FACILITY CONDITION ASSESSMENT

prepared for

Town of Paradise Valley
6401 East Lincoln Drive
Paradise Valley, AZ 85253

Fire Station 91
8444 North Tatum Boulevard
Paradise Valley, AZ 85253

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ON SITE DATE:
May 29, 2025

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1. Executive Summary

Property Overview and Assessment Details

General Information	
Property Type	Fire Station
Number of Buildings	1
Main Address	Fire Station 91, 8444 North Tatum Boulevard, Paradise Valley, AZ 85253
Site Developed	2009
Outside Occupants / Leased Spaces	None
Date(s) of Visit	May 29, 2025
Management Point of Contact	Paradise Valley Public Works Mr. Isaac Chavira, Public Works Director (480) 348-3540, ichavira@paradisevalleyaz.gov
On-site Point of Contact (POC)	Paradise Valley Public Works Eric Shurtleff, Facility Maintenance Technician (602) 769-0629
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AssetCalc Link	Full dataset for this assessment can be found at: https://www.assetcalc.net/

Significant/Systemic Findings and Deficiencies

Historical Summary

Fire Station 91 is fire station located in Paradise Valley, Arizona and is served by the Phoenix Fire Department. It is part of Battalion 2 in the East District and was formerly known as Fire Station 1.

Fire Station 91 consists of one building built in 2009. It measures approximate 9,961 square feet, and contains dorm rooms, dorm restrooms, a residential kitchen, a day room, a fitness room, a laundry room, apparatus bays and support spaces, and restrooms. There were no major renovations conducted since construction.

Architectural

Fire Station 91 is a masonry structure with steel-framed roof decking and beams. The structure is built on a concrete slab foundation with typical perimeter concrete wall footings. The roof structures of the buildings are mainly medium sloped metal construction with flat sections covered in cement tile. The glazing is aluminum windows including four glazed overhead doors in the apparatus bays.

At the interior of the fire station, most of the walls are painted gypsum or glazed CMU. The ceilings are acoustical tile, with limited areas of painted gypsum and exposed ceilings in the apparatus bay. Most of the flooring in the building is terrazzo or sealed concrete.

Mechanical, Electrical, Plumbing and Fire (MEPF)

Fire Station 92 is heated and cooled by condensing units and fan coil units/interior air handlers. Electrical service is made up of a local utility-fed, interior switchboard that feeds distribution panels throughout including rooftop-mounted solar panels. There is a diesel generator and an automatic transfer switch. Interior lighting consists mainly of fluorescent fixtures.

The building has municipal water and sewer. Hot water is provided by an electric-powered tankless water heater, and No concerns have been addressed by maintenance personnel regarding ongoing plumbing issues.

The building is outfitted with a wet-pipe fire sprinkler system. There is fire suppression within the kitchen hood system. The building is equipped with fire extinguishers.

Site

The site is approximately 0.94 acres and is mildly sloped throughout. The building is located in the center of the site and has parking areas in the west and south portions of the site.

Site hardscape at Fire Station 91 consists concrete driveways, three parking areas, concrete and sidewalks adjacent to the building.

The site is covered in stone landscaping with irrigation and mature trees clustered in the parking lot and at the site edges. There are numerous building-mounted and walkway light fixtures.

Recommended Additional Studies

No additional studies recommended at this time.

Facility Condition Index (FCI)

One of the major goals of the FCA is to calculate the Facility Condition Index (FCI), which provides a theoretical objective indication of a facility's overall condition. The FCI is defined as the ratio of the cost of current needs divided by the current replacement value (CRV) of the facility. The chart below presents the industry standard ranges and cut-off points.

FCI Ranges and Description	
0 – 5%	In new or well-maintained condition, with little visual evidence of wear or deficiencies.
5 – 10%	Subjected to wear but is still in a serviceable and functioning condition.
10 – 30%	Subjected to hard or long-term wear. Nearing the end of its useful or serviceable life.
30% and above	Has reached the end of its useful or serviceable life. Renewal is now necessary.

The deficiencies and lifecycle needs identified in this assessment provide the basis for a portfolio-wide capital improvement funding strategy. In addition to the current FCI, extended FCI's have been developed to provide owners the intelligence needed to plan and budget for the "keep-up costs" for their facilities. As such the 3-year, 5-year, and 10-year FCI's are calculated by dividing the anticipated needs of those respective time periods by current replacement value. As a final point, the FCI's ultimately provide more value when used to relatively compare facilities across a portfolio instead of being over-analyzed and scrutinized as stand-alone mathematical values. The table below presents the current, 3-year, 5-year, and 10-year FCI's for this facility:

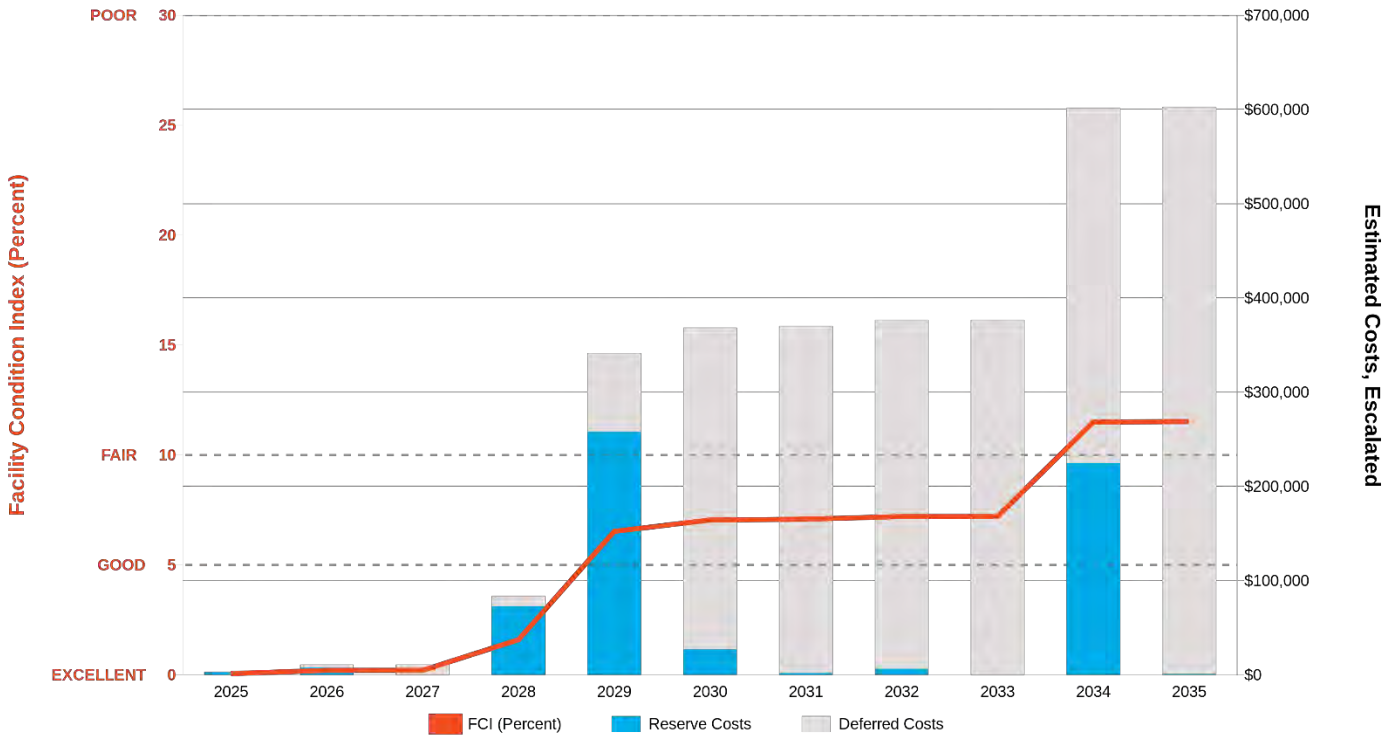
FCI Analysis		
Replacement Value *$5,229,525*	*Total SF* *9,961*	*Cost/SF* *$525*

	Est Reserve Cost	FCI
Current	$3,000	0.1 **%**
3-Year	$83,700	1.6 **%**
5-Year	$368,500	7.0 **%**
10-Year	$602,600	11.5 **%**

NEEDS OVER TIME: The vertical blue bars in the graphic below represent the year-by-year needs identified for the facility. The orange line forecasts what would happen to the FCI (left Y axis) over time, assuming zero capital expenditures over the next ten years. The dollar amounts allocated for each year are associated with the values along the right Y axis.

Needs by Year with Unaddressed FCI Over Time

Replacement Value: $5,229,525.00 **Inflation Rate: 3%** **Average Needs (per year - over next 10 years): $54,773.00**



Immediate Needs

Location	UF Code	Description	Condition	Plan Type	Cost
Fire Station 91	D5013	Solar Power, Inverter, 2.8 KW, Replace	Failed	Performance/Integrity	$3,000
TOTAL (1 items)					**$3,000**

Key Findings

Solar Power in Failed condition.

Inverter, 2.8 KW
Fire Station 91
Electrical Room

Uniformat Code: D5010
Recommendation: **Replace in 2025**

Plan Type: Performance/Integrity

Cost Estimate: $3,000

Non-functional. OOC 3-4 years. - AssetCALC ID: 9407858

Evaporative Cooler in Poor condition.

2 to 3 HP
Fire Station 91
Site Utility Areas

Uniformat Code: D3030
Recommendation: **Replace in 2026**

Plan Type: Performance/Integrity

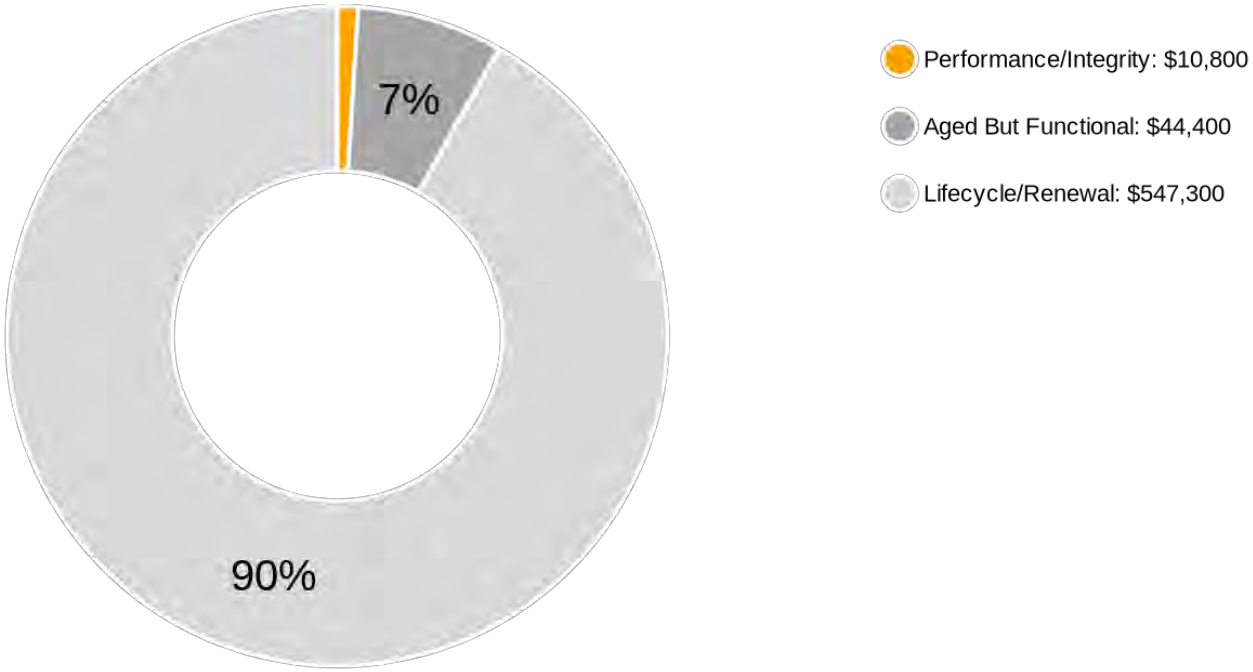
Cost Estimate: $7,600

Actively leaking - AssetCALC ID: 9407870

Plan Types

Each line item in the cost database is assigned a Plan Type, which is the primary reason or rationale for the recommended replacement, repair, or other corrective action. This is the “why” part of the equation. A cost or line item may commonly have more than one applicable Plan Type; however, only one Plan Type will be assigned based on the “best” fit, typically the one with the greatest significance and highest on the list below.

Plan Type Descriptions & Distribution		
Safety		An observed or reported unsafe condition that if left unaddressed could result in injury; a system or component that presents potential liability risk.
Performance/Integrity		Component or system has failed, is almost failing, performs unreliably, does not perform as intended, and/or poses risk to overall system stability.
Accessibility		Does not meet ADA, UFAS, and/or other accessibility requirements.
Environmental		Improvements to air or water quality, including removal of hazardous materials from the building or site.
Retrofit/Adaptation		Components, systems, or spaces recommended for upgrades in in order to meet current standards, facility usage, or client/occupant needs.
Aged But Functional		Any component or system that has aged past its industry-average expected useful life (EUL) but is not currently deficient or problematic.
Lifecycle/Renewal		Any component or system that is neither deficient nor aged past EUL but for which future replacement or repair is anticipated and budgeted.



10-Year Total: $602,500

2. Building Systems and Site Elements

Building Systems Summary		
Address	8444 North Tatum Boulevard, Paradise Valley, AZ 85253	
GPS Coordinates	33.5604822, -111.9774691	
Constructed/Renovated	2009	
Building Area	9,961 SF	
Number of Stories	1 above grade (mechanical mezzanines are present but not included in the count)	
System	*Description*	*Condition*
Structure	Masonry bearing walls with metal roof deck supported by open-web steel joists and concrete strip/wall footing foundation system	Fair
Facade	Primary Wall Finish: Brick Windows: Aluminum	Fair
Roof	Primary: Gable construction with metal finish Secondary: Flat construction with clay/concrete tiles	Fair
Interiors	Walls: Painted gypsum board, and glazed CMU Floors: Terrazzo and sealed concrete Ceilings: Painted gypsum board and ACT, wood plank, and unfinished/exposed	Fair
Elevators	None	Fair

Building Systems Summary		
Plumbing	Distribution: Copper, PVC waste & venting Hot Water: Electric tankless water heater Fixtures: Toilets and sinks in all restrooms, urinal in lobby restroom, showers in dorm restrooms	Fair
HVAC	Non-Central System: Condensing units with FCUs	Fair
Fire Suppression	Wet-pipe sprinkler system and fire extinguishers	Fair
Electrical	Source & Distribution: Main switchboard Interior Lighting: Linear fluorescent Emergency Power: Diesel generator with automatic transfer switch	Fair
Fire Alarm	Alarm panel with smoke detectors, heat detectors, alarms, strobes, pull stations, back-up emergency lights, and exit signs	Fair
Equipment/Special	None	Fair
Accessibility	Presently it does not appear an accessibility study is needed for this building. See the appendix for associated photos and additional information.	
Additional Studies	No additional studies are currently recommended for the building.	
Areas Observed	The interior spaces were observed to gain a clear understanding of the facility's overall condition. Other areas accessed and assessed included the exterior equipment and assets directly serving the building, the exterior walls of the facility, and the roof.	
Key Spaces Not Observed	All key areas of the facility were accessible and observed.	

Site Information		
Site Area	0.94 acres	
Parking Spaces	14 total spaces all in open lots; 1 of which are accessible.	
System	*Description*	*Condition*
Site Pavement	Concrete lots with adjacent concrete sidewalks, curbs and ramps	Fair
Site Development	Building-mounted signage; wrought iron, CMU wall fencing; Limited picnic tables, trash receptacles	Fair
Landscaping & Topography	Limited landscaping features trees and bushes Irrigation present Brick retaining walls Low to moderate site slopes throughout	Fair
Utilities	Municipal water and sewer Local utility-provided electric	Fair
Site Lighting	Building-mounted: fluorescent Pedestrian walkway and landscape accent lighting	Fair
Ancillary Structures	None	Fair
Site Accessibility	Presently it does not appear an accessibility study is needed for the exterior and site areas. See the appendix for associated photos and additional information.	
Site Additional Studies	No additional studies are currently recommended for the site areas.	
Site Areas Observed	The exterior areas within the property boundaries were observed to gain a clear understanding of the site's overall condition.	
Site Key Spaces Not Observed	Areas of note that were either inaccessible or not observed for other reasons are listed here: · Roof; lack of ladder or other means of access // safety concerns (no notable equipment present)	

The table below shows the anticipated costs by trade or building system over the next 20 years.

Fire Station 91: System Expenditure Forecast

System	Immediate	Short Term (1-2 yr)	Near Term (3-5 yr)	Med Term (6-10 yr)	Long Term (11-20 yr)	TOTAL
Structure	$0	$0	$0	$0	$0	$0
Facade	$0	$0	$32,254	$0	$171,160	$203,414
Roofing	$0	$0	$4,558	$5,219	$0	$9,777
Interiors	$0	$0	$42,145	$15,983	$116,450	$174,578
Conveying	$0	$0	$0	$22,181	$0	$22,181
Plumbing	$0	$0	$0	$1,910	$43,448	$45,358
HVAC	$0	$7,828	$66,252	$6,395	$191,884	$272,359
Fire Protection	$0	$0	$0	$13,906	$9,983	$23,889
Electrical	$3,000	$0	$99,611	$164,400	$13,484	$280,495
Fire Alarm & Electronic Systems	$0	$0	$52,130	$0	$0	$52,130
Equipment & Furnishings	$0	$0	$49,296	$0	$5,596	$54,892
Sitework	$0	$0	$11,367	$4,071	$3,781	$19,219
TOTALS	**$3,000**	**$7,900**	**$357,700**	**$234,100**	**$555,800**	**$1,158,500**

3. ADA Accessibility

Generally, Title II of the Americans with Disabilities Act (ADA) prohibits discrimination by entities to access and use of “areas of public accommodations” and “public facilities” on the basis of disability. Regardless of their age, these areas and facilities must be maintained and operated to comply with the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

A public entity (i.e. city governments) shall operate each service, program, or activity so that the service, program, or activity, when viewed in its entirety, is readily accessible to and usable by individuals with disabilities.

However, this does not:

1. Necessarily require a public entity to make each of its existing facilities accessible to and usable by individuals with disabilities;
2. Require a public entity to take any action that would threaten or destroy the historic significance of an historic property; or
3. Require a public entity to take any action that it can demonstrate would result in a fundamental alteration in the nature of a service, program, or activity or in undue financial and administrative burdens. In those circumstances where personnel of the public entity believe that the proposed action would fundamentally alter the service, program, or activity or would result in undue financial and administrative burdens, a public entity has the burden of proving that compliance with 35.150(a) of this part would result in such alteration or burdens. The decision that compliance would result in such alteration or burdens must be made by the head of a public entity or his or her designee after considering all resources available for use in the funding and operation of the service, program, or activity, and must be accompanied by a written statement of the reasons for reaching that conclusion. If an action would result in such an alteration or such burdens, a public entity shall take any other action that would not result in such an alteration or such burdens but would nevertheless ensure that individuals with disabilities receive the benefits or services provided by the public entity.

Removal of barriers to accessibility should be addressed from a liability standpoint in order to comply with federal law, but the barriers may or may not be building code violations. The Americans with Disabilities Act Accessibility Guidelines are part of the ADA federal civil rights law pertaining to the disabled and are not a construction code. State and local jurisdictions have adopted the ADA Guidelines or have adopted other standards for accessibility as part of their construction codes.

During the FCA, Bureau Veritas performed a limited high-level accessibility review of the facility non-specific to any local regulations or codes. The scope of the visual observation was limited to the same areas observed while performing the FCA and the categories set forth in the material included in the appendix. It is understood by the Client that the limited observations described herein do not comprise a full ADA Compliance Survey, and that such a survey is beyond the scope of this assessment. A full measured ADA survey would be required to identify more specific potential accessibility issues. Additional clarifications of this limited survey:

- This survey was visual in nature and actual measurements were not taken to verify compliance
- Only a representative sample of areas was observed
- Two overview photos were taken for each subsection regardless of perceived compliance or non-compliance
- Itemized costs for individual non-compliant items are included in the dataset
- For any “none” boxes checked or reference to “no issues” identified, that alone does not guarantee full compliance

The facility was originally constructed in 2009. The facility has not since been substantially renovated.

No detailed follow-up accessibility study is currently recommended since no major or moderate issues were identified at the subject site. Reference the appendix for specific data, photos, and tables or checklists associated with this limited accessibility survey.

4. Purpose and Scope

Purpose

Bureau Veritas was retained by the client to render an opinion as to the Property's current general physical condition on the day of the site visit.

Based on the observations, interviews and document review outlined below, this report identifies significant deferred maintenance issues, existing deficiencies, and material code violations of record, which affect the Property's use. Opinions are rendered as to its structural integrity, building system condition and the Property's overall condition. The report also notes building systems or components that have realized or exceeded their typical expected useful lives.

The physical condition of building systems and related components are typically defined as being in one of five condition ratings. For the purposes of this report, the following definitions are used:

Condition Ratings	
Excellent	New or very close to new; component or system typically has been installed within the past year, sound and performing its function. Eventual repair or replacement will be required when the component or system either reaches the end of its useful life or fails in service.
Good	Satisfactory as-is. Component or system is sound and performing its function, typically within the first third of its lifecycle. However, it may show minor signs of normal wear and tear. Repair or replacement will be required when the component or system either reaches the end of its useful life or fails in service.
Fair	Showing signs of wear and use but still satisfactory as-is, typically near the median of its estimated useful life. Component or system is performing adequately at this time but may exhibit some signs of wear, deferred maintenance, or evidence of previous repairs. Repair or replacement will be required due to the component or system's condition and/or its estimated remaining useful life.
Poor	Component or system is significantly aged, flawed, functioning intermittently or unreliably; displays obvious signs of deferred maintenance; shows evidence of previous repair or workmanship not in compliance with commonly accepted standards; has become obsolete; or exhibits an inherent deficiency. The present condition could contribute to or cause the deterioration of contiguous elements or systems. Either full component replacement is needed or repairs are required to restore to good condition, prevent premature failure, and/or prolong useful life.
Failed	Component or system has ceased functioning or performing as intended. Replacement, repair, or other significant corrective action is recommended or required.
Not Applicable	Assigning a condition does not apply or make logical sense, most commonly due to the item in question not being present.

Scope

The standard scope of the Facility Condition Assessment includes the following:

- Visit the Property to evaluate the general condition of the building and site improvements, review available construction documents in order to familiarize ourselves with, and be able to comment on, the in-place construction systems, life safety, mechanical, electrical, and plumbing systems, and the general built environment.
- Identify those components that are exhibiting deferred maintenance issues and provide cost estimates for Immediate Costs and Replacement Reserves based on observed conditions, maintenance history and industry standard useful life estimates. This will include the review of documented capital improvements completed within the last five-year period and work currently contracted for, if applicable.
- Provide a full description of the Property with descriptions of in-place systems and commentary on observed conditions.
- Provide a high-level categorical general statement regarding the subject Property's compliance to Title III of the Americans with Disabilities Act. This will not constitute a full ADA survey, but will help identify exposure to issues and the need for further review.
- Obtain background and historical information about the facility from a building engineer, property manager, maintenance staff, or other knowledgeable source. The preferred methodology is to have the client representative or building occupant complete a Pre-Survey Questionnaire (PSQ) in advance of the site visit. Common alternatives include a verbal interview just prior to or during the walk-through portion of the assessment.
- Review maintenance records and procedures with the in-place maintenance personnel.
- Observe a representative sample of the interior spaces/units, including vacant spaces/units, to gain a clear understanding of the property's overall condition. Other areas to be observed include the exterior of the property, the roofs, interior common areas, and the significant mechanical, electrical and elevator equipment rooms.
- Provide recommendations for additional studies, if required, with related budgetary information.
- Provide an Executive Summary at the beginning of this report, which highlights key findings and includes a Facility Condition Index as a basis for comparing the relative conditions of the buildings within the portfolio.

