evaluate any potential adverse interaction between the various energy systems and technologies.



#### SECTION 1202—DEFINITIONS

**1202.1 Definitions.** The following terms are defined in Chapter 2:

**BATTERY SYSTEM, STATIONARY STORAGE.**

BATTERY TYPES.

CAPACITOR ENERGY STORAGE SYSTEM.

CRITICAL CIRCUIT.

EMERGENCY POWER SYSTEM.

ENERGY STORAGE MANAGEMENT SYSTEMS.

**IFC Clause 1207 – Electrical Energy Storage Systems  
(Referred in Section-3 Fire Water Demand Evaluation)**

**SECTION 1207—ELECTRICAL ENERGY STORAGE SYSTEMS (ESS)**



**1207.1 General.** The provisions in this section are applicable to stationary and mobile electrical energy storage systems (ESS).

**Exception:** ESS in Group R-3 and R-4 occupancies shall only be required to comply with Section 1207.11 except where Section 1207.11.4 requires compliance with Sections 1207.1 through 1207.9.

**1207.1.1 Utilities and industrial applications.** This section shall not apply to capacitors and capacitor equipment for electric utilities and industrial facilities used in applications such as flexible AC transmission (FACTS) devices, filter capacitor banks, power factor correction, and standalone capacitor banks for voltage correction and stabilization. (Material based on [NFPA 855](#) 2023 Ed.)

**1207.1.2 Mobile ESS.** Mobile ESS deployed at an electric utility substation or generation facility for 90 days or less shall not add to the threshold values in Table 1207.1.3 for the stationary ESS installation if both of the following conditions apply:

1. The mobile ESS complies with Section 1207.10.
2. The mobile ESS is being used only during periods in which the facility's stationary ESS is being tested, repaired, retrofitted or replaced.

(Material based on [NFPA 855](#) 2023 Ed.)

**1207.1.3 Scope.** ESS having capacities exceeding the values shown in Table 1207.1.3 shall comply with this section. (Material based on [NFPA 855](#) 2023 Ed.)

**TABLE 1207.1.3—ENERGY STORAGE SYSTEM (ESS) THRESHOLD QUANTITIES**

TECHNOLOGY	ENERGY CAPACITY <sup>a</sup>
Capacitor ESS	3 kWh
Flow batteries <sup>b</sup>	20 kWh
Lead-acid batteries, all types	70 kWh <sup>c</sup>
Lithium-ion batteries	20 kWh
Nickel-cadmium (Ni-Cd), nickel metal hydride (Ni-MH) and nickel zinc (Ni-Zn) batteries	70 kWh
Nonelectrochemical ESS <sup>d</sup>	70 kWh
Other battery technologies	10 kWh
Other electrochemical ESS technologies	3 kWh
Sodium nickel chloride batteries	70 kWh
Zinc manganese dioxide batteries (Zn-MnO <sub>2</sub> )	70 kWh

For SI: 1 kilowatt hour = 3.6 megajoules.

a. Energy capacity is the total energy capable of being stored (nameplate rating), not the usable energy rating. For units rated in amp-hours, kWh shall equal rated voltage times amp-hour rating divided by 1,000.

b. Shall include vanadium, zinc-bromine, polysulfide-bromide and other flowing electrolyte-type technologies.

**IFC Clause 1207.1 and 1207.7.4 –  
(Referred in Section-4 Firewater storage capacity requirement)**

**1207.1.6.2 Analysis approval.** The *fire code official* is authorized to approve the hazardous mitigation analysis provided that the consequences of the hazard mitigation analysis demonstrate:

1. Fires will be contained within unoccupied ESS rooms or areas for the minimum duration of the fire-resistance-rated separations identified in Section 1207.7.4.
2. Fires involving the ESS will allow occupants or the general public to evacuate to a safe location. (Material based on NFPA 855 2023 Ed.)

(Material based on NFPA 855 2023 Ed.)

**1207.7.4 Fire-resistance-rated separations.** Rooms and areas containing ESS shall include *fire-resistance-rated* separations as follows:

1. In dedicated-use buildings, rooms and areas containing ESS shall be separated from areas in which administrative and support personnel are located.
2. In nondedicated-use buildings, rooms and areas containing ESS shall be separated from other areas in the building.

Separation shall be provided by 2-hour *fire barriers* constructed in accordance with Section 707 of the *International Building Code* and 2-hour *horizontal assemblies* constructed in accordance with Section 711 of the *International Building Code*, as appropriate. (Material based on NFPA 855 2023 Ed.)



## **Appendix F. BESS Details**

# BESS Container

## 5.015 MWh

Liquid-cooled battery storage system



Preliminary

**Liquid-cooled battery storage system based on HiTHIUM prismatic LFP BESS Cells 314 Ah with very high cyclic lifetime.**

Improved safety characteristics and specially optimised for the highest requirements on safety, reliability and performance. Suitable e.g. for industrial, utility, and grid serving applications.

- Product certifications:  
IEC 62619, IEC 62477, IEC 63056, IEC 61000, UL 1973, UL 9540A, UN 38.3
- Company certifications:  
ISO 9001, ISO 14001, ISO 45001, SA 8000
- Environmental Compliance:  
RoHS, REACH, Cobalt free

### High safety

- High thermal stability thanks to liquid cooling
- Multi-stage, active fire protection system, compliance to NFPA 855
- Use of highly safe prismatic HITHIUM LFP cells
- Dedicated cell monitoring and protection system

### Low LCOS (Levelised Cost of Storage)

- Excellent thermal management improves energy throughput by ensuring optimal operating temperature
- Highly integrated: including thermal management system, fire protection system, BMS, etc.
- Supports back to back and side by side installations

# BESS Container

## 5.015 MWh

Liquid-cooled battery storage system based on prismatic LFP cells with very high cyclic lifetime



GENERAL	
Battery Type	HiTHIUM LFP314-2P52S
No. of Battery Modules	48 (6 x 8)
Configuration	6*2P416S
Cooling Method	Liquid Cooling
BMS Communication	CAN, RS485, Ethernet
Gravimetric	≥ 119 Wh/kg
Volumetric	≥ 117 Wh/l
Application Altitude	≤ 4,000 m

ELECTRICAL	
Nominal Voltage Container	1,331.2 V
Operating Voltage Container	1,040 ... 1,500V
Nominal Energy Container	5,015.96 kWh <sup>1,2</sup>
Nominal SOC at delivery	27 % <sup>2</sup>
Nominal Charge/Discharge Rate	0.5 P / 0.5 P
Round Trip Efficiency	> 94 %

<sup>1</sup> 0.5 P / 0.5 P

<sup>2</sup> 25°C +/- 2.0

<sup>3</sup> ambient temperature

MECHANICAL	
Dimensions (L x W x H)	6,058 x 2,438 x 2,896 mm
Weight Container (20 ft.)	< 42,000 kg
Protection Level	IP 55

TEMPERATURE RANGE	
Operating	-30 °C ... 55 °C <sup>3</sup>
Storing (recommended)	-20 °C ... 35 °C <sup>3</sup>

PRODUCT CERTIFICATIONS	
Certificates and Reports	IEC 62619, IEC 62477, IEC 63056, IEC 61000, UL 1973, UL 9540A, NFPA 855
Safe Transportation	UN 38.3

ENVIRONMENTAL	
Compliance	RoHS, REACH, Cobalt free
Battery Regulation (EU)	2023/1542

COMPANY CERTIFICATIONS	
	ISO 9001, ISO 14001, ISO 45001, SA 8000

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