5. Opinions of Probable Costs

Cost estimates are embedded throughout this report, including the very detailed Replacement Reserves report in the appendix. The cost estimates are predominantly based on construction rehabilitation costs developed by the *RSMeans data from Gordian.* While the *RSMeans data from Gordian* is the primary reference source for the Bureau Veritas cost library, secondary and supporting sources include but are not limited to other industry experts work, such as *Marshall & Swift* and *CBRE Whitestone.* For improved accuracy, additional research integrated with Bureau Veritas's historical experience with past costs for similar properties, city cost indexes, and assumptions regarding future economic conditions also come into play when deemed necessary. Invoice or bid documents provided either by the owner or facility construction resources may be reviewed early in the process or for specific projects as warranted.

Opinions of probable costs should only be construed as preliminary, order of magnitude budgets. Actual costs most probably will vary from the consultant's opinions of probable costs depending on such matters as type and design of suggested remedy, quality of materials and installation, manufacturer and type of equipment or system selected, field conditions, whether a physical deficiency is repaired or replaced in whole, phasing or bundling of the work (if applicable), quality of contractor, quality of project management exercised, market conditions, use of subcontractors, and whether competitive pricing is solicited, etc. Certain opinions of probable costs cannot be developed within the scope of this guide without further study. Opinions of probable cost for further study should be included in the FCA.

Methodology

Based upon site observations, research, and judgment, along with referencing Expected Useful Life (EUL) tables from various industry sources, Bureau Veritas opines as to when a system or component will most probably necessitate replacement. Accurate historical replacement records, if provided, are typically the best source of information. Exposure to the elements, initial quality and installation, extent of use, the quality and amount of preventive maintenance exercised, etc., are all factors that impact the effective age of a system or component. As a result, a system or component may have an effective age that is greater or less than its actual chronological age. The Remaining Useful Life (RUL) of a component or system equals the EUL less its *effective age*, whether explicitly or implicitly stated. Projections of Remaining Useful Life (RUL) are based primarily on age and condition with the presumption of continued use and maintenance of the Property similar to the observed and reported past use and maintenance practices, in conjunction with the professional judgment of Bureau Veritas's assessors. Significant changes in occupants and/or usage may affect the service life of some systems or components.

Where quantities could not be or were not derived from an actual construction document take-off or facility walk-through, and/or where systemic costs are more applicable or provide more intrinsic value, budgetary square foot and gross square foot costs are used. Estimated costs are based on professional judgment and the probable or actual extent of the observed defect, inclusive of the cost to design, procure, construct and manage the corrections.

To account for differences in prices between locations, the base costs are modified by geographical location factors to adjust for to market conditions, transportation costs, or other local contributors. When requested by the client, the costs may be further adjusted by several additional factors including; labor rates (prevailing minimum wage), general contractor fees for profit and overhead, and insurance. If desired, costs for design and permits, and a contingency factor, may also be included in the calculations.

Definitions

Immediate Needs

Immediate Needs are line items that require immediate action as a result of: (1) material existing or potential unsafe conditions, (2) failed or imminent failure of mission critical building systems or components, or (3) conditions that, if not addressed, have the potential to result in, or contribute to, critical element or system failure within one year or will most probably result in a significant escalation of its remedial cost.

For database and reporting purposes the line items with RUL=0, and commonly associated with *Safety* or *Performance/Integrity* Plan Types, are considered Immediate Needs.

Replacement Reserves

Cost line items traditionally called Replacement Reserves (equivalently referred to as Lifecycle/Renewals) are for recurring probable renewals or expenditures, which are not classified as operation or maintenance expenses. The replacement reserves should be budgeted for in advance on an annual basis. Replacement Reserves are reasonably predictable both in terms of frequency and cost. However, Replacement Reserves may also include components or systems that have an indeterminable life but, nonetheless, have a potential for failure within an estimated time period.

Replacement Reserves generally exclude systems or components that are estimated to expire after the reserve term and are not considered material to the structural and mechanical integrity of the subject property. Furthermore, systems and components that are not deemed to have a material effect on the use of the Property are also excluded. Costs that are caused by acts of God, accidents, or other occurrences that are typically covered by insurance, rather than reserved for, are also excluded.

Replacement costs are solicited from ownership/property management, Bureau Veritas's discussions with service companies, manufacturers' representatives, and previous experience in preparing such schedules for other similar facilities. Costs for work performed by the ownership's or property management's maintenance staff are also considered.

Bureau Veritas's reserve methodology involves identification and quantification of those systems or components requiring capital reserve funds within the assessment period. The assessment period is defined as the effective age plus the reserve term. Additional information concerning system or component replacement costs (in today's dollars), typical expected useful lives, and remaining useful lives were estimated so that a funding schedule could be prepared. The Replacement Reserves Schedule presupposes that all required remedial work has been performed or that monies for remediation have been budgeted for items defined as Immediate Needs.

For the purposes of 'bucketizing' the System Expenditure Forecasts in this report, the Replacement Reserves have been subdivided and grouped as follows: Short Term (years 1-3), Near Term (years 4-5), Medium Term (years 6-10), and Long Term (years 11-20).

Key Findings

In an effort to highlight the most significant cost items and not be overwhelmed by the Replacement Reserves report in its totality, a subsection of Key Findings is included within the Executive Summary section of this report. Key Findings typically include repairs or replacements of deficient items within the first five-year window, as well as the most significant high-dollar line items that fall anywhere within the ten-year term. Note that while there is some subjectivity associated with identifying the Key Findings, the Immediate Needs are always included as a subset.

6. Certification

Town of Paradise Valley, FCA Inventory Program (the Client) retained Bureau Veritas to perform this Facility Condition Assessment in connection with its continued operation of Fire Station 91, 8444 North Tatum Boulevard, Paradise Valley, AZ 85253, the “Property”. It is our understanding that the primary interest of the Client is to locate and evaluate materials and building system defects that might significantly affect the value of the property and to determine if the present Property has conditions that will have a significant impact on its continued operations.

The conclusions and recommendations presented in this report are based on the brief review of the plans and records made available to our Project Manager during the site visit, interviews of available property management personnel and maintenance contractors familiar with the Property, appropriate inquiry of municipal authorities, our Project Manager’s walk-through observations during the site visit, and our experience with similar properties.

No testing, exploratory probing, dismantling or operating of equipment or in-depth studies were performed unless specifically required under the *Purpose and Scope* section of this report. This assessment did not include engineering calculations to determine the adequacy of the Property’s original design or existing systems. Although walk-through observations were performed, not all areas may have been observed (see Section 1 for specific details). There may be defects in the Property, which were in areas not observed or readily accessible, may not have been visible, or were not disclosed by management personnel when questioned. The report describes property conditions at the time that the observations and research were conducted.

This report has been prepared for and is exclusively for the use and benefit of the Client identified on the cover page of this report. The purpose for which this report shall be used shall be limited to the use as stated in the contract between the client and Bureau Veritas.

This report, or any of the information contained therein, is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose without the advance written consent of Bureau Veritas. Any reuse or distribution without such consent shall be at the client's or recipient's sole risk, without liability to Bureau Veritas.

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7. Appendices

Appendix A: Photographic Record
Appendix B: Site and Floor Plan(s)
Appendix C: Pre-Survey Questionnaire(s)
Appendix D: Accessibility Review and Photos
Appendix E: Component Condition Report
Appendix F: Replacement Reserves
Appendix G: Equipment Inventory List
Appendix H: Electrical Study

Appendix A:
Photographic Record

Photographic Overview

1 - FRONT ELEVATION

2 - LEFT ELEVATION

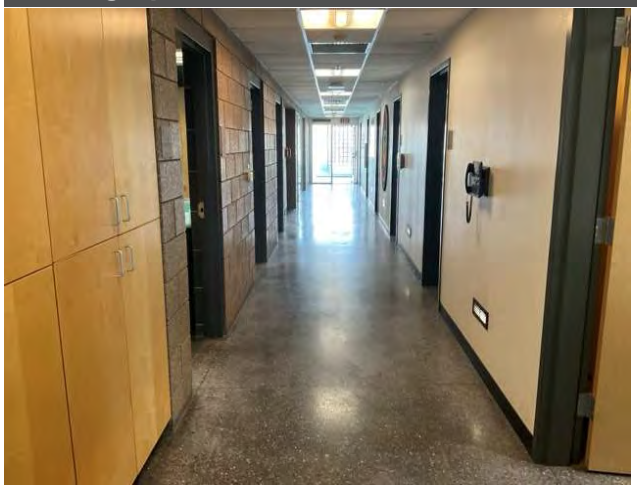
3 - RIGHT ELEVATION

4 - REAR ELEVATION

5 - ENTRY

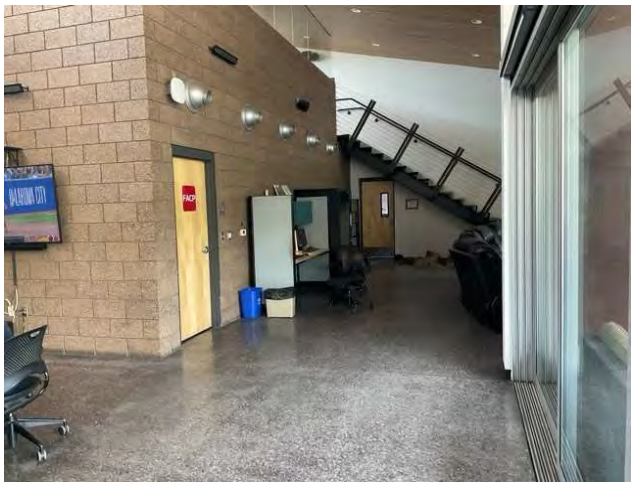
6 - LOBBY

Photographic Overview

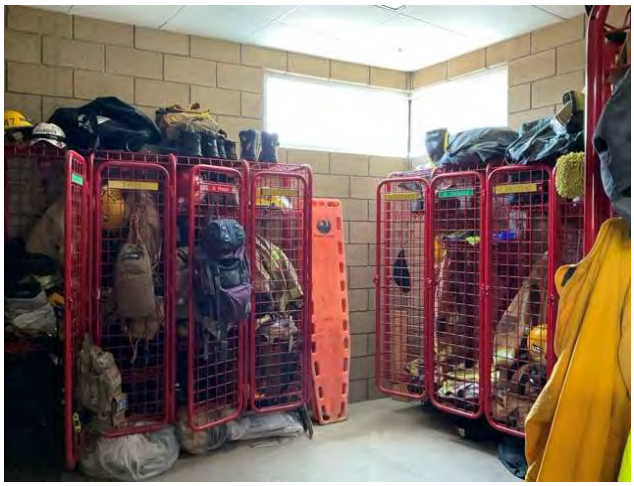


7 - NORTH CORRIDOR

8 - TYPICAL DORM ROOM

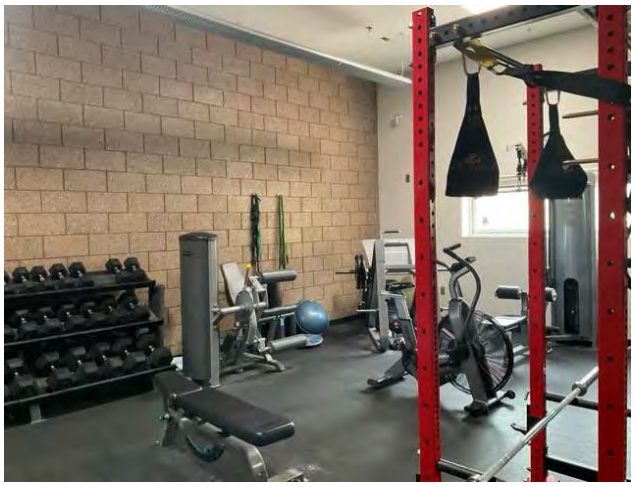


9 - DAY ROOM



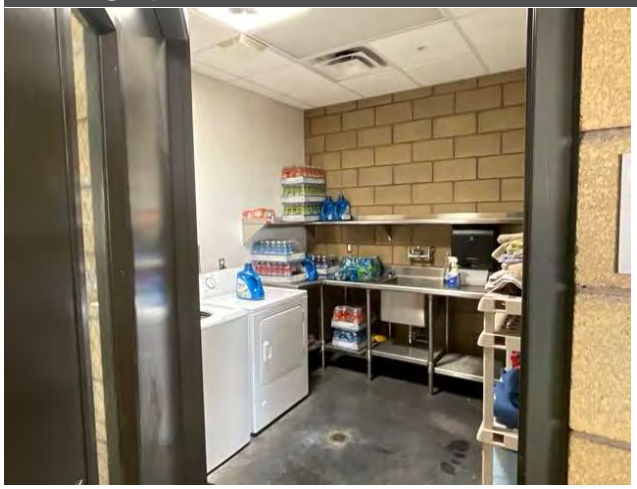
10 - TURN-OUT ROOM

11 - KITCHEN



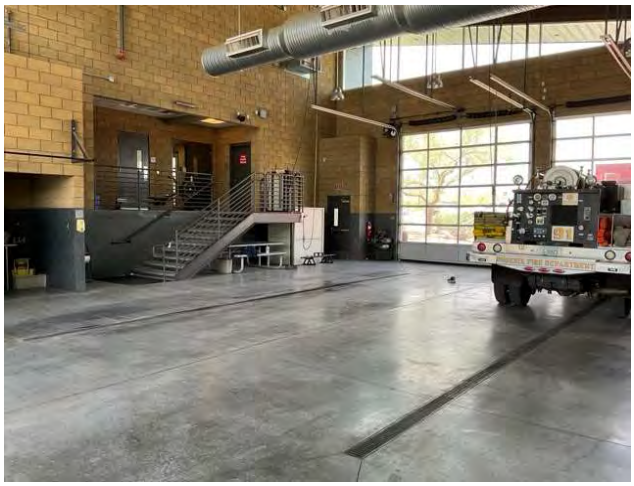
12 - FITNESS ROOM

Photographic Overview



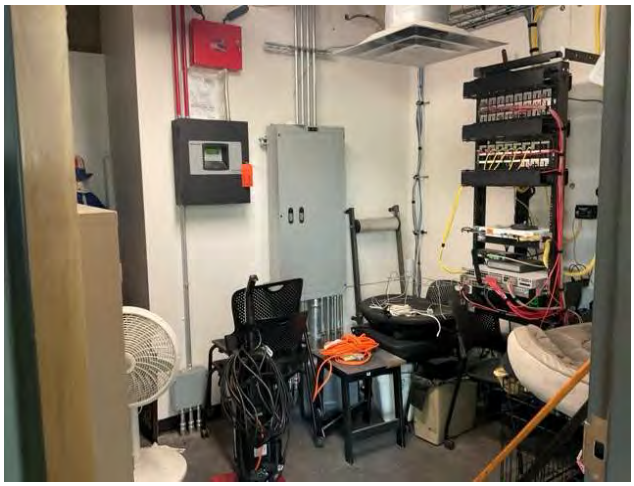
13 - LAUNDRY ROOM

14 - TYPICAL RESTROOM



15 - APPARATUS BAY

16 - JANITOR CLOSET



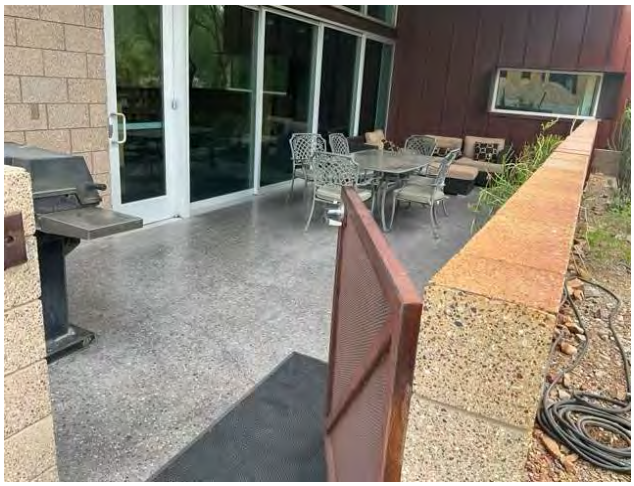
17 - TELE/COMM ROOM

18 - FIRE RISER ROOM

Photographic Overview

19 - SITE UTILITY SOUTH

20 - SITE UTILITY AREA



21 - PATIO

22 - BUILDING NE CORNER

23 - APPARATUS BAY NORTH

24 - BAY SOUTH

Appendix B:
Site and Floor Plan(s)

Site Plan

Project Number	Project Name
172662.25R000-005.468	Fire Station 91
Source	**On-Site Date**
Google	May 29th, 2025

N

Appendix C:
Pre-Survey Questionnaire(s)

BV FACILITY CONDITION ASSESSMENT: PRE-SURVEY QUESTIONNAIRE

Building / Facility Name: Fire Station 91

Name of person completing form: Eric Shurtleff

Title / Association w/ property: Facility Maintenance Technician

Length of time associated w/ property: 16

Date Completed: 5/29/2025

Phone Number: 6027690629

Method of Completion: INTERVIEW - verbally completed during interview

Directions: Please answer all questions to the best of your knowledge and in good faith. Please provide additional details in the Comments column, or backup documentation for any ***Yes*** responses.

Data Overview		Response		
1	Year(s) constructed	Constructed: 2009	Renovated:	
2	Building size in SF	9,961 **SF**		
3	Major Renovation/Rehabilitation		Year	Additional Detail
		Facade		
		Roof		
		Interiors		
		HVAC		
		Electrical		
		Site Pavement		
		Accessibility		
4	List other significant capital improvements (focus on recent years; provide approximate date).			
5	List any major capital expenditures planned/requested for the next few years. Have they been budgeted?			
6	Describe any on-going extremely problematic, historically chronic, or immediate facility needs.			

Mark the column corresponding to the appropriate response. Please provide additional details in the Comments column, or backup documentation for any ***Yes*** responses. (**NA** indicates "*Not Applicable*", **Unk** indicates "*Unknown*")

	Question	Response				Comments
		Yes	No	Unk	NA	
7	Are there any problems with foundations or structures, like excessive settlement?		X			
8	Are there any wall, window, basement or roof leaks?		X			
9	Has any part of the facility ever contained visible suspect mold growth, or have there been any indoor air quality complaints?		X			
10	Are your elevators unreliable, with frequent service calls?		X			
11	Are there any plumbing leaks, water pressure, or clogging/backup issues?		X			
12	Have there been any leaks or pressure problems with natural gas, HVAC piping, or steam service?		X			
13	Are any areas of the facility inadequately heated, cooled or ventilated? Poorly insulated areas?		X			
14	Is the electrical service outdated, undersized, or problematic?		X			
15	Are there any problems or inadequacies with exterior lighting?		X			
16	Is site/parking drainage inadequate, with excessive ponding or other problems?		X			
17	Are there any other unresolved construction defects or significant issues/hazards at the property that have not yet been identified above?		X			
18	ADA: Has an accessibility study been previously performed? If so, when?			X		
19	ADA: Have any ADA improvements been made to the property since original construction? Describe.		X			
20	ADA: Has building management reported any accessibility-based complaints or litigation?		X			
21	Are any areas of the property leased to outside occupants?		X			

Signature of Assessor

Signature of POC

Appendix D:
Accessibility Review and Photos

Visual Survey - 2010 ADA Standards for Accessible Design

Property Name: Fire Station 91

BV Project Number: 172662.25R000-005.468

Facility History & Interview

	Question	Yes	No	Unk	Comments
1	Has an accessibility study been previously performed? If so, when?		X		
2	Have any ADA improvements been made to the property since original construction? Describe.		X		
3	Has building management reported any accessibility-based complaints or litigation?		X		

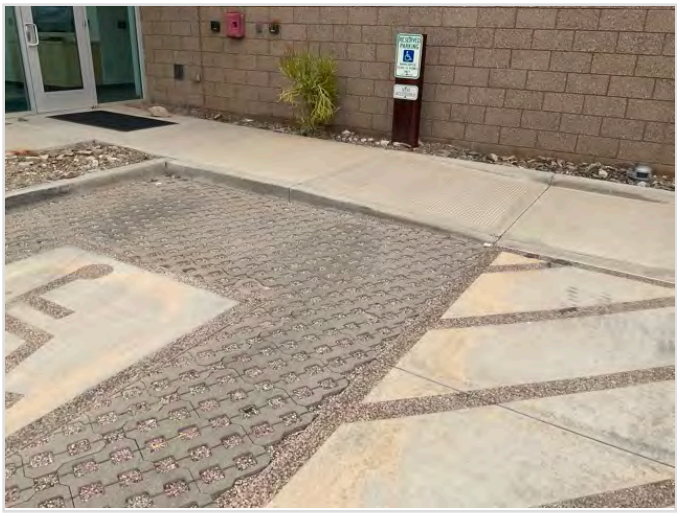
005 - Fire Station 91: Accessibility Issues

Category	Major Issues (ADA study recommended)	Moderate Issues (ADA study recommended)	Minor Issues	None*
Parking				
Exterior Accessible Route				
Building Entrances				
Interior Accessible Route				
Elevators	**NA**			
Public Restrooms				
Kitchens/Kitchenettes	**NA**			
Playgrounds & Swimming Pools	**NA**			
Other	**NA**			

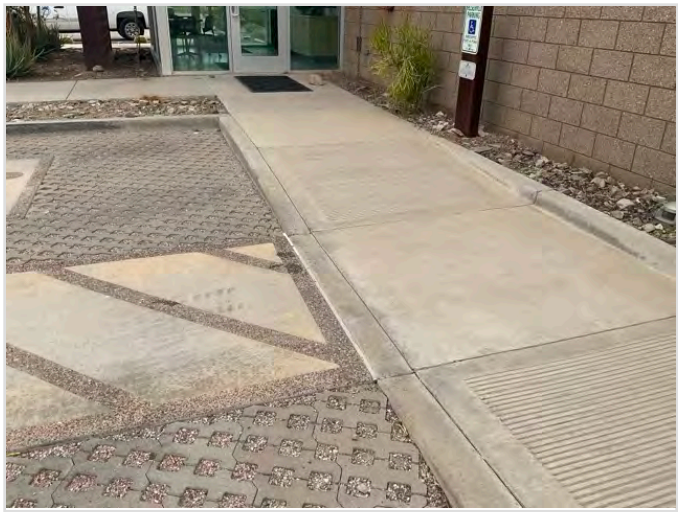
**be cognizant that if the "None" box is checked that does not guarantee full compliance; this study is limited in nature*

Fire Station 91: Photographic Overview

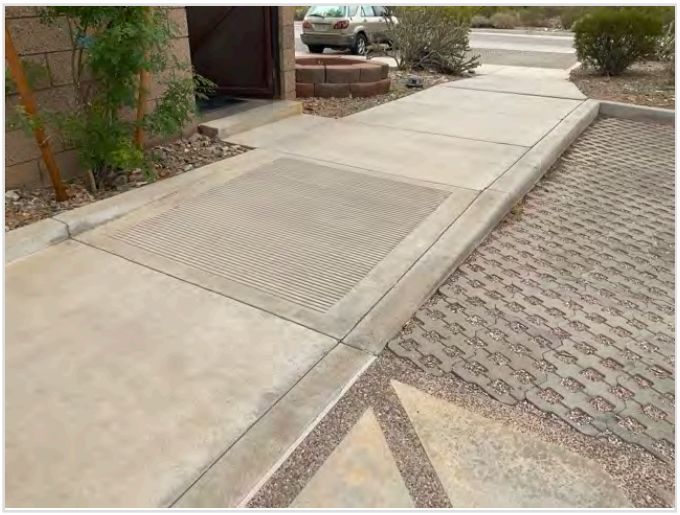
OVERVIEW OF ACCESSIBLE PARKING AREA



CLOSE-UP OF STALL

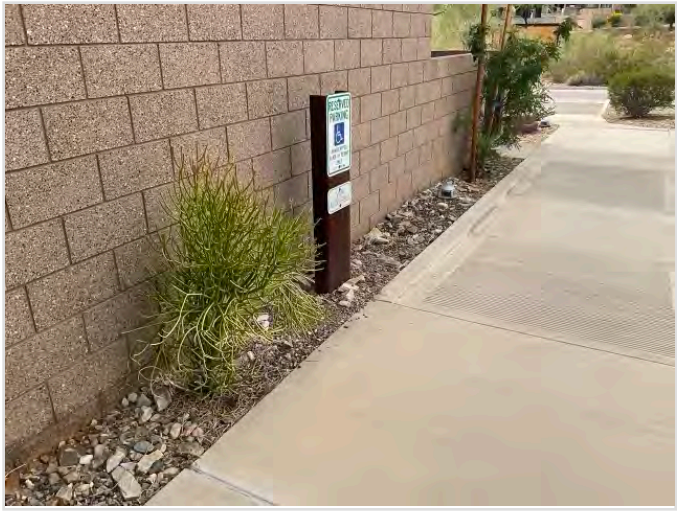


ACCESSIBLE PATH



CURB CUT

MAIN ENTRANCE



SIGNAGE

Fire Station 91: Photographic Overview

ACCESSIBLE INTERIOR PATH

DOOR HARDWARE

TOILET STALL OVERVIEW

SINK, FAUCET HANDLES AND ACCESSORIES

Appendix E:
Component Condition Report

Component Condition Report | 005 - Fire Station 91

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
Structure						
A4010	Substructure	Fair	Foundation, Concrete Slab-on-Grade, w/ Integral Perimeter Footings	9,661 SF	59	9407822
B1010	Superstructure	Good	Structural Framing, Steel Columns & Beams, 1-2 Story Building	9,961 SF	59	9407844
Facade						
B2010	Building Exterior	Fair	Exterior Walls, Brick/Masonry/Stone, Clean & Seal, Maintain	8,100 SF	4	9407865
B2010	Building Exterior	Fair	Exterior Walls, Metal/Insulated Sandwich Panels	1,700 SF	29	9407882
B2020	Building Exterior	Fair	Glazing, any type by SF	1,700 SF	14	9407866
B2050	Building Exterior	Fair	Exterior Door, Steel, Commercial	2	24	9407879
B2050	Building Exterior	Fair	Automatic Door Opener, Commercial Overhead/Dock Door	4	3	9407837
B2050	Building Exterior	Fair	Exterior Door, Aluminum-Framed & Glazed, Standard Swing	3	14	9407873
Roofing						
B3010	Roof	Good	Roofing, Clay/Concrete Tile	2,700 SF	34	9407892
B3010	Roof	Fair	Roofing, Metal	7,000 SF	24	9407827
B3020	Roof	Fair	Roof Appurtenances, Gutters & Downspouts, Aluminum w/ Fittings	450 LF	4	9407867
B3080	Building Exterior	Fair	Soffit/Fascia, Metal	800 SF	9	9407895
Interiors						
C1010	Throughout Building	Good	Interior Wall, Concrete Block (CMU)	10,000 SF	34	9407899
C1020	Throughout Building	Fair	Interior Glazing, any type by SF	350 SF	24	9407823
C1030	Throughout Building	Fair	Interior Door, Aluminum-Framed & Glazed, Standard Swing	1	24	9407900
C1030	Throughout Building	Fair	Interior Door, Steel, Standard	8	24	9407872
C1030	Throughout Building	Fair	Interior Door, Wood, Solid-Core Commercial	13	24	9407842
C1070	Throughout Building	Fair	Suspended Ceilings, Acoustical Tile (ACT)	3,500 SF	9	9407862
C1090	Hallways & Common Areas	Fair	Lockers, Steel-Baked Enamel, 6' Height per LF	20 LF	4	9407886
C2010	Throughout Building	Fair	Wall Finishes, any surface, Prep & Paint	8,800 SF	5	9407893
C2010	Restrooms	Fair	Wall Finishes, Ceramic Tile	600 SF	21	9407861
C2030	Throughout Building	Fair	Flooring, any surface, w/ Paint or Sealant, Prep & Paint	2,035 SF	5	9407829
C2030	Throughout Building	Good	Flooring, Terrazzo	7,500 SF	34	9407817
C2030	Gymnasium	Fair	Flooring, Rubber Tile	390 SF	3	9407891
C2050	Throughout Building	Fair	Ceiling Finishes, exposed irregular elements, Prep & Paint	2,035 SF	5	9407894
C2050	Throughout Building	Fair	Ceiling Finishes, any flat surface, Prep & Paint	1,000 SF	5	9407896

Component Condition Report | 005 - Fire Station 91

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
C2050	Throughout Building	Fair	Ceiling Finishes, Wood Paneling	3,500 SF	14	9407860
Conveying						
D1010	Utility Rooms/Areas	Fair	Vertical Lift, Wheelchair, 5' Rise, Renovate	1	9	9407883
Plumbing						
D2010	Restrooms	Fair	Shower, Valve & Showerhead	3	14	9407857
D2010	Throughout Building	Fair	Sink/Lavatory, Vanity Top, Stainless Steel	2	14	9407848
D2010	Throughout Building	Fair	Sink/Lavatory, Service Sink, Floor	1	19	9407847
D2010	Restrooms	Fair	Shower, Terrazzo	3	14	9407841
D2010	Building Exterior	Fair	Backflow Preventer, Domestic Water	1	14	9407875
D2010	Restrooms	Fair	Sink/Lavatory, Wall-Hung	1	14	9407898
D2010	Building Exterior	Fair	Backflow Preventer, Domestic Water	1	14	9407863
D2010	Utility Rooms/Areas	Fair	Water Heater, Gas, Tankless	1	6	9407874
D2010	Throughout Building	Fair	Plumbing System, Supply & Sanitary, Low Density (excludes fixtures)	9,961 SF	24	9407840
D2010	Building Exterior	Fair	Backflow Preventer, Domestic Water	1	14	9407864
D2010	Restrooms	Fair	Toilet, Commercial Water Closet	4	14	9407884
D2010	Restrooms	Fair	Urinal, Standard	1	14	9407836
HVAC						
D3030	Site Utility Areas	Fair	Split System, Condensing Unit/Heat Pump [CU-3]	1	3	9407818
D3030	Site Utility Areas	Fair	Split System, Condensing Unit/Heat Pump [CU-6]	1	3	9407826
D3030	Hallways & Common Areas	Fair	Split System, Fan Coil Unit, DX, 3.5 to 5 TON [FC-2]	1	3	9407825
D3030	Site Utility Areas	Fair	Split System, Condensing Unit/Heat Pump [CU-2]	1	7	9407854
D3030	Site Utility Areas	Fair	Split System, Condensing Unit/Heat Pump [CU-5]	1	3	9407876
D3030	Hallways & Common Areas	Fair	Split System, Fan Coil Unit, DX, 3.5 to 5 TON [FC-3]	1	3	9407833
D3030	Hallways & Common Areas	Fair	Split System, Fan Coil Unit, DX, 3.5 to 5 TON [FC-1]	1	3	9407832
D3030	Utility Rooms/Areas	Fair	Split System, Fan Coil Unit, DX, 3 TON [FC-6]	1	3	9407828
D3030	Site Utility Areas	Fair	Split System, Condensing Unit/Heat Pump	1	12	9407831
D3030	Hallways & Common Areas	Fair	Split System, Fan Coil Unit, DX, 3 TON [FC-4]	1	3	9407821
D3030	Site Utility Areas	Poor	Evaporative Cooler, 2 to 3 HP	1	1	9407870
D3030	Hallways & Common Areas	Fair	Split System, Fan Coil Unit, DX, 3.5 to 5 TON [FC-5]	1	3	9407877
D3030	Site Utility Areas	Fair	Split System, Condensing Unit/Heat Pump [CU-1]	1	3	9407851
D3030	Site Utility Areas	Fair	Split System Ductless, Single Zone [CU-7]	1	3	9407889

Component Condition Report | 005 - Fire Station 91

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D3050	Throughout Building	Fair	HVAC System, Ductwork w/ VAV/FCU, Medium Density	9,961 SF	14	9407838
D3060	Utility Rooms/Areas	Fair	Exhaust Fan, Roof or Wall-Mounted, 36"Damper	1	4	9407849
D3060	Utility Rooms/Areas	Fair	Exhaust Fan, Roof or Wall-Mounted, 36"Damper	1	4	9407850
Fire Protection						
D4010	Throughout Building	Fair	Fire Suppression System, Existing Sprinkler Heads, by SF	9,961 SF	9	9407839
D4010	Mechanical Room	Fair	Supplemental Components, Fire Riser, Dry	1	24	9407815
D4010	Mechanical Room	Fair	Backflow Preventer, Fire Suppression	1	14	9407824
Electrical						
D5010	Electrical Room	Failed	Solar Power, Inverter, 2.8 KW	1	0	9407858
D5010	Site Utility Areas	Fair	Generator, Diesel	1	9	9407830
D5010	Site Utility Areas	Fair	Automatic Transfer Switch, ATS	1	9	9407846
D5010	Electrical Room	Fair	Automatic Transfer Switch, ATS	1	9	9407878
D5010	Roof	Fair	Solar Power, Photovoltaic (PV) Panels by SF	450 SF	4	9407855
D5020	Electrical Room	Fair	Distribution Panel, 120/208 V	1	13	9407852
D5020	Site Utility Areas	Fair	Switchboard, 120/208 V	1	23	9407814
D5030	Electrical Room	Fair	Electrical System, Wiring & Switches, Average or Low Density/Complexity	9,961 SF	24	9407835
D5040	Building Exterior	Fair	Exterior Light, any type, w/ LED Replacement	18	4	9407868
D5040	Throughout Building	Fair	Interior Lighting System, Full Upgrade, High Density & Standard Fixtures	9,961 SF	4	9407856
Fire Alarm & Electronic Systems						
D6060	Throughout Building	Fair	Intercom/PA System, Public Address Upgrade, Facility-Wide	9,961 SF	4	9407885
D7050	Throughout Building	Fair	Fire Alarm System, Full System Upgrade, Standard Addressable, Upgrade/Install	9,961 SF	4	9407816
Equipment & Furnishings						
E1030	Commercial Kitchen	Fair	Foodservice Equipment, Sink, 1-Bowl	1	14	9407859
E1030	Commercial Kitchen	Fair	Foodservice Equipment, Sink, 2-Bowl	1	14	9407820
E2010	Restrooms	Fair	Casework, Bathroom Vanity Cabinet, Wood w/ Cultured Marble Sink Top	3	4	9407845
E2010	Throughout Building	Fair	Casework, Cabinetry, Standard	134 LF	4	9407834
Pedestrian Plazas & Walkways						
G2020	Site Parking Areas	Fair	Parking Lots, Pavement, Concrete	16,500 SF	34	9407888
Sitework						
G2060	Utility Rooms/Areas	Fair	Picnic Table, Metal Powder-Coated	1	10	9407869
G2060	Site General	Fair	Signage, Property, Monument, Replace/Install	1	4	9407880

Component Condition Report | 005 - Fire Station 91

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
G2060	Site Utility Areas	Fair	Fences & Gates, Pedestrian Gate, Wrought Iron	3	9	9407890
G2060	Site General	Fair	Flagpole, Metal	1	14	9407881
G2060	Building Exterior	Fair	Fences & Gates, Screen Walls, Concrete Masonry Unit (CMU)	1,450 SF	34	9407853
G2060	Building Exterior	Good	Fences & Gates, Fence, Wrought Iron 6'	38 LF	34	9407887
G2060	Site General	Fair	Retaining Wall, Brick/Stone	500 SF	24	9407843
G2080	Site General	Fair	Irrigation System, Pop-Up Spray Heads, Commercial, Replace/Install	7,100 SF	4	9407819

Appendix F:
Replacement Reserves

Replacement Reserves Report

005 - Fire Station 91

7/8/2025

Location	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Total Escalated Estimate
005 - Fire Station 91	$3,000	$7,828	$0	$72,787	$257,786	$27,057	$1,910	$6,395	$0	$224,823	$941	$0	$5,703	$8,811	$373,256	$41,037	$12,196	$0	$113,399	$1,403	$0	**$1,158,332**
Grand Total	**$3,000**	**$7,828**	**$0**	**$72,787**	**$257,786**	**$27,057**	**$1,910**	**$6,395**	**$0**	**$224,823**	**$941**	**$0**	**$5,703**	**$8,811**	**$373,256**	**$41,037**	**$12,196**	**$0**	**$113,399**	**$1,403**	**$0**	**$1,158,332**

Uniformat Code	Location Description	ID	Cost Description	Lifespan (EUL)	EAge	RUL	Quantity	Unit	Unit Cost*	Subtotal	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Deficiency Repair Estimate
B2010	Building Exterior	9407865	Exterior Walls, Brick/Masonry/Stone, Clean & Seal, Maintain	20	16	4	8100	SF	$1.86	$15,066					$15,066																	**$15,066**
B2020	Building Exterior	9407866	Glazing, any type by SF, Replace	30	16	14	1700	SF	$55.00	$93,500															$93,500							**$93,500**
B2050	Building Exterior	9407873	Exterior Door, Aluminum-Framed & Glazed, Standard Swing, Replace	30	16	14	3	EA	$1,300.00	$3,900															$3,900							**$3,900**
B2050	Building Exterior	9407837	Automatic Door Opener, Commercial Overhead/Dock Door, Replace	15	12	3	4	EA	$3,500.00	$14,000				$14,000															$14,000			**$28,000**
B3020	Roof	9407867	Roof Appurtenances, Gutters & Downspouts, Aluminum w/ Fittings, Replace	20	16	4	450	LF	$9.00	$4,050					$4,050																	**$4,050**
B3080	Building Exterior	9407895	Soffit/Fascia, Metal, Replace	25	16	9	800	SF	$5.00	$4,000										$4,000												**$4,000**
C1070	Throughout Building	9407862	Suspended Ceilings, Acoustical Tile (ACT), Replace	25	16	9	3500	SF	$3.50	$12,250										$12,250												**$12,250**
C1090	Hallways & Common Areas	9407886	Lockers, Steel-Baked Enamel, 6' Height per LF, Replace	20	16	4	20	LF	$500.00	$10,000					$10,000																	**$10,000**
C2010	Throughout Building	9407893	Wall Finishes, any surface, Prep & Paint	10	5	5	8800	SF	$1.50	$13,200						$13,200										$13,200						**$26,400**
C2030	Throughout Building	9407829	Flooring, any surface, w/ Paint or Sealant, Prep & Paint	10	5	5	2035	SF	$1.50	$3,053						$3,053										$3,053						**$6,105**
C2030	Gymnasium	9407891	Flooring, Rubber Tile, Replace	15	12	3	390	SF	$9.00	$3,510				$3,510															$3,510			**$7,020**
C2050	Throughout Building	9407860	Ceiling Finishes, Wood Paneling, Replace	30	16	14	3500	SF	$14.00	$49,000															$49,000							**$49,000**
C2050	Throughout Building	9407894	Ceiling Finishes, exposed irregular elements, Prep & Paint	10	5	5	2035	SF	$2.50	$5,088						$5,088										$5,088						**$10,175**
C2050	Throughout Building	9407896	Ceiling Finishes, any flat surface, Prep & Paint	10	5	5	1000	SF	$2.00	$2,000						$2,000										$2,000						**$4,000**
D1010	Utility Rooms/Areas	9407883	Vertical Lift, Wheelchair, 5' Rise, Renovate	25	16	9	1	EA	$17,000.00	$17,000										$17,000												**$17,000**
D2010	Utility Rooms/Areas	9407874	Water Heater, Gas, Tankless, Replace	15	9	6	1	EA	$1,600.00	$1,600							$1,600															**$1,600**
D2010	Building Exterior	9407875	Backflow Preventer, Domestic Water, Replace	30	16	14	1	EA	$3,200.00	$3,200															$3,200							**$3,200**
D2010	Building Exterior	9407863	Backflow Preventer, Domestic Water, Replace	30	16	14	1	EA	$1,400.00	$1,400															$1,400							**$1,400**
D2010	Building Exterior	9407864	Backflow Preventer, Domestic Water, Replace	30	16	14	1	EA	$1,400.00	$1,400															$1,400							**$1,400**
D2010	Restrooms	9407857	Shower, Valve & Showerhead, Replace	30	16	14	3	EA	$800.00	$2,400															$2,400							**$2,400**
D2010	Throughout Building	9407848	Sink/Lavatory, Vanity Top, Stainless Steel, Replace	30	16	14	2	EA	$1,200.00	$2,400															$2,400							**$2,400**
D2010	Restrooms	9407841	Shower, Terrazzo, Replace	30	16	14	3	EA	$3,000.00	$9,000															$9,000							**$9,000**
D2010	Restrooms	9407898	Sink/Lavatory, Wall-Hung, Replace	30	16	14	1	EA	$1,700.00	$1,700															$1,700							**$1,700**
D2010	Restrooms	9407884	Toilet, Commercial Water Closet, Replace	30	16	14	4	EA	$1,300.00	$5,200															$5,200							**$5,200**
D2010	Restrooms	9407836	Urinal, Standard, Replace	30	16	14	1	EA	$1,100.00	$1,100															$1,100							**$1,100**
D2010	Throughout Building	9407847	Sink/Lavatory, Service Sink, Floor, Replace	35	16	19	1	EA	$800.00	$800																				$800		**$800**
D3030	Site Utility Areas	9407870	Evaporative Cooler, 2 to 3 HP, Replace	15	14	1	1	EA	$7,600.00	$7,600		$7,600															$7,600					**$15,200**
D3030	Site Utility Areas	9407818	Split System, Condensing Unit/Heat Pump, Replace	15	12	3	1	EA	$5,200.00	$5,200				$5,200															$5,200			**$10,400**
D3030	Site Utility Areas	9407826	Split System, Condensing Unit/Heat Pump, Replace	15	12	3	1	EA	$4,000.00	$4,000				$4,000															$4,000			**$8,000**
D3030	Hallways & Common Areas	9407825	Split System, Fan Coil Unit, DX, 3.5 to 5 TON, Replace	15	12	3	1	EA	$4,600.00	$4,600				$4,600															$4,600			**$9,200**
D3030	Site Utility Areas	9407876	Split System, Condensing Unit/Heat Pump, Replace	15	12	3	1	EA	$5,200.00	$5,200				$5,200															$5,200			**$10,400**
D3030	Hallways & Common Areas	9407833	Split System, Fan Coil Unit, DX, 3.5 to 5 TON, Replace	15	12	3	1	EA	$4,600.00	$4,600				$4,600															$4,600			**$9,200**
D3030	Hallways & Common Areas	9407832	Split System, Fan Coil Unit, DX, 3.5 to 5 TON, Replace	15	12	3	1	EA	$4,600.00	$4,600				$4,600															$4,600			**$9,200**
D3030	Utility Rooms/Areas	9407828	Split System, Fan Coil Unit, DX, 3 TON, Replace	15	12	3	1	EA	$3,800.00	$3,800				$3,800															$3,800			**$7,600**
D3030	Hallways & Common Areas	9407821	Split System, Fan Coil Unit, DX, 3 TON, Replace	15	12	3	1	EA	$3,800.00	$3,800				$3,800															$3,800			**$7,600**
D3030	Hallways & Common Areas	9407877	Split System, Fan Coil Unit, DX, 3.5 to 5 TON, Replace	15	12	3	1	EA	$4,600.00	$4,600				$4,600															$4,600			**$9,200**
D3030	Site Utility Areas	9407851	Split System, Condensing Unit/Heat Pump, Replace	15	12	3	1	EA	$5,200.00	$5,200				$5,200															$5,200			**$10,400**
D3030	Site Utility Areas	9407889	Split System Ductless, Single Zone, Replace	15	12	3	1	EA	$3,500.00	$3,500				$3,500															$3,500			**$7,000**
D3030	Site Utility Areas	9407854	Split System, Condensing Unit/Heat Pump, Replace	15	8	7	1	EA	$5,200.00	$5,200							$5,200															**$5,200**
D3030	Site Utility Areas	9407831	Split System, Condensing Unit/Heat Pump, Replace	15	3	12	1	EA	$4,000.00	$4,000														$4,000								**$4,000**
D3050	Throughout Building	9407838	HVAC System, Ductwork w/ VAV/FCU, Medium Density, Replace	30	16	14	9961	SF	$6.00	$59,766															$59,766							**$59,766**
D3060	Utility Rooms/Areas	9407849	Exhaust Fan, Roof or Wall-Mounted, 36"Damper, Replace	20	16	4	1	EA	$5,600.00	$5,600					$5,600																	**$5,600**

Replacement Reserves Report

005 - Fire Station 91

7/8/2025

Uniformat Code	Location Description	ID	Cost Description	Lifespan (EUL)	EAge	RUL	Quantity	Unit	Unit Cost*	Subtotal	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Deficiency Repair Estimate
D3060	Utility Rooms/Areas	9407850	Exhaust Fan, Roof or Wall-Mounted, 36"Damper, Replace	20	16	4	1	EA	$5,600.00	$5,600					$5,600																	**$5,600**
D4010	Throughout Building	9407839	Fire Suppression System, Existing Sprinkler Heads, by SF, Replace	25	16	9	9961	SF	$1.07	$10,658										$10,658												**$10,658**
D4010	Mechanical Room	9407824	Backflow Preventer, Fire Suppression, Replace	30	16	14	1	EA	$6,600.00	$6,600															$6,600							**$6,600**
D5010	Site Utility Areas	9407830	Generator, Diesel, Replace	25	16	9	1	EA	$86,000.00	$86,000										$86,000												**$86,000**
D5010	Electrical Room	9407858	Solar Power, Inverter, 2.8 KW, Replace	15	15	0	1	EA	$3,000.00	$3,000	$3,000															$3,000						**$6,000**
D5010	Roof	9407855	Solar Power, Photovoltaic (PV) Panels by SF, Replace	20	16	4	450	SF	$70.00	$31,500					$31,500																	**$31,500**
D5010	Site Utility Areas	9407846	Automatic Transfer Switch, ATS, Replace	25	16	9	1	EA	$20,000.00	$20,000										$20,000												**$20,000**
D5010	Electrical Room	9407878	Automatic Transfer Switch, ATS, Replace	25	16	9	1	EA	$20,000.00	$20,000										$20,000												**$20,000**
D5020	Electrical Room	9407852	Distribution Panel, 120/208 V, Replace	30	17	13	1	EA	$6,000.00	$6,000														$6,000								**$6,000**
D5040	Building Exterior	9407868	Exterior Light, any type, w/ LED Replacement, Replace	20	16	4	18	EA	$400.00	$7,200					$7,200																	**$7,200**
D5040	Throughout Building	9407856	Interior Lighting System, Full Upgrade, High Density & Standard Fixtures, Replace	20	16	4	9961	SF	$5.00	$49,805					$49,805																	**$49,805**
D6060	Throughout Building	9407885	Intercom/PA System, Public Address Upgrade, Facility-Wide, Replace	20	16	4	9961	SF	$1.65	$16,436					$16,436																	**$16,436**
D7050	Throughout Building	9407816	Fire Alarm System, Full System Upgrade, Standard Addressable, Upgrade/Install	20	16	4	9961	SF	$3.00	$29,883					$29,883																	**$29,883**
E1030	Commercial Kitchen	9407859	Foodservice Equipment, Sink, 1-Bowl, Replace	30	16	14	1	EA	$1,600.00	$1,600															$1,600							**$1,600**
E1030	Commercial Kitchen	9407820	Foodservice Equipment, Sink, 2-Bowl, Replace	30	16	14	1	EA	$2,100.00	$2,100															$2,100							**$2,100**
E2010	Restrooms	9407845	Casework, Bathroom Vanity Cabinet, Wood w/ Cultured Marble Sink Top, Replace	20	16	4	3	EA	$1,200.00	$3,600					$3,600																	**$3,600**
E2010	Throughout Building	9407834	Casework, Cabinetry, Standard, Replace	20	16	4	134	LF	$300.00	$40,200					$40,200																	**$40,200**
G2060	Site Utility Areas	9407890	Fences & Gates, Pedestrian Gate, Wrought Iron, Replace	25	16	9	3	EA	$800.00	$2,400										$2,400												**$2,400**
G2060	Utility Rooms/Areas	9407869	Picnic Table, Metal Powder-Coated, Replace	20	10	10	1	EA	$700.00	$700											$700											**$700**
G2060	Site General	9407880	Signage, Property, Monument, Replace/Install	20	16	4	1	EA	$3,000.00	$3,000					$3,000																	**$3,000**
G2060	Site General	9407881	Flagpole, Metal, Replace	30	16	14	1	EA	$2,500.00	$2,500															$2,500							**$2,500**
G2080	Site General	9407819	Irrigation System, Pop-Up Spray Heads, Commercial, Replace/Install	20	16	4	7100	SF	$1.00	$7,100					$7,100																	**$7,100**
Totals, Unescalated											**$3,000**	**$7,600**	**$0**	**$66,610**	**$229,040**	**$23,340**	**$1,600**	**$5,200**	**$0**	**$172,308**	**$700**	**$0**	**$4,000**	**$6,000**	**$246,766**	**$26,340**	**$7,600**	**$0**	**$66,610**	**$800**	**$0**	**$867,514**
Totals, Escalated (3.0% inflation, compounded annually)											**$3,000**	**$7,828**	**$0**	**$72,787**	**$257,786**	**$27,057**	**$1,910**	**$6,395**	**$0**	**$224,823**	**$941**	**$0**	**$5,703**	**$8,811**	**$373,256**	**$41,037**	**$12,196**	**$0**	**$113,399**	**$1,403**	**$0**	**$1,158,332**

* Markup has been included in unit costs.

Appendix G:
Equipment Inventory List

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
B20 OTHER													
1	9407837	B2050	**Automatic Door Opener**	Commercial Overhead/Dock Door		005 - Fire Station 91	Building Exterior						4

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D10 Conveying													
1	9407883	D1010	**Vertical Lift**	Wheelchair, 5' Rise		005 - Fire Station 91	Utility Rooms/Areas	National Wheel-O-Vator Company	No dataplate	No dataplate		3003799	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D20 Plumbing													
1	9407874	D2010	**Water Heater**	Gas, Tankless	5 GPM	005 - Fire Station 91	Utility Rooms/Areas	Navien	NPE-240A	7414X1672821068	2016	3003771	
2	9407875	D2010	**Backflow Preventer**	Domestic Water	2 IN	005 - Fire Station 91	Building Exterior	Wilkins Zurn	975XL2	No dataplate		3003792	
3	9407863	D2010	**Backflow Preventer**	Domestic Water	1 IN	005 - Fire Station 91	Building Exterior	Febco	825Y	J012275		3003788	
4	9407864	D2010	**Backflow Preventer**	Domestic Water	1 IN	005 - Fire Station 91	Building Exterior	Watts	LF009M2QT	040129		3003796	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D30 HVAC													
1	9407870	D3030	**Evaporative Cooler**	2 to 3 HP	18000 CFM	005 - Fire Station 91	Site Utility Areas	Aerocool	UID701	No dataplate		3003768	
2	9407831	D3030	**Split System**	Condensing Unit/Heat Pump	3 TON	005 - Fire Station 91	Site Utility Areas	American Standard Inc.	4A6H4036G1000AB	22161NAX4F	2022	3003847	
3	9407851	D3030	**Split System** [CU-1]	Condensing Unit/Heat Pump	4 TON	005 - Fire Station 91	Site Utility Areas	Trane	4TWX6048B1000BA	8344MHL1F	2008	3003849	
4	9407854	D3030	**Split System** [CU-2]	Condensing Unit/Heat Pump	4 TON	005 - Fire Station 91	Site Utility Areas	Trane	4TWR4048Q1000AA	17196KUL4F	2017	3003846	
5	9407818	D3030	**Split System** [CU-3]	Condensing Unit/Heat Pump	4 TON	005 - Fire Station 91	Site Utility Areas	Trane	4TWX6048B1000BA	8344MF91F	2008	3003853	
6	9407876	D3030	**Split System** [CU-5]	Condensing Unit/Heat Pump	4 TON	005 - Fire Station 91	Site Utility Areas	Trane	4TWX6048B1000BA	8344MFT1F	2008	3003854	
7	9407826	D3030	**Split System** [CU-6]	Condensing Unit/Heat Pump	3 TON	005 - Fire Station 91	Site Utility Areas	Trane	4TWX6036B1000AA	8344PNM1F	2008	3003852	
8	9407832	D3030	**Split System** [FC-1]	Fan Coil Unit, DX, 3.5 to 5 TON	4 Ton	005 - Fire Station 91	Hallways & Common Areas	Trane	4TEE3F48A1000AA	8053OK22V	2008	3003829	
9	9407825	D3030	**Split System** [FC-2]	Fan Coil Unit, DX, 3.5 to 5 TON	4 Tons	005 - Fire Station 91	Hallways & Common Areas	Trane	4TEE3F48A1000AA	8053N212V	2009	3003836	
10	9407833	D3030	**Split System** [FC-3]	Fan Coil Unit, DX, 3.5 to 5 TON	4 Ton	005 - Fire Station 91	Hallways & Common Areas	Trane	4TEE3F48A1000AA	8122YR72V	2008	3003786	
11	9407821	D3030	**Split System** [FC-4]	Fan Coil Unit, DX, 3 TON	3 Ton	005 - Fire Station 91	Hallways & Common Areas	Trane	Inaccessible	Inaccessible		3003851	
12	9407877	D3030	**Split System** [FC-5]	Fan Coil Unit, DX, 3.5 to 5 TON	4 Ton	005 - Fire Station 91	Hallways & Common Areas	Trane	4TEE3F48A1000AA	80532U42V	2008	3003837	
13	9407828	D3030	**Split System** [FC-6]	Fan Coil Unit, DX, 3 TON	3 Ton	005 - Fire Station 91	Utility Rooms/Areas	Trane	4TEE3F37B1000AA	8333TET1V	2008	3003763	
14	9407889	D3030	**Split System Ductless** [CU-7]	Single Zone	1 TON	005 - Fire Station 91	Site Utility Areas	Sanyo	CH1271	0143571	2007	3003830	
15	9407849	D3060	**Exhaust Fan**	Roof or Wall-Mounted, 36"Damper	10000 CFM	005 - Fire Station 91	Utility Rooms/Areas	Inaccessible	Inaccessible	Inaccessible		3003787	
16	9407850	D3060	**Exhaust Fan**	Roof or Wall-Mounted, 36"Damper	10000 CFM	005 - Fire Station 91	Utility Rooms/Areas	Inaccessible	Inaccessible	Inaccessible		3003848	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D40 Fire Protection													
1	9407824	D4010	**Backflow Preventer**	Fire Suppression	4 INCH	005 - Fire Station 91	Mechanical Room	Ames	Colt 200	16-2973		3003773	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D50 Electrical													
1	9407830	D5010	**Generator**	Diesel	150 KW	005 - Fire Station 91	Site Utility Areas	Generac	10313570100	2100235		3003772	
2	9407858	D5010	**Solar Power**	Inverter, 2.8 KW	2.8 KW	005 - Fire Station 91	Electrical Room	Xantrex	No dataplate	No dataplate	2007	3003794	
3	9407846	D5010	**Automatic Transfer Switch**	ATS	400 AMP	005 - Fire Station 91	Site Utility Areas	Generac	0049412	5141083		3003828	
4	9407878	D5010	**Automatic Transfer Switch**	ATS	400 AMP	005 - Fire Station 91	Electrical Room	Generac	No dataplate	Illegible		3003803	
5	9407814	D5020	**Switchboard**	120/208 V	800 AMP	005 - Fire Station 91	Site Utility Areas	Siemens	No dataplate	No dataplate		3003770	
6	9407852	D5020	**Distribution Panel**	120/208 V	400 AMP	005 - Fire Station 91	Electrical Room	Siemens	P2C42JX400FBS	No dataplate	2008	3003833	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
E10 Equipment													
1	9407859	E1030	**Foodservice Equipment**	Sink, 1-Bowl		005 - Fire Station 91	Commercial Kitchen						
2	9407820	E1030	**Foodservice Equipment**	Sink, 2-Bowl		005 - Fire Station 91	Commercial Kitchen						

Appendix H:
Electrical Study

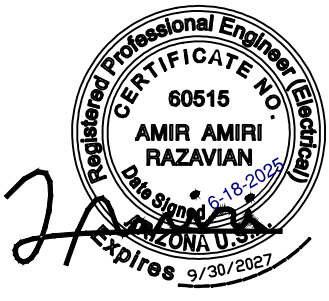
225 Broadway Suite 350, San Diego, CA 92101
1 + 310 364 5228 | 1 + 619 323 1515
mailto: Info@120degreez.com | www.120degreez.com

Arc Flash, Short Circuit, and Load Flow Analysis provided for:

FIRE STATION #91

8444 N. Tatum Blvd

Paradise Valley, AZ 85253



FIRE STATION #91

8444 N. Tatum Blvd

Paradise Valley, AZ 85253

FOR:
Town of Paradise Valley
Department of Public Works
6401 E. Lincoln Drive
Paradise Valley, AZ 85253

Submitted By:
Amir Amiri, P.E.
Electrical Engineer

Submittal date:
DATE: 6-12-2025

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APPENDIX 4 – TCC REPORT

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APPENDIX 6 – PPE TABLES AND ARC FLASH LABELS

1. EXECUTIVE SUMMARY

1.1. Introduction

A System Coordination and Arc Flash study of the distribution system was performed for the town of Paradise Valley's Fire Station 91located at 8444 N. Tatum Blvd, Paradise Valley, AZ 85253. The study determined the adequacy of the system components and the installed protective equipment. The study/analysis performed included short circuit, load flow, protective device coordination studies and incident energy (Arc-flash) evaluations.
The power distribution system provided for this site is the following:

- SES-FS 91 is an 800 amp, 208/120V, 3-phase service fed from a wye utility transformer with a Short Circuit current determined by the power company to be 49,505 Amps.

The serving utility has provided the short circuit current availability of this transformer with their service manual which is noted in the field notes provided. The serving utility's published available fault current (AFC) for each transformer which is called out in the field notes. Values used were provided by APS for phase-to-phase faults. Each Service Equipment System (SES) serves primarily lighting and equipment loads of the building in which it is located.
The short circuit analysis evaluates the short time thermal and electrodynamic strength of the facilities equipment. Arc flash and protective equipment studies evaluate the incident energy at specific points of the distribution system to provide Arc-Flash hazard warning labels and personal protective equipment (PPE) recommendations. System protection coordination analysis is used to evaluate the adequacy of the protective devices (Fuses-Circuit Breakers) for the proper protection of system components and are unitized in the verify selective coordination of overcurrent protective devices. Finally, the load flow analysis evaluates the ability of equipment and cables to safely serve the loads they supply. Voltage drop values are included in the appendix report.

Major objectives of the analysis are:

- Compare the calculated fault duties with withstanding/interrupting ratings for customer owned electrical distribution system equipment and note any area of deficiency.
- Demonstrate protective device coordination and note any area of deficiency. Recommended settings for protective devices that will isolate faults in a manner that is consistent with the basic system design and operation. The recommendations given will balance system protection and selective fault isolation.
- Identify incident energy levels, arc flash boundaries, and what level of Personal Protective Equipment (PPE) is required for safe energized work, in accordance with NFPA 70E 2018.
- Evaluate and assess the panels, switches, fuses, and cables nominal values under the current and voltage levels at site, according the load flow analysis results.

Note areas of deficiency and make recommendations for corrective measures that are consistent with applicable codes and standards.

1.1.1. Full narratives of the analysis performed as well as the findings and recommendations of the analysis are included in Sections 2 and 3 of this report. The appendices include the computer output from the analysis performed and tables containing the settings for the adjustable devices in the scope of work. Time current curves, a copy of the Arc-Flash labels, and a one-line diagram of the system model are also included in the appendices.

1.1.2. Various scenarios (where relevant) were modeled, and all related studies' results have been detailed in this report.

The following were the scenarios that were modeled and evaluated:

- Scenario #1: Short circuit analysis
- Scenario #2: Arc-Flash analysis
- Scenario #3: Load Flow analysis
- Scenario #4: TCC Tables

The assessment of the power distribution system components and equipment will be done based on the worst-case outcomes, including the highest levels of fault currents, load flow currents and assumed current usage as well as the highest available arc flash incident energy. The results of the analysis are included in Appendixes of this report. The appendices include the data derived from the SKM analysis software. Additionally, the Appendixes include Time-Current curves of protective devices, a copy of the Arc-Flash labels to be installed, one line diagram for overall system for short circuit, and incident energies. Additional diagrammatic illustrations of the one-line diagram are included.

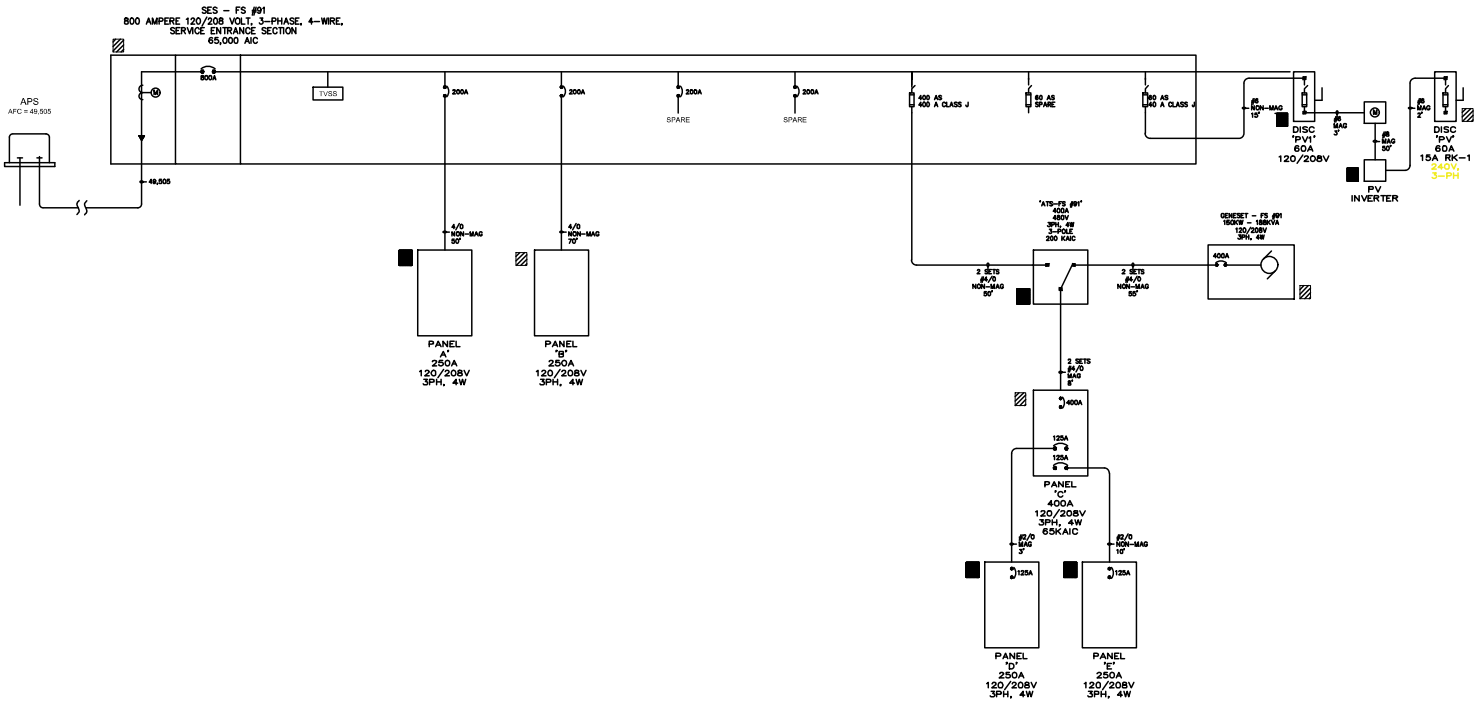
1.2.2 DC systems less than 50 volts.

The Occupational Safety and Health Administration, under 29 CFR 1910.303(g)(2)(i), considers electrical systems rated 50 volts or more as hazardous. By extension, those systems rated less than 50 volts are not considered to be hazardous. NFPA 70E, section 130.5(C), under Table 130.5(C), indicates that there is no likelihood of occurrence "For dc systems, maintenance on a single cell for a battery system or multi-cell units in an open rack.". As a result, DC systems rated 50 volts or less are not addressed by this study and are excluded from its scope.

1.2. Distribution System

The electrical system's overall single line diagrams are shown in the following figures below. Each individual single line is shown with the associated field report that contains the facilities equipment technical specifications and ratings, based upon visual observations. The actual field notes should be referenced for existing conditions as this report focuses on the Short Circuit Fault currents and Arc Flash evaluation. The physical condition of the services and equipment are described by the Excel report but are not formally addressed by this study.

FIRE STATION #91



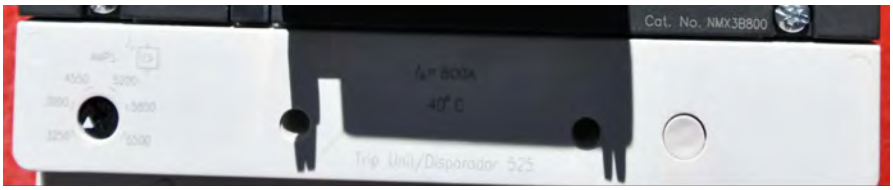
LABEL LEGEND

EQUIPMENT TO BEAR A LABEL

EQUIPMENT TO BEAR A LABEL STATING
–NO SAFE LEVEL OF PPE–

FACILITY	FIRE STATION #91	ADDRESS:	8444 N. TATUM BLVD, PARADISE VALLEY
UTILITY:	APS		
TRANSFORMER SIZE:	225	OTHER COMMENTS	
TRANSFORMER %Z:	1.35%		
SECONDARY COND SIZE:	(6) x 750 KCMIL AL		
LENGTH:			
AFC (PER UTILITY TABLES):	49,505		
VOLTAGE:	120/208		
PHASE:	3Ø-4W		
NOTE:	METER NUMBER Q22803		

EQUIPMENT NAME:	SES - FS #91	VOLTAGE:	120/208	PHASE:	3Ø 4w	AMPS:	800	SCCR:	65K	MAIN:	MCB
EQUIPMENT TYPE:	SWITCHBOARD									MODEL:	NMX SB800
MANUFACTURER:	SIEMENS									AMPS	800
MODEL:	SB3 REV. A					OTHER COMMENTS					
TYPE:						THE EQUIPMENT IS IN NEED OF PREVENTATIVE MAINTENANCE					
FED FROM:	UTILITY XFMR										
AFC:	49,505										
FEEDER SIZE:											
CONDUCTOR TYPE:											
RACEWAY TYPE:											
LENGTH:											
MAIN:	800										



SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
TVSS	0	0		65K			TVSS IS INTEGRAL TO THE SERVICE
PANEL 'A'	200	200		65K	FXD63B200		
PANEL 'B'	200	200		65K	FXD63B200		
SPARE (2)	200	200		65K	FXD63B200		2 SPARES
SPARE	60	NA		100K			SPARE
PV SYSTEM	60	40	J FUSES	100K			
ATS FS #91	400	400	JTD	100K			LITTLE FUSE J TIME DELAY FUSE

EQUIPMENT NAME:	ATS FS #91	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	400	SCCR:	200K	MAIN:	
EQUIPMENT TYPE:	AUTOMATIC XFR SW									MODEL:	
MANUFACTURER:	GENERAC									AMPS	
MODEL:	GTSO40W-SG2LDNAY					OTHER COMMENTS					
TYPE:						3 POLE XFR SW.					
FED FROM:	SW-SM & GENSET										
AFC:		EQUIPMENT APPEARS TO BE IN GOOD CONDITION AND SUITABLE FOR THE CONDITIONS HOWEVER,									
FEEDER SIZE:	2-SETS OF #4/0	WIRING WITHIN THE EQUPMENT OBSURED ALL DATA PLATES, INFORMATION COULD NOT BE VERIFIED.									
CONDUCTOR TYPE:	CU	AS A RESULT, THE EQUIPMENT WILL BEAR A LABEL INDICTATING THERE WILL BE NO SAFE LEVEL OF PPE.									
RACEWAY TYPE:	NON-MAG										
LENGTH:	50'										
MAIN:											

FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
PANEL 'C'							

EQUIPMENT NAME:	GENSET - FS #91	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	400	SCCR:	25K	MAIN:	MCB
EQUIPMENT TYPE:	GENSET									MODEL:	GBU 403
MANUFACTURER:	GENERAC									AMPS:	400
MODEL:	10313570100					OTHER COMMENTS					
TYPE:	GENSET					150KW GENSET					
FED FROM:		NAMEPLATE INFORMATION SHOWS 600A MCB, CIRCUIT BREAKER INDICATES 400A									
AFC:		MAIN RATED FOR 18K AIC									
SETS:	2 SETS										
FEEDER SIZE:	#4/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	NON-MAG										
LENGTH:	55'										
MAIN:	400										
OCPD:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
ATS FS #91	400	400					

EQUIPMENT NAME:	PANEL 'C'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	400	SCCR:	10K	MAIN:	MCB
EQUIPMENT TYPE:	PANELBOARD									MODEL:	JXD63B400
MANUFACTURER:	SIEMENS									AMPS:	400
MODEL:						OTHER COMMENTS					
TYPE:						BRANCH BREAKERS: HBL (65K AIC) AND BQD (65K AIC)					
FED FROM:	ATS FS #91										
AFC:											
SETS:	2 SETS										
FEEDER SIZE:	#4/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	8'										
MAIN:	400										
OCPD:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
PANEL 'D'	200	125		100K	NGB3B125		
PANEL 'E'	200	125		100K	NGB3B125		

EQUIPMENT NAME:	PANEL 'D'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	250	SCCR:	10K	MAIN:	MCB
EQUIPMENT TYPE:	PANELBOARD									MODEL:	ED43B125
MANUFACTURER:	SIEMENS									AMPS:	125
MODEL:	P1					OTHER COMMENTS					
TYPE:						TYPE BL BRANCH CIRCUIT BREAKERS - 10K AIC					
FED FROM:	PANEL 'C'					MAIN CIRCUIT BREAKER - 65K AIC					
AFC:						AFC WILL EXCEED THE AIC RATING OF THE PANEL. NO SERIES RATINGS ARE SHOWN					
SETS:						A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.					
FEEDER SIZE:	#2/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	3'										
MAIN:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
PANEL 'LOA'	100	100		10K			

EQUIPMENT NAME:	PANEL 'E'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	250	SCCR:	10K	MAIN:	MCB
EQUIPMENT TYPE:	PANELBOARD									MODEL:	ED43B125
MANUFACTURER:	SIEMENS									AMPS:	125
MODEL:	P1					OTHER COMMENTS					
TYPE:						TYPE BL BRANCH CIRCUIT BREAKERS - 10K AIC					
FED FROM:	PANEL 'C'					MAIN CIRCUIT BREAKER - 65K AIC					
AFC:						AFC WILL EXCEED THE AIC RATING OF THE PANEL. NO SERIES RATINGS ARE SHOWN					
SETS:						A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.					
FEEDER SIZE:	#2/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	NON-MAG										
LENGTH:	10'										
MAIN:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES

EQUIPMENT NAME:	PANEL 'A'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	250	SCCR:	10K	MAIN:	MLO
EQUIPMENT TYPE:	SWTICHBOARD									MODEL:	
MANUFACTURER:	SIEMENS									AMPS:	
MODEL:	P1					OTHER COMMENTS					
TYPE:						TYPE BL CIRCUIT BREAKERS - 10K AIC					
FED FROM:	SES - FS #91										
AFC:						AFC WILL EXCEED THE AIC RATING OF THE PANEL. NO SERIES RATINGS ARE SHOWN					
SETS:						A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.					
FEEDER SIZE:	#4/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	NON-MAG										
LENGTH:	50'										
MAIN:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES

EQUIPMENT NAME:	PANEL 'B'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	250	SCCR:	10K	MAIN:	MLO
EQUIPMENT TYPE:	PANELBOARD									MODEL:	
MANUFACTURER:	SIEMENS									AMPS:	
MODEL:	P1					OTHER COMMENTS					
TYPE:	PANELBOARD					TYPE BL AND BAF CIRCUIT BREAKERS - 10K AIC					
FED FROM:	SES - FS #91										
AFC:											
SETS:											
FEEDER SIZE:	#4/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	NON-MAG										
LENGTH:	70'										
MAIN:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES

EQUIPMENT NAME:	PANEL 'C'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	250	SCCR:	65K	MAIN:	MLO
EQUIPMENT TYPE:	PANELBOARD									MODEL:	
MANUFACTURER:	SIEMENS									AMPS:	
MODEL:	P1					OTHER COMMENTS					
TYPE:	PANELBOARD					TYPE BL (10K AIC) AND, HBL, BQD CIRCUIT BREAKERS - 65K AIC					
FED FROM:	SES - FS #91										
AFC:						THE PANELBOARD HAS SEVERAL 10K AIC CIRCUIT BREAKERS INSTALLED. THESE					
SETS:						APEAR TO HAVE BEEN INSTALLED AT A LATER DATE.					
FEEDER SIZE:	#4/0					IF THE AVAILABLE FAULT CURRENT EXCEEDS 10,000 AMPERES					
CONDUCTOR TYPE:	CU					A LABEL WILL BE INSTALLED INDICATING THAT THERE WILL BE NO SAFE LEVEL OF PPE.					
RACEWAY TYPE:	NON-MAG										
LENGTH:	135										
MAIN:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES

EQUIPMENT NAME:	'SW PV1'	VOLTAGE:	240	PHASE:	3Ø-4W	AMPS:	60	SCCR:	100K	MAIN:	SWITCH
EQUIPMENT TYPE:	DISCONNECT									MODEL:	UNKN
MANUFACTURER:										AMPS	
MODEL:						OTHER COMMENTS					
TYPE:						SWITCH WAS PADLOCKED BY UTILITY, NO ACCESS.					
FED FROM:	SES - FS #91					A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.					
AFC:											
FEEDER SIZE:	#6										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	3'										
MAIN:											

FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
PV SYSTEM							

EQUIPMENT NAME:	PV'	VOLTAGE:	240	PHASE:	3Ø-4W	AMPS:	60	SCCR:	100K	MAIN:	SWITCH
EQUIPMENT TYPE:	PV SYSTEM									MODEL:	UNKN
MANUFACTURER:										AMPS	
MODEL:						OTHER COMMENTS					
TYPE:						COULD NOT OPEN EQUIPMENT					
FED FROM:	0					A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.					
AFC:											
FEEDER SIZE:											
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	3'										
MAIN:											

FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
SW PV2'							

EQUIPMENT NAME:	'SW PV2'	VOLTAGE:	240	PHASE:	3Ø-4W	AMPS:	60	SCCR:	100K	MAIN:	SWITCH
EQUIPMENT TYPE:	DISCONNECT									MODEL:	
MANUFACTURER:										AMPS	15A RK-1 FUSES
MODEL:						OTHER COMMENTS					
TYPE:											
FED FROM:											
AFC:											
FEEDER SIZE:											
CONDUCTOR TYPE:											
RACEWAY TYPE:	MAGNETIC										
LENGTH:	6'										
MAIN:	15A RK-1 FUSES										

FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES

1.3. Findings

1.3.1. Short Circuit Analysis

The short circuit study provides the available fault current at each busbar (point or node) of the distribution system based upon the impedance of the system to that point. Based upon these results, we can compare the equipment's short circuit current withstanding ratings (SCCR) and the ampere interrupting current ratings (AIC) with the available fault current**.**

Based on the short circuit study, calculated faults exceed the 10 KAIC ratings of the Panels A, B, C, D, and E.

At the locations noted, the available fault current exceeds the AIC and/or SCCR ratings of the equipment. As documentation from the manufacturer was not available, it is not possible to verify if the equipment is permitted to be used as part of a series rated system. While it appears that the applications of the labels are correct, it should be independently verified.

1.3.2. Protective Device Coordination

1.3.2.1. The MDP SES-FS 91 service feeders (TCC Report) imply poor over current protection coordination. However, this is a common practice for service feeders and the design is NEC code compliant.

1.3.2.2. The protective device settings in this report (Refer to TCC reports), do show that there is reasonable system protection for this installation. Refer to sections 2.6 and 3.3 for more details.

1.3.3. Arc Flash Evaluation

1.3.3.1. **The utility's metering cabinet and the main switchboard are often found to have incident energy levels that exceed 40 Cal/cm^2 (no safe level of PPE).** In locations where no safe level of PPE is recommended, energized work should be prohibited or extension tools (e.g., hotstick) should be used to distance personnel from the potential arc point. The incident energy at the indicated working distance dictates the required level of PPE. Wherever possible, protective device settings are suggested to try to reduce the incident energy levels. Please refer to Sections 2.5 and 3.2 for more detailed information.

1.3.3.2. The incident energy calculations utilize the data obtained from the serving utility. The incident energy calculations also assume the recommended settings shown both in the SKM Arc Flash One-Line and the follow up report for each SES distribution system. These settings must be implemented for the data provided on the labels to be correct. **Improper or inadequate maintenance can result in increased opening time of overcurrent protective devices, thus increasing the incident energy and negating the results of this study.**

1.3.3. Load Flow Analysis

The table in Appendix 3 provides an overview of the all the distribution panels predicted voltage drop. The voltage drop to all equipment appears to be satisfactory. It should be noted that excessive voltage drop can cause electronic equipment, such as computer systems, to unexpectedly shut down and effects the electrical system's performance. None of the locations studied were found to have current capacity less than available demand current flow.

Refer to Section 3.4 for more detail.

1.4. Study Notes

This study is based upon the most accurate information available at the time the study was conducted.

In reviewing the report, the serving utility typically does not provide the actual values for their contribution to the available fault current nor the impedance of their transformers. Values are published in their respective Electrical Service Requirement Manuals (ESRM) however, they will not guarantee the accuracy of this information. Additionally, there is no external labeling of the equipment that would provide this information. As a result, the values provided in this study may differ from actual values.

The serving utilities also will not indicate if overcurrent protective equipment, devices, or relays have been provided on the line side of their distribution transformer(s). As a result, it is prudent to perform these studies assuming that no protection has been provided.

There is equipment that was not surveyed due to being in locked rooms or otherwise inaccessible. Without being able to determine panel condition, we generated a Red Dangerous label for such panels.

Precise measurements of the distribution system feeders are all but impossible. Every effort has been made to estimate conductor length based upon equipment location and observed raceway or cable routing. Additionally, calculations provided in this study assume magnetic raceways above grade and non-magnetic raceways below grade except where positive identification is possible.

The results of this study are valid for a maximum of 5 calendar years after the date of publication and are invalidated whenever any of the following conditions or modifications are made to the distribution system or where the electrical equipment is not properly maintained.

The following conditions will negate the findings of this study and render the results invalid.

- Changes made to the utility distribution system or equipment
- The addition of equipment or loads
- Removal or replacement of overcurrent devices with differing specifications
- Changing overcurrent protective device settings
- Any modification to the facility distribution system
- Improper maintenance of equipment
- Removal of equipment
- Equipment that is not properly exercised as required by the manufacturer(s).

Whenever new equipment or loads have been provided after this study has been published, it is strongly recommended that a new study be provided to assess how the changes have impacted the system.

2. ANALYSIS

2.1. Basis of Analysis

Electrical system inputs, for the analysis performed, are composed of both non-intrusive on-site data gathering methods and integrating predictable values. This information is presented in the Excel spreadsheets included in this report. Source data was obtained from the Salt River Project Electrical Service Requirements Manual. SKM Power Tools version "9.0.0.7" was used for all analysis performed. Using this software, a computer model of the electrical system was created based on data obtained for the analysis. The single line diagram of the distribution system is shown on Fig.01 which is a graphical representation of the electrical system. The components on the Single Line Diagram (SLD) included all required device information for the analysis. This model was then used to study the electrical system and generate the calculations found in Appendices 1 through 5 of this report.

2.2. Campus as built Data Gathering Assumptions

When reviewing the system single line diagram, the provided information is based upon visual observations made at the site. In some circumstances it was not possible to access or open equipment. Access to this equipment may have been limited to any of the following conditions.

- Personnel not permitted to de-energize equipment
- Personnel could not gain access to equipment due to locked doors, gates or covers
- Equipment could not be opened or accessed without de-energizing the equipment or systems
- Staff felt the opening of the equipment may expose persons or property to an unreasonable risk due to the condition of the equipment.

As demand loads are necessary to complete the calculations, this study is based upon information provided by the facilities owner indicating the highest demand loads for the last calendar year. This information is supplied by the serving utility to the facility owner/operator. Where this information has not been provided, all calculations performed have been based upon a value 80% of the rating of the electrical service(s) for the facility with an anticipated power factor (PF) of 80%.

As demand loads are necessary to complete the calculations, it was necessary to make assumptions for these loads to complete the study. As load studies have not been completed for each panel or feeder, we based the study by using the following assumptions for all estimated loads (actual values are used when provided):

- Motors protected by circuit breakers: 40% of the circuit breaker rating
- Motors protected by fuses: 50% of the fuse rating
- All other loads: 50% of the rating of the upstream OCPD.

These assumptions are conservative in nature and should provide an acceptable range of results. It should be noted that in some instances, these assumptions indicate that equipment may not be suitable for the loads applied. The values provided do not necessarily indicate an overloaded or unsafe condition however, additional investigation may be necessary to assure the safe and continued operation of the equipment or systems.

The demand loads for switchboards and panelboards will be as follows:

Panelboard load estimate:

- **Main Distribution Board SES-FS 91:** 552 amps (reference Load Flow One Line).
- **Panel A & B:** 102 & 103 amps
- **Panel C:** 346 amps
- **Panel D & E:** 71 & 72 amps

2.3. Equipment Evaluation

Each device on the one-line diagram in Fig.01 is identified by an identifier. Common identifiers used in this report include:

AFC– Available Fault Current
AF – Arc Flash
IC – Interrupting Current
Gen – Generator
SCC – Short Circuit Current
CB – Circuit Breaker
SW – Switch
IE – Incident Energy
PPE – Personal Protective Equipment
TCC – Time Current Curve
AF – Arc Flash
SWB – Switchboard
LV – Low Voltage
CBL – Cable
LF – Load Flow
SC – Short Circuit

The incident energy summary in each report contains the available fault current calculations at each indicated device in the electrical system. Incident energy may increase if protective device settings in the electrical equipment is changed or adjusted or, if they are replaced. Increases in incident energy may also result from improper or inadequate maintenance or new construction.

Electrical equipment and protection devices must be in proper working condition for the equipment to operate properly and open as expected. A maintenance inspection and testing program should ensure that all equipment and devices function as designed by the manufacturer. NFPA 70E 2018 provides standards for electrical safety, including the following requirements for electrical equipment and protective devices:

> **General Maintenance Requirements** - Electrical equipment shall be maintained in accordance with manufacturers' instructions or industry consensus standards to reduce the risk of failure and the subsequent exposure of employees to electrical hazards.
>
> **Overcurrent Protective Devices** - Overcurrent protective devices shall be maintained in accordance with the manufacturers' instructions or industry consensus standards. Maintenance, tests, and inspections shall be documented.
>
> **210.5 Protective Devices** - Protective devices shall be maintained to adequately withstand or interrupt available fault current.

As of June, 2025, the amended 2014 National Electrical Code (NEC) is in effect in the town of Paradise Valley. Article 110 of the NEC contains requirements for all electrical installations, including maintenance and mechanical execution of work:

> **110.12(B): Mechanical Execution of work** - There shall be no damaged parts that may adversely affect safe operation or mechanical strength of the equipment such as parts that are broken, bent, cut; or deteriorated by corrosion, chemical action, or overheating.
>
> **110.26: Spaces about Electrical Equipment** - Access and working space shall be provided and maintained about all electrical equipment to permit ready and safe operation and maintenance of such equipment.

Additionally, when series ratings are used the National Electrical Code (NEC) Article 110 requires series combination rated overcurrent devices are visibly marked by permanently affixed means as stated:

> **110.22(B): Engineered Series Combination Systems** - Equipment enclosures for circuit breakers or fuses applied in compliance with series combination ratings selected under engineering supervision in accordance with 240.86(A) shall be legibly marked in the field as directed by the engineer to indicate the equipment has been applied with a series combination system. The marking shall meet the requirements in 110.21(B) and shall be readily visible and state the following: CAUTION – ENGINEERED SERIES COMBINATION SYSTEM RATED XXXXX AMPERES. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED.

Equipment that is malfunctioning, has been inadequately or improperly installed, maintained, or modified, may result in injury or death, and will invalidate the results of this study.

2.4 Short Circuit Analysis

An analysis of the system was performed to determine the maximum fault levels at the equipment covered within the scope of work. SKM Power Tools version 9.0.1.3 (Unbalanced/Single Phase Subroutine) was used for the analysis using the comprehensive ANSI/IEEE C37.13 standard for calculation of these fault currents during short-circuit. The following short circuit currents have been calculated for system components:

- Initial Symmetrical line to line short circuit current (SCC1)
- Initial Symmetrical single line to ground short circuit current (SCC2)

The SCC1 is the maximum available short circuit current at any point in the distribution system, this is generally at the point the utility company connects to the system's service entrance system. This connection is called the point of service or the service point. The available fault current, at each point in the distribution system, is based upon the contributed fault current provided by the utility (this value is provided by the serving utility or from the utilities tables). Then, through analyzing the fault current calculations, the electrical system's components' fault withstand capability will be assessed by comparing them with SCC1.

The short-circuit current should not exceed the equipment rating with required factors for the protective device.

Based on the short circuit study, calculated faults exceeded the 10 KAIC ratings of the Panels A, B, C, D, and E.

The Short Circuit Analysis in each SES SKM report summarizes the fault duties at each device. The AF incident energy summary in the SES report shows IE at the safe distance and PPE requirements for each location into the system.

2.5 Arc Flash Evaluation

Arc Flash Evaluations are used to assess arc flash hazards and to assess the work Site risk to personnel. The Occupational Safety and Health Administration (OSHA), and the National Fire Protection Association (NFPA) standard 70E provide requirements for arc flash and other work Site hazards. OSHA requires employers provide a workplace free from recognized hazards that may cause injury or death to their employees. NFPA 70E 2018 provides the Standard for Electrical Safety in the Workplace. NFPA 70E 130.5 states:

"An arc flash risk assessment shall be performed and shall determine if an arc flash hazard exists. If an arc flash hazard exists, the risk assessment shall determine appropriate safety-related work practices, the arc flash boundary, and the PPE to be used within the arc flash boundary."

Arc Flash Evaluations are used to determine the required level of personal protective equipment (PPE), arc flash boundaries, and restrictions on the work of energized equipment. This information must include on the labels as required by NFPA and OSHA standards.

NFPA 70E 130.5(H) requires electrical equipment to be field-marked with a label containing the following information:

(1) Nominal system voltage
(2) Arc flash boundary
(3) At least one of the following:

a. Available incident energy and the corresponding working distance, OR the arc flash PPE category in Table 130.7(C)(15)(a) or Table 130.7(C)(15)(b) for the equipment, but not both
b. Minimum arc rating of clothing
c. Site-specific level of PPE

Furthermore, the National Electrical Code (NEC) contains additional requirements for the installation of Arc-Flash warning labels and arc energy reduction:

110.16 Arc-Flash Hazard Warning. Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that in other than dwelling units, and is likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

240.67 Arc Energy Reduction. Where fuses rated 1200 A or higher are installed, 240.67(A) and (B) shall apply. This requirement shall become effective January 1, 2020.

(A) Documentation. Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses.
(B) Method to Reduce Clearing Time. A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following shall be provided:

(1) Differential relaying
(2) Energy-reducing maintenance switching with local status
(3) Energy-reducing active arc flash mitigation system
(4) An approved equivalent means

240.87 Arc Energy Reduction. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted is 1200 A or higher, 240.87(A) and (B) shall apply. Not applicable for this Campus as all Overcurrent Circuit protection is 1000 amp or less.

NFPA 70E 130.5(G) also contains information on the selection of PPE where required based on the incident energy available at the equipment. Different types of PPE are suggested dependent on the exposure level of the energy as rated in Cal/cm^2. The energy exposure levels are shown in the Incident Energy Summary in each report. The levels are defined using the following energy Cal/cm^2:

Level A: 1.2 Cal/cm^2
Level B: 4 Cal/cm^2
Level C: 8 Cal/cm^2
Level D: 25 Cal/cm^2
Level E: 40 Cal/cm^2
Level D: 100 Cal/cm^2
Level E: 120 Cal/cm^2

The upper limit for the highest rated PPE is 40 Cal/cm^2. Energy exposure beyond this upper limit is relatively unsafe with any PPE, and energized work at equipment exceeding this rating should be avoided. **Arc-Flash labels with incident energy exceeding this threshold show the required PPE as "No Safe PPE Available – Energized Work is Prohibited".**

NFPA 70E 130.7(C) describes PPE requirements in effect at specified boundaries of working distance. NFPA 70E 130.4 is effective where working within the "restricted Approach Boundary", and NFPA 70E 130.5 were working within the "Arc Flash Boundary". Previous versions of NFPA 70E 2018 contain varied names and descriptions for these boundaries. This analysis uses NFPA 70E 2018, the most recent version as of the preparation of the analysis, as the basis for descriptions of approach boundaries.

The incident energy calculations utilize information provided by the serving utility. The incident energy calculations also assume the correct settings of overcurrent protective devices for the data provided on the labels to be correct. Improper or inadequate maintenance can result in increased opening time of the overcurrent protective device(s), thus increasing the incident energy.

2.5.1 Arc Flash Labels

Equipment labels containing the incident energy level, working boundaries and PPE requirements for exposed energized work are in Appendix 6. The labels are color coded per ANSI Z535.4 and are to be field-marked per NFPA 70E 130.5(D) and NEC 110.16.

The settings used in Arc Energy Reduction or other temporary means of incident energy reduction should be reset as soon as the work is complete to return the system to the normal engineered settings. Failure to do so will result in non-selective operation of the system and may result in unnecessary loss of power to critical systems.

2.6 Coordination Analysis

A protective device Coordination Study was performed to evaluate the capability of the protective devices to provide protection under fault conditions. The Coordination Study was performed by plotting the protective device characteristics as Time-Current Characteristic (TCC) curve sets. SKM Power Tools version 9.0.1.3 was used for TCC plots and analysis in this report. Protective devices including fuses and breakers were compared in a graphed set to coordinate the operating time and current of devices adjacent to each other in the electrical system.

In many systems, compromises need to be made between coordination, protection, and service needs of the Site due to the amperage and devices in the system.

ANSI/IEEE Standard 242-2001 states, "Whether minimizing the risk of equipment damage or preserving service continuity is the more important objective depends on the operating philosophy of the particular plant or business."

Subsequent changes in devices or operation of the system may require re-evaluation of protective devices.

Time-Current Curve (TCC) sets for the systems analyzed are in the Appendix 4 report. The voltage and current are considered in the one-line diagram that show the relationship between the protective devices plotted on each curve set. The curves for each device are terminated at the maximum fault magnitude available at the device's location. The curve sets consist of the TCC of devices plotted on a log-log graph showing current and time axis. The findings based on the TCC plots do not address lack of selectivity due to instantaneous units being in series.

2.7 Load Flow Evaluation

An analysis of the system was performed to determine the maximum voltage drop, voltage phase, power factor, branches voltage, current, power losses, active and reactive power.

2.8 Energized Electrical Work Permit

An example of an Energized Electrical Work Permit is included in the Appendix. It is provided for reference and may be used as needed to meet the requirements of NFPA 70E 2018 for the facility.

3. STUDYS' RESULTS INTERPRETATION

3.1 Short Circuit Interpretation

Starting with Init.Sym.RMS provided for the service as the available symmetrical short circuit current at service equipment by the serving utility:

- SES-FS 91 is a 3PH 208V system with an APS utility provided 49.5 KA fault value.

The fault current from the service entrance to the downstream equipment is reduced proportionately based on the impedance of each successive buss or line. Short Circuit Current ratings, or Ampere Interrupting Capacity ratings, are based upon the available energy at each specific point in the electrical system according to the short circuit study.

The model utilizes information obtained from field observations and compared the available fault current with the interrupting and/or short circuit ratings (IC) of the protective devices in the electrical system.

Based on short circuit study, Panels A, B, C, D, and E exceed their KAIC values. Issues with the electrical system at the main location are noted in the Excel report. *Reference Excel field report.*

Eq. Name	SES-FS 91	Panel A	Panel B	Panel C	Panel D	Panel E
SC RATING(KASCw)	65KA ☑	10KA ☒	10KA ☒	10KA ☒	10KA ☒	10KA ☒
$I_{k"-3Ph.-Init.Sym.}$	43.9KA ↗	20.1KA ↗	16.2KA ↗	26.3KA ↗	24.5KA ↗	21.9KA ↗

Table (1)

NOTE 1:

☑ : Passed. Equipment is adequate to use under circumstance.

☒ : Failed. Equipment is not adequate to use under circumstance. Client must upgrade the panel or perhaps the circuit breakers with higher ratings as proposed in this report.

3.2 Arc Flash Study Interpretation

The analysis of faults and protective devices were used to evaluate incident energy in the electrical system. These rapid clearing times help to reduce the time that the arc is ON. The quicker an overcurrent device opens or clears the fault, a lower value of Incident Energy is expected and in turn, lowers the AF categories. The AF study also evaluated the incident energy for the facility where the system(s) supply was provided.

The incident energy (IE) at the service point, is elevated, as we did not consider any MV circuit breaker on transformer primary side as the serving utility will not provide this information. It should be noted that where a MV CB / or fuse on transformer primary is provided, the IE provided by the utility system will be significantly decreased.

All sources of energy should follow lock-out tag-out procedures and the switchgear should be in a constant de-energized state when servicing, modifying, or maintaining the equipment. The following general site recommendations are:

The worst-case energy levels should be utilized in developing energized electrical safety procedures and other PPE required for the site.

Voltage should always be verified to be equal to or less than the indicated voltage on the provided labels and/or the nameplate provided with the equipment, or the findings of this report will be invalidated.

Labels are to be printed with the following color code as per customer request.

INCIDENT ENERGY (cal/cm^2)	CLOTHING DESCRIPTION	COLOR CODE
<1.2	Non-melting or untreated natural fiber long-sleeve shirt, long pants or coveralls, and other PPE per NFPA 70E-2018 Article 130.7(C).	
1.2-12	AR total body and face protection (rated equal to or greater IE level), and other PPE per NFPA-70E-2018 Table 130.5(G) and Article 130.7(C).	
>12-40	AR total body and face protection (rated equal to or greater IE level), and other PPE per NFPA-70E-2018 Table 130.5(G) and Article 130.7(C).	
>40*	INCIDENT ENERGIES AT THIS LOCATION EXCEEDS THE MAXIMUM SAFE WORKING LEVEL. ENERGIZED WORK IS NOT RECOMMENDED	

3.30 Coordination Study Interpretation

The short circuit analysis of faults was modeled with protective devices in the electrical system. Inserting all protective elements in one diagram could cause confusion, so each radial branch's TCC have been shown in individual TCC diagrams.

Typical TCC curves are provided in Appendix 4.

TCC diagrams show Circuit breaker to cable coordination and do not call out undersized bus systems. It should be noted that changing overcurrent device sizes or settings may introduce additional hazards or issues; any changes should be done in consultation with a registered electrical engineer.

3.40 Load Flow Study Interpretation

The load flow study calculated all system nominal currents, voltages, and power consumption throughout the distribution system assuming normal operation of the facility with nominal demands.

Assumptions for the facility demand loads had to be utilized to evaluate the system. The indicated loads are not actual and should be independently verified. It is recommended, as part of a continuing maintenance program, to periodically conduct load studies whenever systems are modified or equipment is added. The study should determine the actual loads used during the system operation and for a period of not less than 30 days. Based upon the study's findings, it may become necessary to remove or relocate loads or, it may find that load balancing may become necessary. It should be noted that actual loads are often significantly less than the calculated loads mandated by the NEC as these calculations tend to be very conservative.

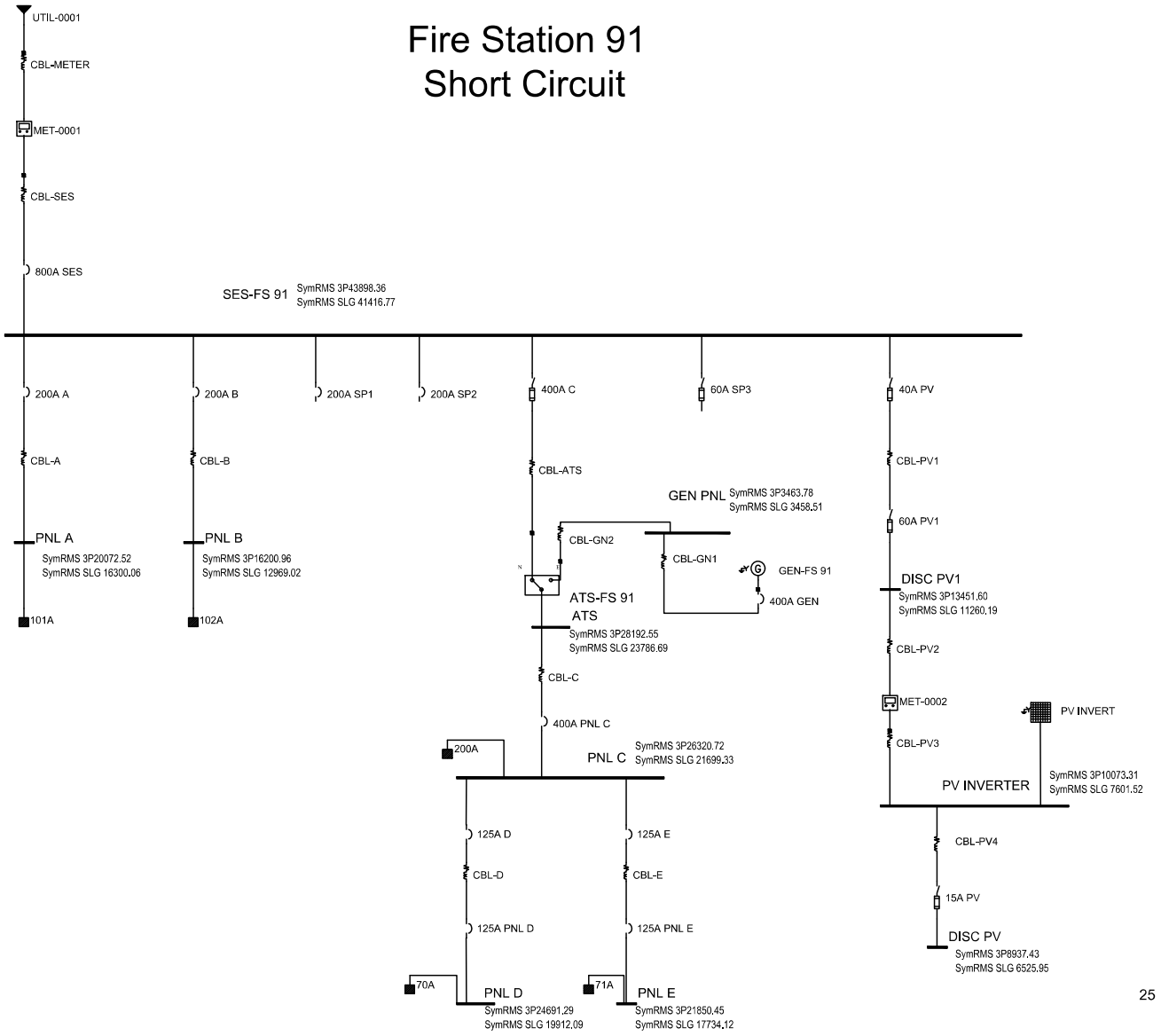
OCPD: Over Current Protection Device (Fuse/Breaker) are acceptable based upon estimated loads.

It appears that the voltage drop for the campus distribution system's feeders are acceptable. It should be noted that where voltage drop is excessive (greater than 5%) it may create operational issues (impacting the proper operation of data processing equipment as an example) and increase operational costs, it can also reduce the life expectancy of equipment such as motors and HVAC equipment and impact the proper operation of overcurrent devices and will increase clearing time which will also increase the incident energy of an arc flash. Finally, excessive voltage drop can also damage conductor insulation due to the increased heating of the conductor. Where these calculations indicate excessive voltage drop is present, the systems components should be evaluated by a registered electrical engineer.

APPENDIX 1

SHORT CIRCUIT SKM REPORT

Fire Station 91
Short Circuit



Project: Fire Station 91
Base Project

DAPPER Fault Contribution Complete Report

Comprehensive Short Circuit Study Settings

Three Phase Fault	Yes	**Faulted Bus**	All Buses
Single Line to Ground	Yes	**Bus Voltages**	First Bus From Fault
Line to Line Fault	No	**Branch Currents**	First Branch From Fault
Line to Line to Ground	No	**Phase or Sequence**	Report phase quantities
Motor Contribution	Yes	**Fault Current Calculation**	Asymmetrical RMS (with DC offset and Decay)
Transformer Tap	Yes	**Asym Fault Current at Time**	0.50 **Cycles**
Xformer Phase Shift	Yes		

			Initial Symmetrical Amps				Asymmetrical Amps				Init Sym Neutral Amps	
Bus Name	**Contributions**		**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
BUS-0001			**49,563**	**49,563**	**0**	**0**	**68,531**	**68,530**	**0**	**0**		
CBL-METER	CABLE	In	58	58	0	0	80	80	0	0	58	
UTIL-0001	UTILITY	In	49,505	49,505	0	0	68,450	68,450	0	0	49,505	
BUS-0002			**45,222**	**43,254**	**0**	**0**	**56,851**	**52,430**	**0**	**0**		
CBL-METER	CABLE	In	45,164	43,197	0	0	56,778	52,360	0	0	43,192	
CBL-SES	CABLE	In	58	58	0	0	73	71	0	0	63	
SES-FS 91			**43,898**	**41,417**	**0**	**0**	**53,888**	**48,798**	**0**	**0**		

			-------Initial Symmetrical Amps------				----------Asymmetrical Amps----------				--Init Sym Neutral Amps--	
Bus Name	**-----Contributions-----**		**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
CBL-A	CABLE	In	0	0	0	0	0	0	0	0		
CBL-ATS	CABLE	In	0	0	0	0	0	0	0	0		
CBL-B	CABLE	In	0	0	0	0	0	0	0	0		
CBL-PV1	CABLE	In	58	58	0	0	71	69	0	0	65	
CBL-SES	CABLE	In	43,840	41,359	0	0	53,817	48,730	0	0	41,353	
PNL A			**20,073**	**16,300**	**0**	**0**	**20,201**	**16,424**	**0**	**0**		
CBL-A	CABLE	In	20,073	16,300	0	0	20,201	16,424	0	0	16,300	
PNL B			**16,201**	**12,969**	**0**	**0**	**16,251**	**13,028**	**0**	**0**		
CBL-B	CABLE	In	16,201	12,969	0	0	16,251	13,028	0	0	12,969	
BUS-0009			**3,475**	**3,475**	**0**	**0**	**5,451**	**5,451**	**0**	**0**		
CBL-GN1	CABLE	In	0	0	0	0	0	0	0	0		
GEN-FS 91	GEN	In	3,475	3,475	0	0	5,451	5,451	0	0	3,475	
PNL C			**26,321**	**21,699**	**0**	**0**	**26,830**	**22,029**	**0**	**0**		
CBL-C	CABLE	In	26,321	21,699	0	0	26,830	22,029	0	0	21,699	
CBL-D	CABLE	In	0	0	0	0	0	0	0	0		
CBL-E	CABLE	In	0	0	0	0	0	0	0	0		

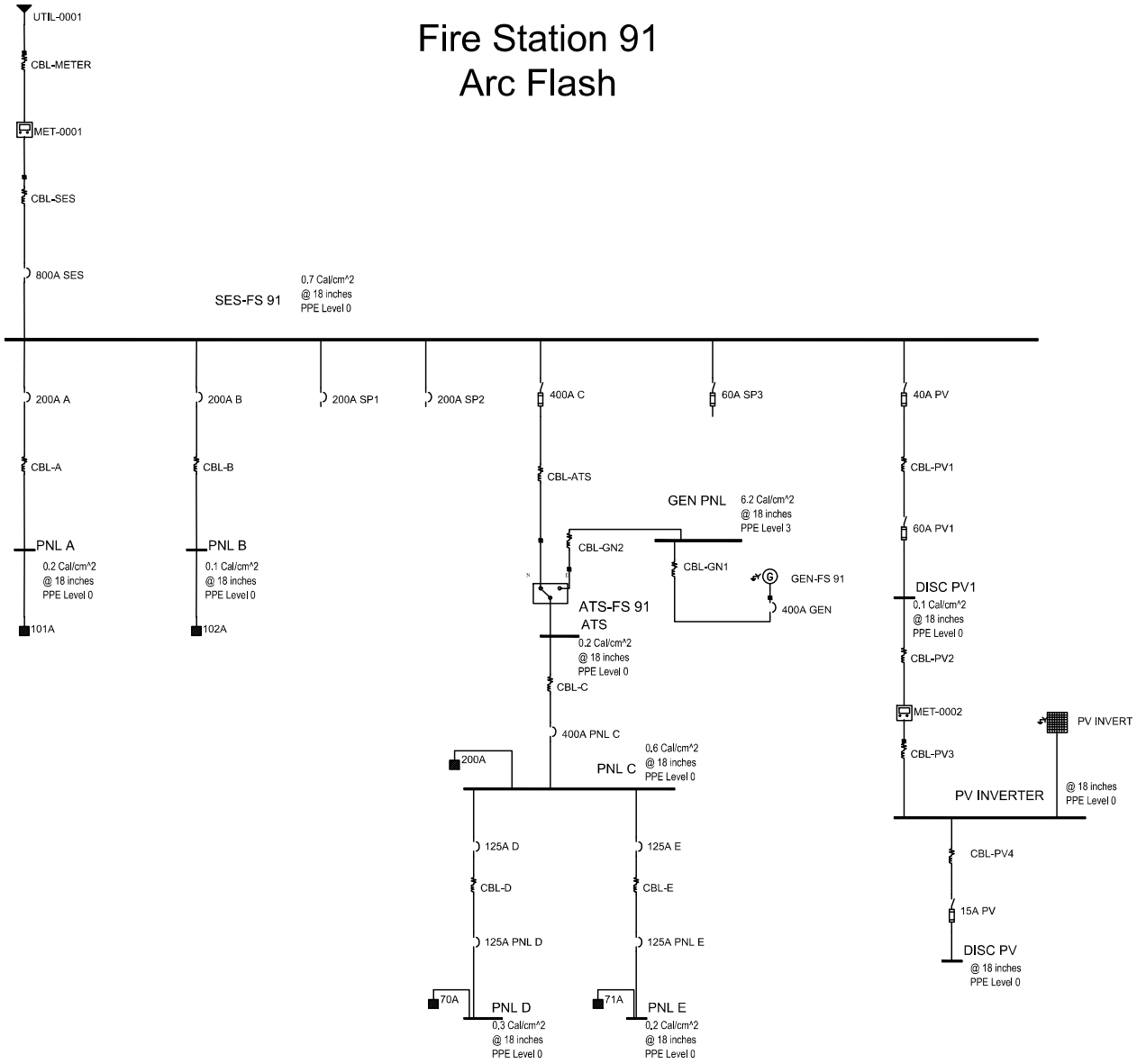
Bus Name	Contributions		Initial Symmetrical Amps 3 Phase	SLG	LLG	LL	Asymmetrical Amps 3 Phase	SLG	LLG	LL	Init Sym Neutral Amps SLG	LLG
PNL D			**24,691**	**19,912**	**0**	**0**	**25,038**	**20,101**	**0**	**0**		
CBL-D	CABLE	In	24,691	19,912	0	0	25,038	20,101	0	0	19,912	
PNL E			**21,850**	**17,734**	**0**	**0**	**21,994**	**17,841**	**0**	**0**		
CBL-E	CABLE	In	21,850	17,734	0	0	21,994	17,841	0	0	17,734	
DISC PV1			**13,452**	**11,260**	**0**	**0**	**13,452**	**11,260**	**0**	**0**		
CBL-PV1	CABLE	In	13,422	11,231	0	0	13,422	11,231	0	0	11,223	
CBL-PV2	CABLE	In	58	58	0	0	58	58	0	0	77	
BUS-0015			**11,526**	**9,084**	**0**	**0**	**11,526**	**9,084**	**0**	**0**		
CBL-PV2	CABLE	In	11,499	9,058	0	0	11,499	9,058	0	0	9,049	
CBL-PV3	CABLE	In	58	58	0	0	58	58	0	0	83	
PV INVERTER			**9,396**	**6,947**	**0**	**0**	**9,396**	**6,947**	**0**	**0**		
CBL-PV3	CABLE	In	9,371	6,924	0	0	9,371	6,924	0	0	6,915	
CBL-PV4	CABLE	In	0	0	0	0	0	0	0	0		
PV INVERT	GEN	In	58	58	0	0	58	58	0	0	89	
DISC PV			**8,397**	**6,035**	**0**	**0**	**8,397**	**6,035**	**0**	**0**		

			-------Initial Symmetrical Amps------				----------Asymmetrical Amps----------				--Init Sym Neutral Amps-	
Bus Name	**------Contributions------**		**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
CBL-PV4	CABLE	In	8,397	6,035	0	0	8,397	6,035	0	0	6,035	
GEN PNL			**3,464**	**3,459**	**0**	**0**	**5,389**	**5,373**	**0**	**0**		
CBL-GN1	CABLE	In	3,464	3,459	0	0	5,389	5,373	0	0	3,459	
CBL-GN2	CABLE	In	0	0	0	0	0	0	0	0		
ATS			**28,193**	**23,787**	**0**	**0**	**28,874**	**24,300**	**0**	**0**		
CBL-C	CABLE	In	0	0	0	0	0	0	0	0		
BUS-0021			**28,193**	**23,787**	**0**	**0**	**28,874**	**24,300**	**0**	**0**		
CBL-ATS	CABLE	In	28,193	23,787	0	0	28,874	24,300	0	0	23,787	
ATS-FS 91		In	0	0	0	0	0	0	0	0		
BUS-0023			**3,345**	**3,286**	**0**	**0**	**4,798**	**4,649**	**0**	**0**		
CBL-GN2	CABLE	In	3,345	3,286	0	0	4,798	4,649	0	0	3,286	
ATS-FS 91		In	28,193	23,787	0	0	28,874	24,300	0	0		

APPENDIX 2

ARC FLASH SKM REPORT

Fire Station 91
Arc Flash



Project: Fire Station 91
Base Project

Arc Flash Evaluation Report

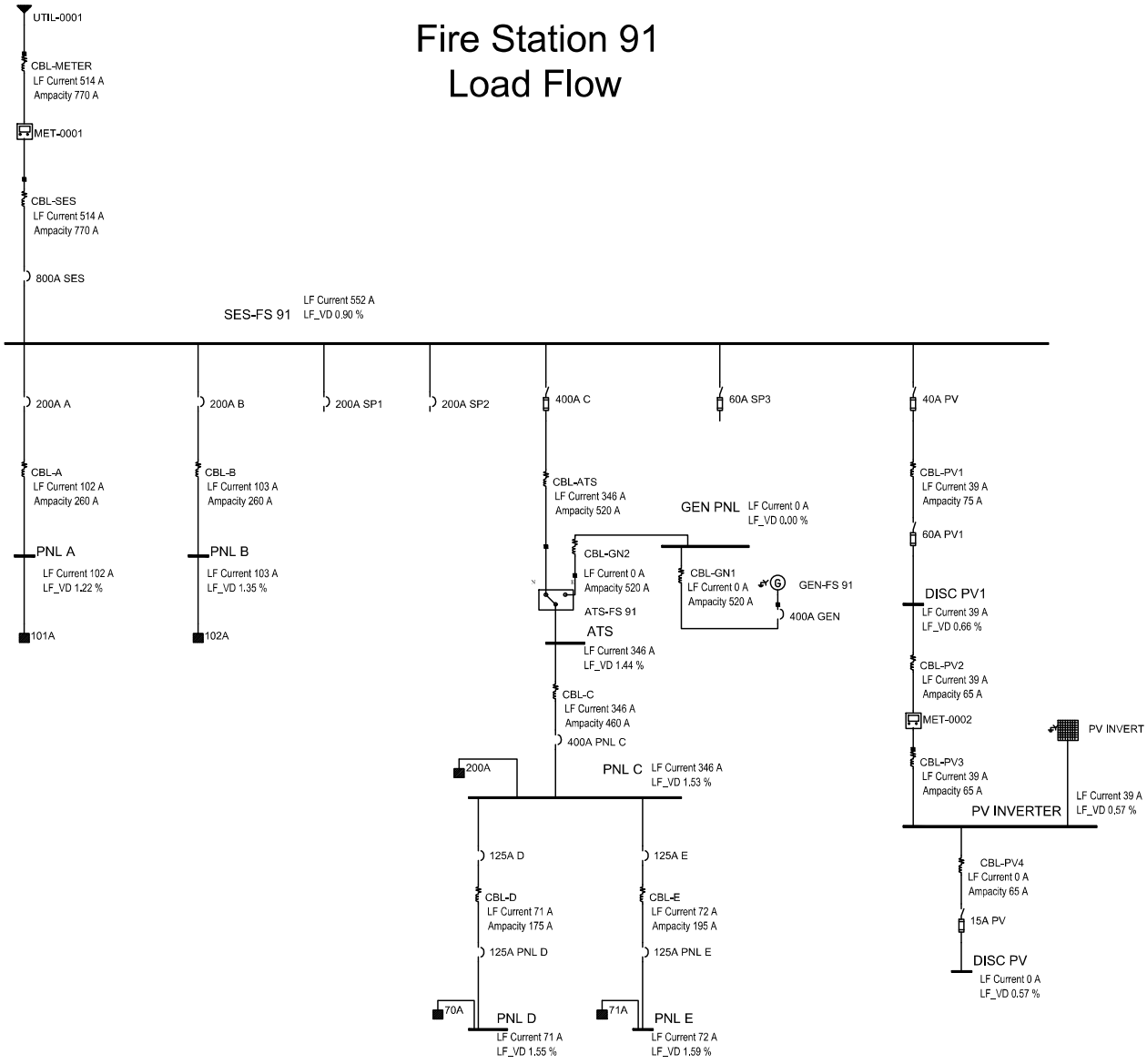
Bus Name	Bus kV	Protective Device Name	Bus Bolted/ Arcing (kA)	Prot Bolted/ Arcing (kA)	Trip/ Breaker Time (sec.)	Equip Type/ Gap (mm)	Electrode Config / WC Config	Box Height/ Width (in)	Box Depth (in)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
ATS	0.208	400A C	28.19	28.19	0.008	PNL	VCB	14	10	6.17	18.00	0.22	No Arc-rated PPE Required
			10.50	10.50	0.000	25	VCB	12					
DISC PV	0.208	15A PV	8.40	8.40	0.004	PNL	VCB	14	10	2.00	18.00	0.04	No Arc-rated PPE Required
			3.79	3.79	0.000	25	VCB	12					
DISC PV1	0.208	60A PV1	13.45	13.42	0.004	PNL	VCB	14	10	2.78	18.00	0.06	No Arc-rated PPE Required
			6.24	6.22	0.000	25	VCB	12					
GEN PNL	0.208	400A GEN	3.46	3.46	2.000	PNL	VCB	14	10	50.45	18.00	6.23	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
			1.44	1.44	0.000	25	VCB	12					
PNL A	0.208	200A A	20.07	20.07	0.007	PNL	VCB	14	10	5.19	18.00	0.16	No Arc-rated PPE Required
			9.21	9.21	0.000	25	VCB	12					
PNL B	0.208	200A B	16.20	16.20	0.008	PNL	VCB	14	10	4.74	18.00	0.14	No Arc-rated PPE Required
			7.52	7.52	0.000	25	VCB	12					
PNL C	0.208	400A PNL C	26.32	26.32	0.021	PNL	VCB	14	10	11.73	18.00	0.61	No Arc-rated PPE Required
			11.58	11.58	0.000	25	VCB	12					
PNL D	0.208	125A D	24.69	24.69	0.010	PNL	VCB	14	10	7.05	18.00	0.27	No Arc-rated PPE Required
			11.01	11.01	0.000	25	VCB	12					
PNL E	0.208	125A E	21.85	21.85	0.010	PNL	VCB	14	10	6.58	18.00	0.24	No Arc-rated PPE Required
			9.93	9.93	0.000	25	VCB	12					

Bus Name	Bus kV	Protective Device Name	Bus Bolted/ Arcing (kA)	Prot Bolted/ Arcing (kA)	Trip/ Breaker Time (sec.)	Equip Type/ Gap (mm)	Electrode Config / WC Config	Box Height/ Width (in)	Box Depth (in)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
PV INVERTER	0.208	40A PV	9.40	9.37	0.004	PNL	VCB	14	10	2.17	18.00	0.04	No Arc-rated PPE Required
			4.27	4.26	0.000	25	VCB	12					
SES-FS 91	0.208	800A SES	43.90	43.84	0.017	PNL	VCB	14	10	12.84	18.00	0.70	No Arc-rated PPE Required
			15.71	15.69	0.000	25	VCB	12					

APPENDIX 3

LOAD FLOW STUDY

Fire Station 91
Load Flow



Project: Fire Station 91
Base Project

Load Flow Summary Report

Load Flow Study Settings

Include Source Impedance	Yes	**Bus Voltage Drop %**	5.00
Solution Method	Exact (Iterative)	**Branch Voltage Drop %**	3.00
Load Specification	Connected Load		

Swing Generators

Source	In/Out Service	Vpu	Angle	kW	kvar	VD%	Utility Impedance
GEN-FS 91	In	1.00	0.00	0.0	0.0	0.00	3.99 +*j* 79.79
UTIL-0001	In	1.00	0.00	145.4	112.3	0.73	0.70 +*j* 5.56

PQ Generators

Participation PQ Source	In/Out Service	VD %	Vp.u.	KW	KVAR
PV INVERT	In	0.57	0.990	12.6	6.1

Buses

Bus Name	In/Out Service	Design Volts	LF Volts	Angle Degree	PU Volts	%VD
ATS	In	208	205	-0.41	0.99	1.44
DISC PV	In	208	207	-0.50	0.99	0.57
DISC PV1	In	208	207	-0.48	0.99	0.66
GEN PNL	In	208	208	0.00	1.00	0.00
PNL A	In	208	205	-0.42	0.99	1.22
PNL B	In	208	205	-0.41	0.99	1.35
PNL C	In	208	205	-0.41	0.98	1.53
PNL D	In	208	205	-0.40	0.98	1.55
PNL E	In	208	205	-0.40	0.98	1.60
PV INVERTER	In	208	207	-0.50	0.99	0.57
SES-FS 91	In	208	206	-0.43	0.99	0.90

Cables

From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
ATS PNL C	CBL-C	In	0.09	98.4 0.1	73.8 0.1	123.0 0.1	346.4 75.3	0.80
BUS-0001 BUS-0002	CBL-METER	In	0.12	145.4 0.2	112.3 0.2	183.7 0.2	513.7 66.7	0.79
BUS-0002 SES-FS 91	CBL-SES	In	0.04	145.2 0.1	112.1 0.1	183.5 0.1	513.7 66.7	0.79
BUS-0015	CBL-PV3	In	0.05	-12.6	-6.1	14.0	39.1	0.90

From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
PV INVERTER				0.0	0.0	0.0	60.1	
DISC PV1 BUS-0015	CBL-PV2	In	0.05	-12.6 0.0	-6.1 0.0	14.0 0.0	39.1 60.1	0.90
GEN PNL BUS-0009	CBL-GN1	In	0.00	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.00
GEN PNL BUS-0023	CBL-GN2	In	0.00	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.00
PNL C PNL D	CBL-D	In	0.02	20.2 0.0	15.1 0.0	25.2 0.0	71.1 40.6	0.80
PNL C PNL E	CBL-E	In	0.06	20.5 0.0	15.4 0.0	25.6 0.0	72.2 37.0	0.80
PV INVERTER DISC PV	CBL-PV4	In	0.00	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.00
SES-FS 91 BUS-0021	CBL-ATS	In	0.54	99.0 0.6	74.1 0.4	123.7 0.7	346.4 66.6	0.80
SES-FS 91 DISC PV1	CBL-PV1	In	0.24	-12.6 0.0	-6.1 0.0	14.0 0.0	39.1 52.1	0.90
SES-FS 91 PNL A	CBL-A	In	0.32	29.2 0.1	21.9 0.1	36.5 0.1	102.2 39.3	0.80
SES-FS 91 PNL B	CBL-B	In	0.45	29.5 0.1	22.1 0.1	36.9 0.2	103.4 39.8	0.80

Project: Fire Station 91
Generator

Load Flow Summary Report

Load Flow Study Settings

Include Source Impedance	Yes	**Bus Voltage Drop %**	5.00
Solution Method	Exact (Iterative)	**Branch Voltage Drop %**	3.00
Load Specification	Connected Load		

Swing Generators

Source	In/Out Service	Vpu	Angle	kW	kvar	VD%	Utility Impedance
GEN-FS 91	In	1.00	0.00	69.9	52.4	4.84	3.99 +*j* 79.79
UTIL-0001	In	1.00	0.00	46.2	38.0	0.24	0.70 +*j* 5.56

PQ Generators

Participation PQ Source	In/Out Service	VD %	Vp.u.	KW	KVAR
PV INVERT	In	-0.03	1.000	12.6	6.1

Buses

Bus Name	In/Out Service	Design Volts	LF Volts	Angle Degree	PU Volts	%VD
ATS	In	208	197	-3.21	0.95	5.32
DISC PV	In	208	208	-0.20	1.00	-0.03
DISC PV1	In	208	208	-0.18	1.00	0.06
GEN PNL	In	208	198	-3.23	0.95	4.88
PNL A	In	208	207	-0.12	0.99	0.61
PNL B	In	208	206	-0.11	0.99	0.74
PNL C	In	208	197	-3.21	0.95	5.39
PNL D	In	208	197	-3.21	0.95	5.41
PNL E	In	208	197	-3.20	0.95	5.45
PV INVERTER	In	208	208	-0.20	1.00	-0.03
SES-FS 91	In	208	207	-0.13	1.00	0.30

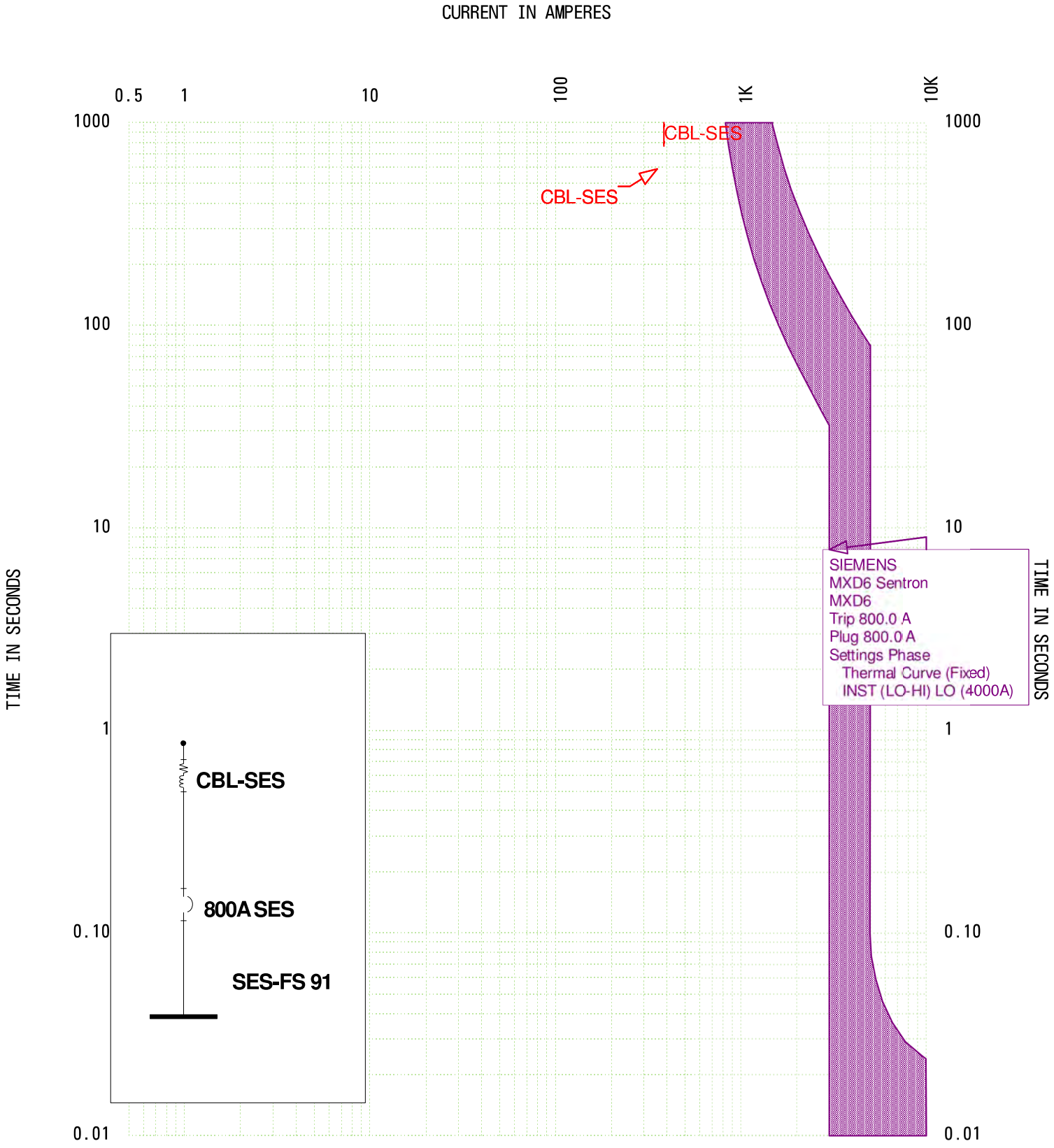
Cables

From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
ATS PNL C	CBL-C	In	0.07	69.5 0.0	52.1 0.0	86.9 0.1	254.8 55.4	0.80
BUS-0001 BUS-0002	CBL-METER	In	0.04	46.2 0.0	38.0 0.0	59.8 0.0	166.4 21.6	0.77
BUS-0002 SES-FS 91	CBL-SES	In	0.01	46.2 0.0	37.9 0.0	59.8 0.0	166.4 21.6	0.77
BUS-0015	CBL-PV3	In	0.05	-12.6	-6.1	14.0	38.8	0.90

From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
PV INVERTER				0.0	0.0	0.0	77.7	
DISC PV1 BUS-0015	CBL-PV2	In	0.05	-12.6 0.0	-6.1 0.0	14.0 0.0	38.8 59.8	0.90
GEN PNL BUS-0009	CBL-GN1	In	0.04	-69.9 0.0	-52.4 0.0	87.3 0.0	254.8 49.0	0.80
GEN PNL BUS-0023	CBL-GN2	In	0.43	69.9 0.3	52.4 0.2	87.3 0.4	254.8 49.0	0.80
PNL C PNL D	CBL-D	In	0.02	20.2 0.0	15.1 0.0	25.2 0.0	74.0 42.3	0.80
PNL C PNL E	CBL-E	In	0.07	20.5 0.0	15.4 0.0	25.6 0.0	75.1 38.5	0.80
PV INVERTER DISC PV	CBL-PV4	In	0.00	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.00
SES-FS 91 BUS-0021	CBL-ATS	In	0.00	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.00
SES-FS 91 DISC PV1	CBL-PV1	In	0.23	-12.6 0.0	-6.1 0.0	14.0 0.0	38.8 51.8	0.90
SES-FS 91 PNL A	CBL-A	In	0.32	29.2 0.1	21.9 0.1	36.5 0.1	101.6 39.1	0.80
SES-FS 91 PNL B	CBL-B	In	0.45	29.5 0.1	22.1 0.1	36.9 0.2	102.8 39.5	0.80

APPENDIX 4

TCC REPORT

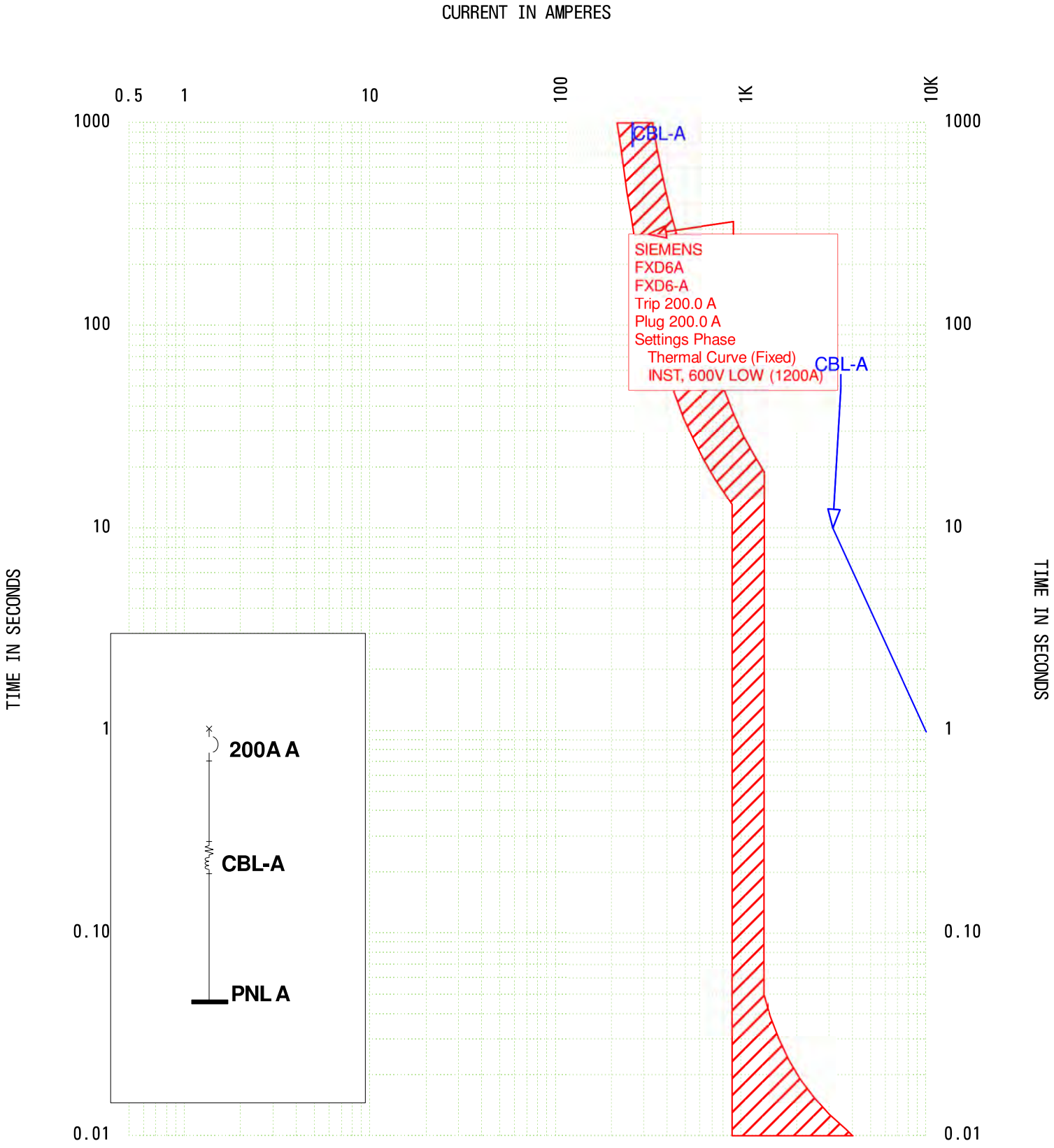


TCC Name: SES-FS 91
Oneline: SES-FS 91
June 9, 2025 9:46 AM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

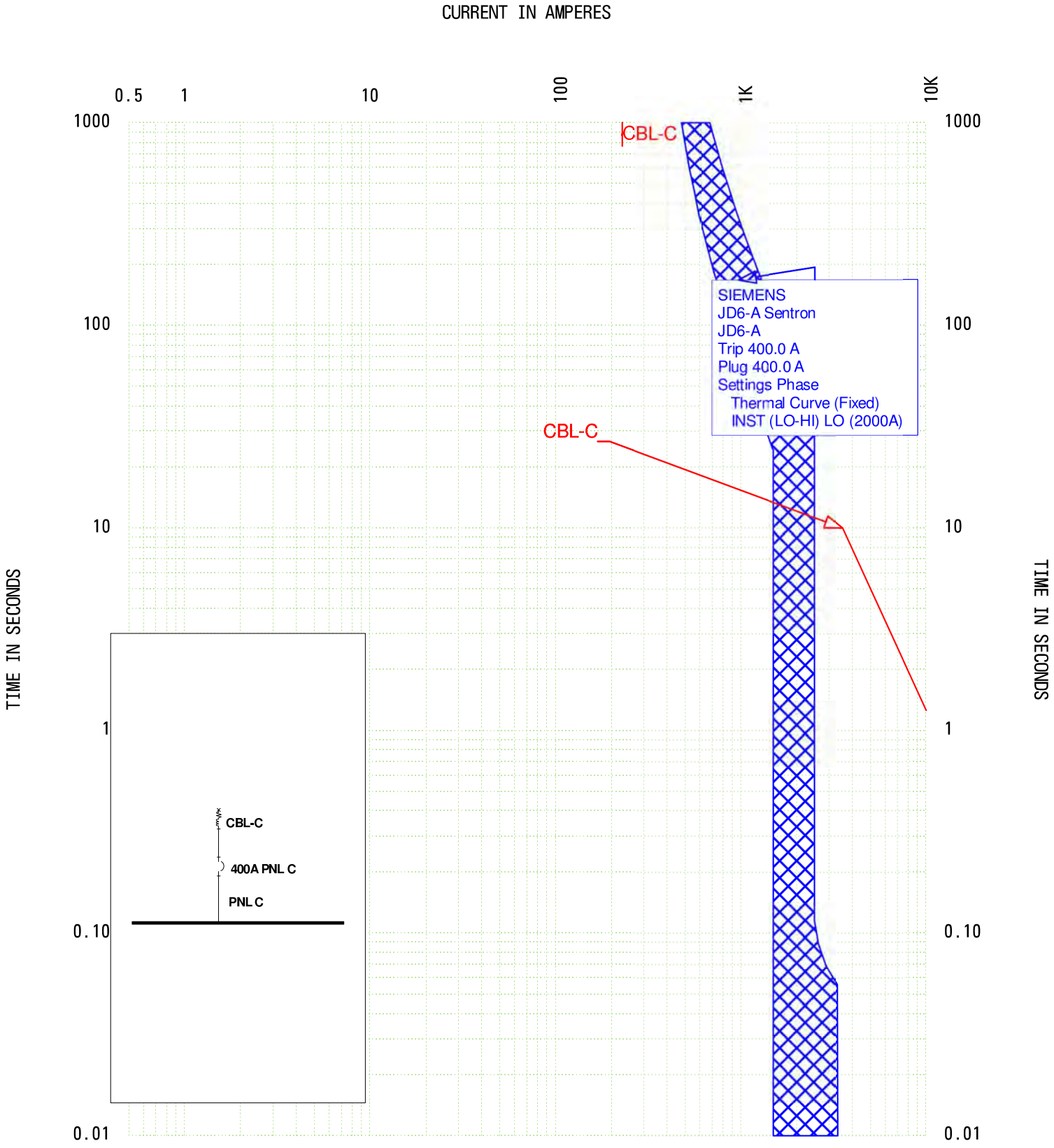


TCC Name: Pnls A&B
Oneline: Pnls A&B
June 9, 2025 10:04 AM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

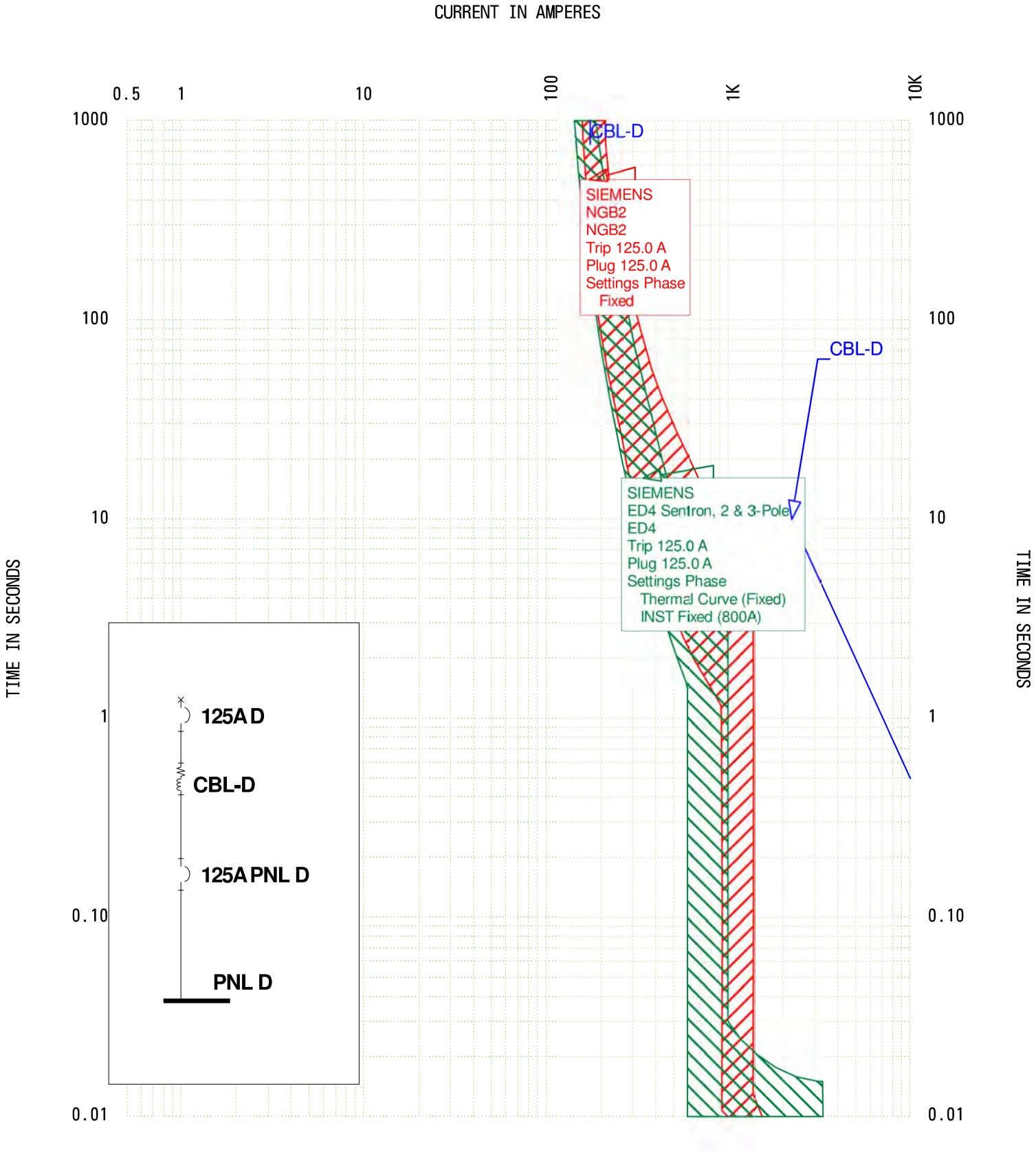


TCC Name: Pnl C
Oneline: Pnl C
June 9, 2025 9:41 AM

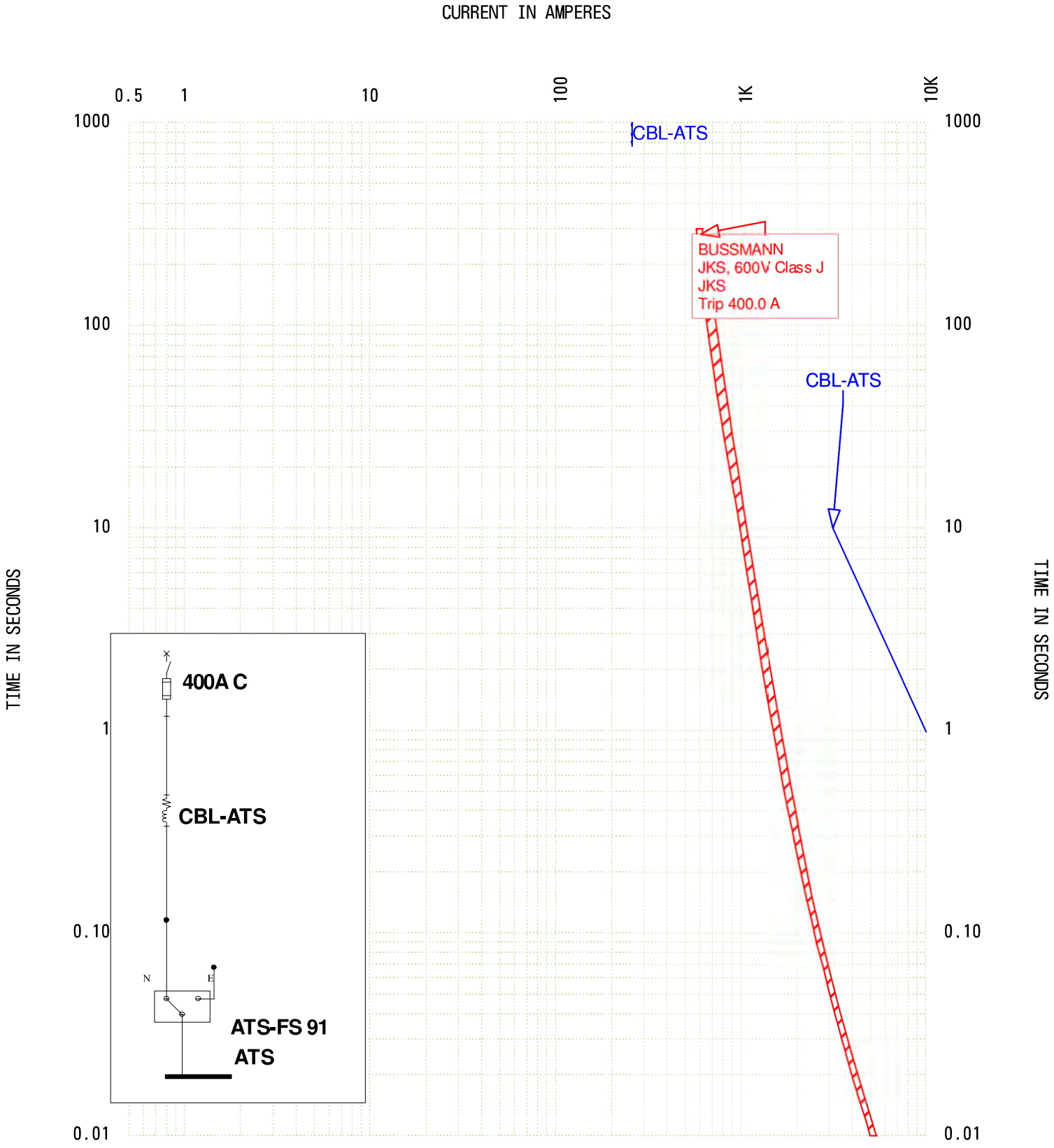
Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.



TCC Name: Pnls D&E	Current Scale x 1	Reference Voltage: 208
Oneline: Pnls D&E		
June 9, 2025 10:07 AM		SKM Systems Analysis, Inc.

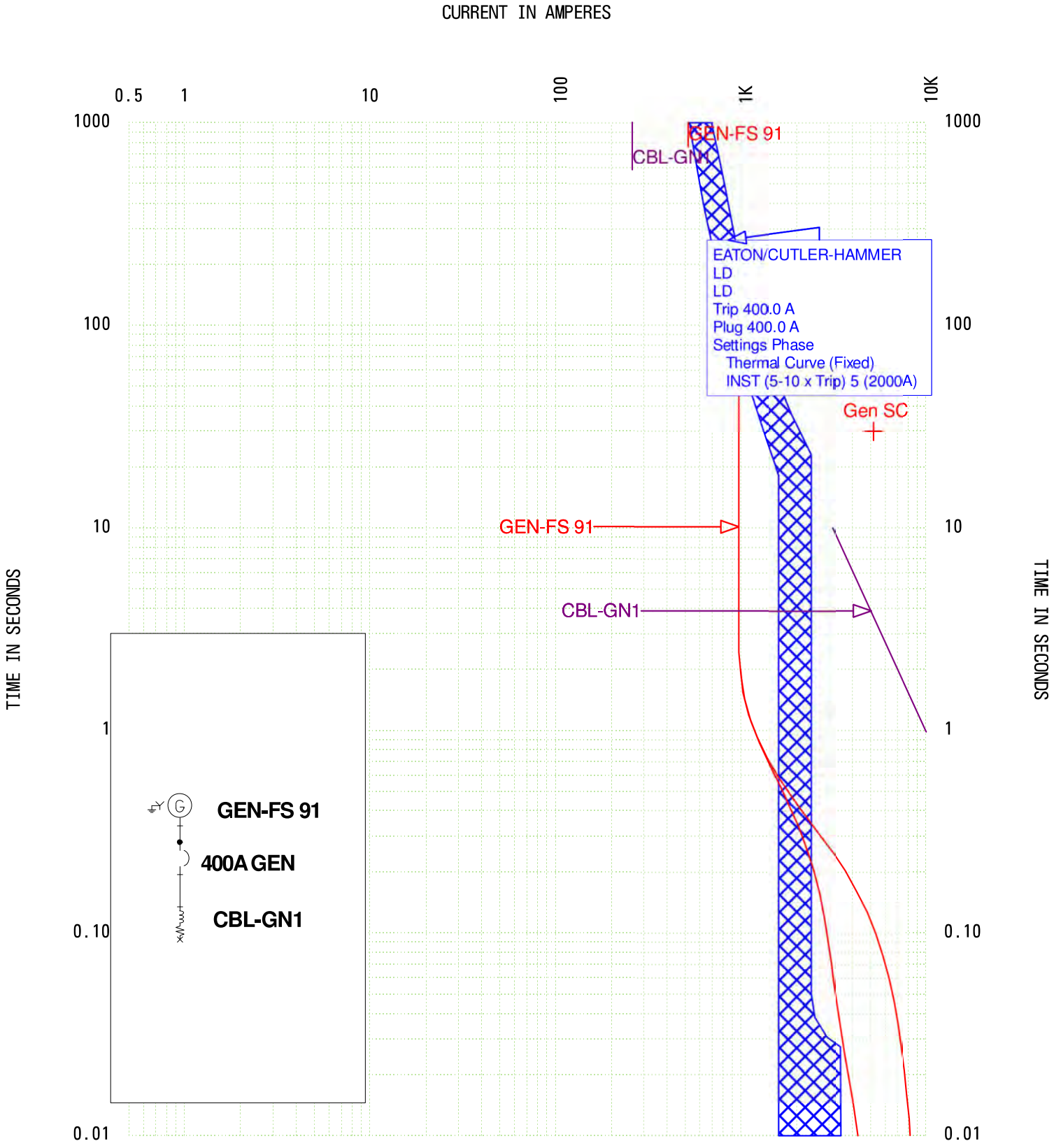


TCC Name: ATS
Oneline: ATS
June 9, 2025 10:23 AM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

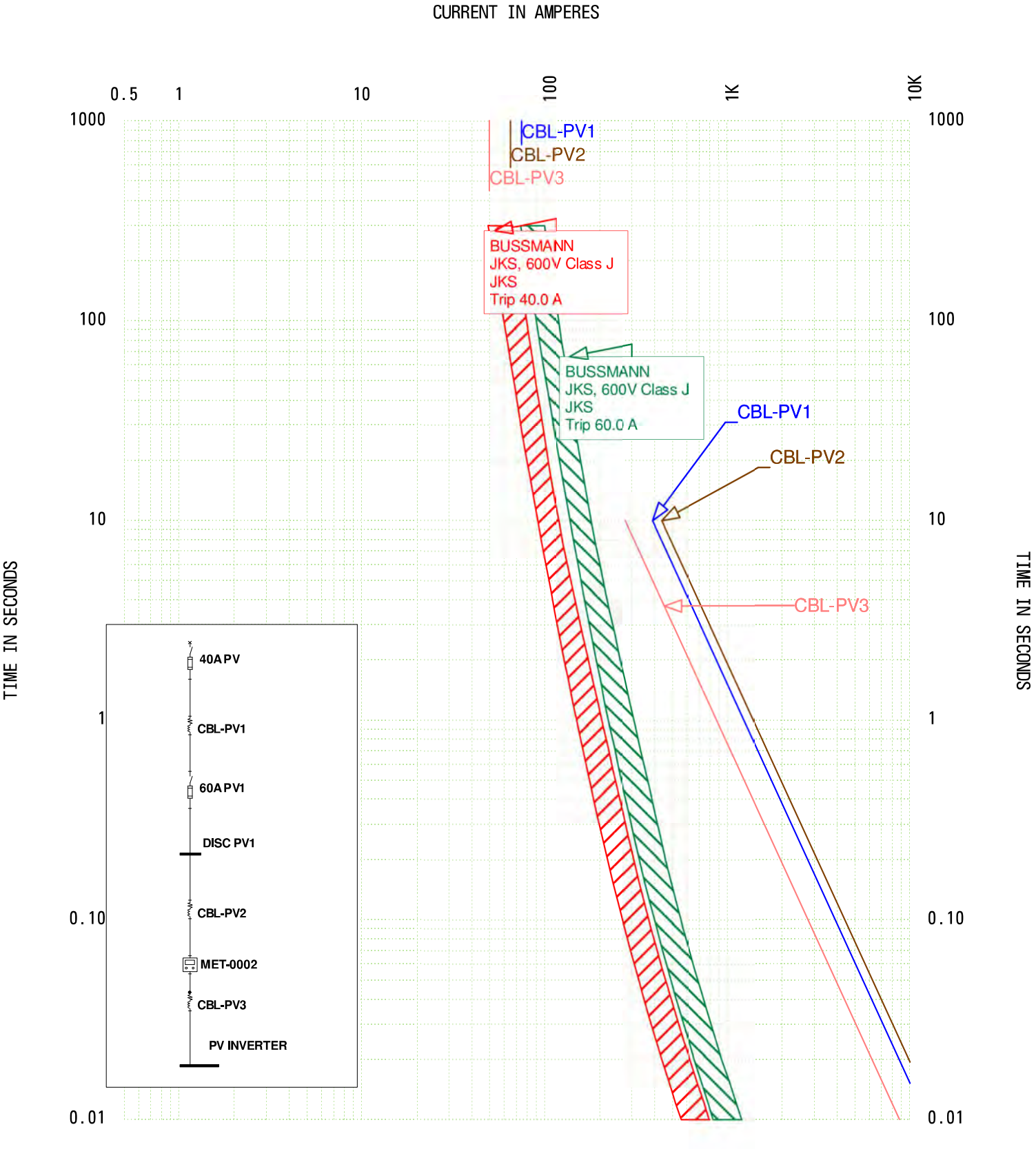


TCC Name: 150 KW Generator
Oneline: 150 KW Generator
June 9, 2025 9:34 AM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

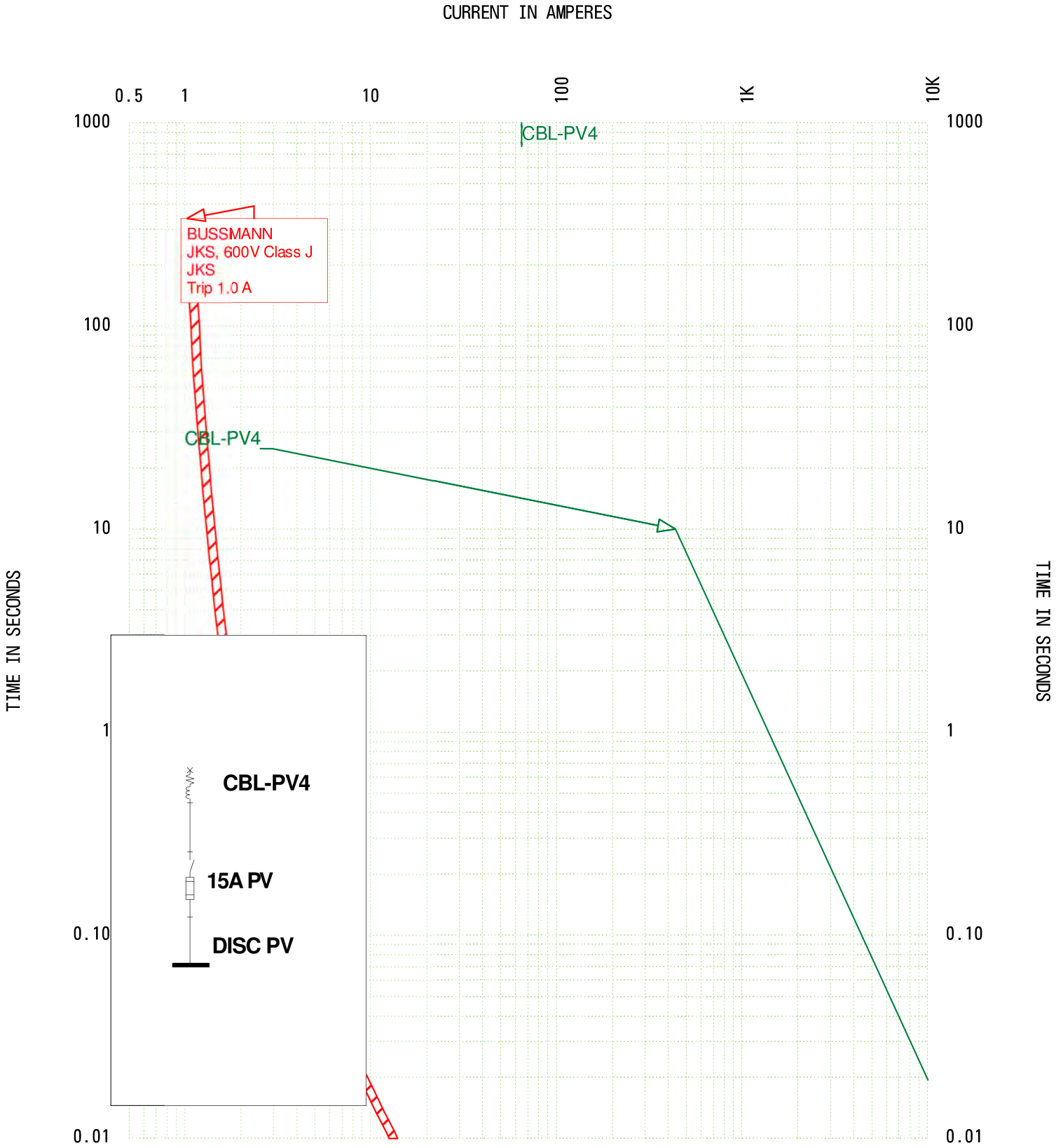


TCC Name: PV Inverter
Oneline: PV Inverter
June 9, 2025 10:13 AM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.



TCC Name: Individual PV arrays
Oneline: Individual PV arrays
June 9, 2025 10:15 AM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

APPENDIX 5

WORK PERMIT SAMPLE

ENERGIZED ELECTRICAL WORK PERMIT

PART I: TO BE COMPLETED BY THE REQUESTER:

Job/Work Order Number: _____

(1) Description of circuit/equipment/job location:
PNL LA

(2) Description of work to be done:

(3) Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage:

Requester/Title _____ Date _____

PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS DOING THE WORK

Check When Complete

(1) Detailed job description procedure to be used in performing the above detailed work: ☐

(2) Description of the Safe Work Practices to be employed: ☐

Arc Flash Boundary	8"	Incident Energy	0.35 cal/cm^2	Working Distance	18"
Shock Hazard	208 VAC	Limited Approach Restricted Approach	42" 12"	Glove Class	00
Required PPE	No Arc-rated PPE Required				

(3) Means employed to restrict the access of unqualified persons from the work area: ☐

(4) Evidence of completion of a job briefing including discussion of any job-related hazards:

(5) Do you agree the above described work can be done safely? ☐ Yes ☐ No (If no, return to requester)

Electrically Qualified Person(s) _____ Date _____

Electrically Qualified Person(s) _____ Date _____

PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:

Maintenance/Engineering Manager _____ Manufacturing Manager _____

Safety Manager _____ Electrically Knowledgeable Person _____

General Manager _____ Date _____

APPENDIX 6

ARC FLASH LABELS

PPE TABLE

ARC FLASH LABELS

	Incident Energy From (cal/cm^2)	Incident Energy To (cal/cm^2)	IE Low Marginal (cal/cm^2)	IE High Marginal (cal/cm^2)	PPE Level #	PPE Level	Clothing Layers	Required Minimum Arc Rating of PPE (cal/cm^2)	Notes	Level Background Color	Level Foreground Color	Warning Label Text
1	0.0	1.2	0.000	1.190	0	No Arc-rated PPE Required	N/A	N/A	H.3			WARNING
2	1.2	12.0	1.210	11.800	3	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit	2 or 3	12	130.5(G)			WARNING
3	12.0	40.0	12.200	40.000	4	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit	3 or more	40	130.5(G)			WARNING
4	40.0	9999.0	40.000	9998.000	Dangerous!	DO NOT WORK ON LIVE!	ↄ NOT WORK ON LIV	N/A	DO NOT WORK ON LIVE!			DANGER

	Head & Eye & Hearing Protection	Hand & Arm Protection	Foot Protection	PPE Others 1	PPE Others 2	PPE Others 3	PPE Others 4	PPE Others 5
1	Safety Glasses or Goggles + Ear Canal Inserts	Leather Gloves	N/A	Safety glasses	N/A	> 50V voltage rated tools + Class 0 (minimum) gloves	Dielectric shoes or insulating mat (step and touch potential).	
2	Hardhat + Arc-rated hard hat liner + Safety Glasses or Goggles + Ear Canal Inserts	Leather Gloves	Leather footwear	Safety glasses, electrically rated hard hat with hood and face shield. Hearing protection.	Arc-rated shirt (long-sleeve) plus Arc-rated pants (long) or Arc-rated coverall, or arc rated arc flash suit jacket, pants, & hood, Arc-rated rainwear as needed.	> 50V voltage rated tools + Class 0 (minimum) gloves and leather protectors (flash).	Leather shoes (flash) as needed. Dielectric shoes or insulating mat (step and touch potential).	
3	Hardhat + Arc-rated hard hat liner + Safety Glasses or Goggles + Ear Canal Inserts	Arc-rated Gloves	Leather footwear	Safety glasses, electrically rated hard hat with hood and face shield. Hearing protection.	Arc-rated shirt (long-sleeve) plus Arc-rated pants (long) or Arc-rated coverall, or arc rated arc flash suit jacket, pants, & hood, Arc-rated rainwear as needed.	> 50V voltage rated tools + Class 0 (minimum) gloves and leather protectors (flash).	Leather shoes (flash) as needed. Dielectric shoes or insulating mat (step and touch potential).	
4	DO NOT WORK ON LIVE!	DO NOT WORK ON LIVE!	DO NOT WORK ON LIVE!	DO NOT WORK ON LIVE!	DO NOT WORK ON LIVE!	DO NOT WORK ON LIVE!	DO NOT WORK ON LIVE!	

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

2 in	Arc Flash Boundary
0.04 cal/cm^2	Incident Energy at 18 in
PPE	No Arc-rated PPE Required
208 VAC	Shock Risk when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location:	DISC PV

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	25-040	Prepared on:	06/10/25	By:	AA/MP/RR

Warning: Changes in equipment settings or system configuration will invalidate the calculated values and PPE requirements

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

13 in	Arc Flash Boundary
0.70 cal/cm^2	Incident Energy at 18 in
PPE	No Arc-rated PPE Required
208 VAC	Shock Risk when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location:	SES-FS 91

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	25-040	Prepared on:	06/10/25	By:	AA/MP/RR

Warning: Changes in equipment settings or system configuration will invalidate the calculated values and PPE requirements

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

50 in	Arc Flash Boundary
6.23 cal/cm^2	Incident Energy at 18 in
PPE	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
208 VAC	Shock Risk when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location:	GEN PNL

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	25-040	Prepared on:	06/10/25	By:	AA/MP/RR

Warning: Changes in equipment settings or system configuration will invalidate the calculated values and PPE requirements

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

Shock Risk when cover is removed
Glove Class
Limited Approach
Restricted Approach

Location:	**PNL A**

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	**25-040**	**Prepared on:**	**06/10/25**	**By:**	**AA/MP/RR**

DANGER: Panel/equipment has insufficient KAIC rating. The equipment/panel is to be de-energized before servicing or working with covers removed.

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

Shock Risk when cover is removed
Glove Class
Limited Approach
Restricted Approach

Location:	**PNL C**

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	**25-040**	**Prepared on:**	**06/10/25**	**By:**	**AA/MP/RR**

DANGER: Panel/equipment has insufficient KAIC rating. The equipment/panel is to be de-energized before servicing or working with covers removed.

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

Shock Risk when cover is removed
Glove Class
Limited Approach
Restricted Approach

Location:	**PNL B**

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	**25-040**	**Prepared on:**	**06/10/25**	**By:**	**AA/MP/RR**

DANGER: Panel/equipment has insufficient KAIC rating. The equipment/panel is to be de-energized before servicing or working with covers removed.

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

Shock Risk when cover is removed
Glove Class
Limited Approach
Restricted Approach

Location:	**PNL D**

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	**25-040**	**Prepared on:**	**06/10/25**	**By:**	**AA/MP/RR**

DANGER: Panel/equipment has insufficient KAIC rating. The equipment/panel is to be de-energized before servicing or working with covers removed.

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

Shock Risk when cover is removed
Glove Class
Limited Approach
Restricted Approach

Location:	**PNL E**

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	**25-040**	**Prepared on:**	**06/10/25**	**By:**	**AA/MP/RR**

DANGER: Panel/equipment has insufficient KAIC rating. The equipment/panel is to be de-energized before servicing or working with covers removed.

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

Shock Risk when cover is removed
Glove Class
Limited Approach
Restricted Approach

Location:	**ATS**

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	**25-040**	**Prepared on:**	**06/10/25**	**By:**	**AA/MP/RR**

DANGER: Panel/equipment has deficiencies that require the equipment/panel to be de-engerised before servicing or working with covers removed.

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

Shock Risk when cover is removed
Glove Class
Limited Approach
Restricted Approach

Location:	**PV INVERTER**

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	**25-040**	**Prepared on:**	**06/10/25**	**By:**	**AA/MP/RR**

DANGER: Panel/equipment has deficiencies that require the equipment/panel to be de-engerised before servicing or working with covers removed.

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

Shock Risk when cover is removed
Glove Class
Limited Approach
Restricted Approach

Location:	**DISC PV1**

120 DEGREEZ MEP ENGINEERING

225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	**25-040**	**Prepared on:**	**06/10/25**	**By:**	**AA/MP/RR**

DANGER: Panel/equipment has deficiencies that require the equipment/panel to be de-engerised before servicing or working with covers removed.

The End of Study Report