FACILITY CONDITION ASSESSMENT

prepared for

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

EMT Ambulance Building
6517 East Lincoln Drive
Paradise Valley, AZ 85253

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BV PROJECT #:
172662.25R000-001.468

DATE OF REPORT:
July 7, 2025

ON SITE DATE:
May 27, 2025

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1. Executive Summary

Property Overview and Assessment Details

General Information	
Property Type	Single-family
Number of Buildings	1
Main Address	6517 East Lincoln Drive, Paradise Valley, AZ 85253
Site Developed	1966
Outside Occupants / Leased Spaces	None
Date(s) of Visit	May 27, 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 John Fraley, Lead Technician (480) 797-2060
Assessment and Report Prepared By	Billy Barnett
Reviewed By	Rashad Alnial *for,* Gregg Young Program Manager 800.733.0660 x7296228 Gregg.Young@bureauveritas.com
Link	Full dataset for this assessment can be found at: https://www.assetcalc.net/

Significant/Systemic Findings and Deficiencies

Historical Summary

EMT Ambulance Building is a residential-like structure located in Paradise Valley, Arizona and serves as lodging for on duty/on call EMT personnel. It was formerly a private residence. The building is located directly behind and shares the same street address as the Municipal Court building.

EMT Ambulance Building consists of one building built in 1966. It measures approximately 3,518 square feet, and contains a day room, storage room, bunkrooms, restrooms, a residential kitchen, laundry room, enclosed carport, and an ancillary carport structure. There have been no major renovations conducted since construction, resulting in the building being in mostly aged but functional condition.

Architectural

EMT Ambulance Building is a conventional wood frame structure over concrete slab foundation. The roof structure of the building is mainly of medium sloped construction covered in asphalt shingles. The building's exterior wood siding appears to be degraded and in need of repair.

The enclosed carport uses a chain link fence as its gate and contains the building's utility areas. The ancillary carport consists of metal posts and a canopy roof. The door to the carport storage room is missing. The carport ceiling has minor damage in need of repair.

At the interior of the building, most of the walls are painted gypsum. The ceilings are painted gypsum. The flooring in the building is carpet, ceramic tile and VCT. There are a few cracked ceramic tiles in the entry way in need of replacement. There are various holes in the interior walls which are in need of repair and paint.

Mechanical, Electrical, Plumbing and Fire (MEPF)

EMT Ambulance Building is heated and cooled by an interior FCU and an exterior condensing unit. Electrical service is made up of a local utility-fed, exterior distribution panel which is fed from the Municipal Court building. Interior lighting consists mainly of incandescent fixtures with some restroom fixtures missing light bulbs and the kitchen light fixture missing its cover.

The building has municipal water and an onsite septic tank. Hot water is provided by a gas-powered water heater. No concerns have been addressed by maintenance personnel regarding ongoing plumbing issues.

The building is not outfitted with a sprinkler system. The building is equipped with fire extinguishers. A smoke detector is located in the kitchen and is degraded and in need of replacement.

Site

The site is approximately 0.38 acres and is relatively flat. The building is located in the center of the site and has an asphalt lot with no designated parking spaces.

Site hardscape at EMT Ambulance Building consists of an asphalt lot and concrete sidewalks adjacent to the building.

The site is covered in stone and vegetative landscaping without irrigation and mature trees clustered in the front and backyard. There are numerous building-mounted incandescent light fixtures and one pole-mounted LED light fixture. The asphalt lot has large cracks due to excessive wear and tear.

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:

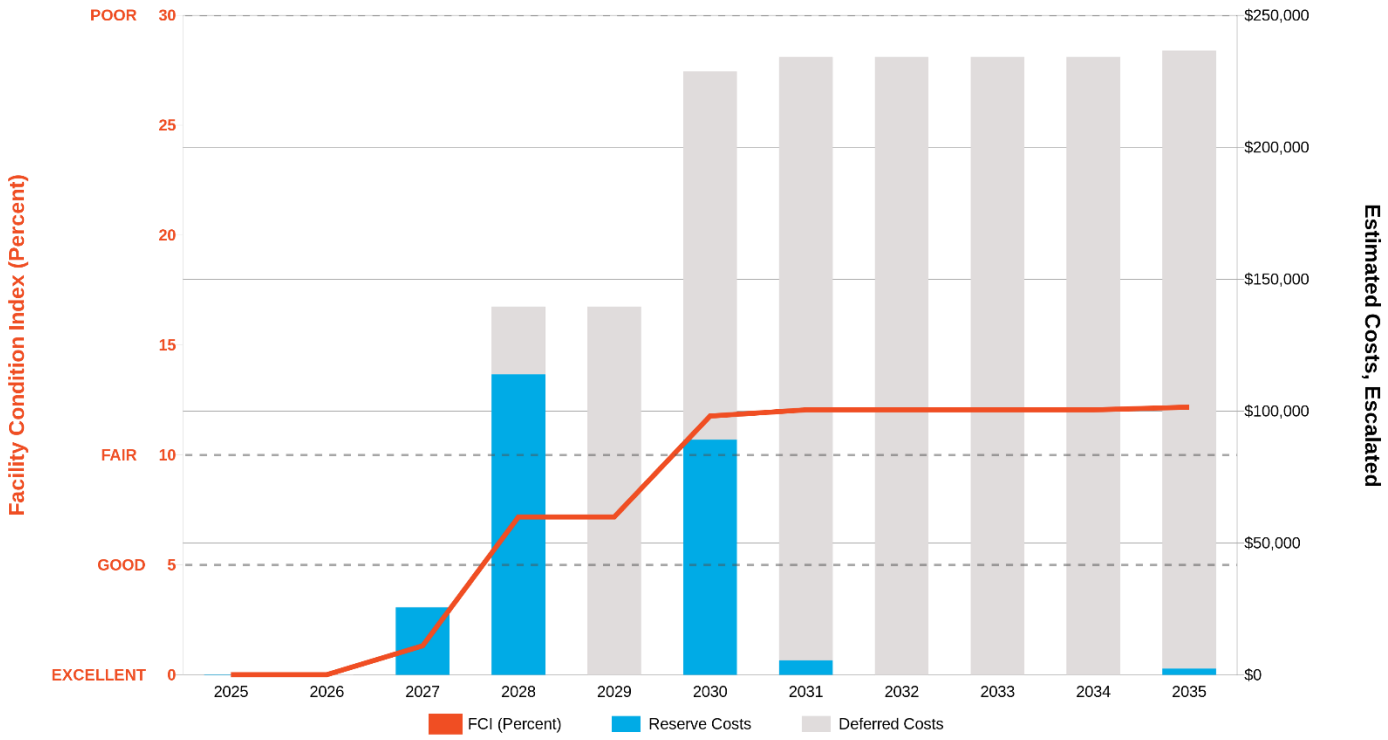
FCI Analysis		
Replacement Value *$1,943,025*	*Total SF* *3,701*	*Cost/SF* *$525*

	Est Reserve Cost	FCI
Current	$200	0.0 **%**
3-Year	$139,700	7.2 **%**
5-Year	$228,800	11.8 **%**
10-Year	$236,700	12.2 **%**

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: $1,943,025.00 **Inflation Rate: 3%** **Average Needs (per year - over next 10 years): $21,511.00**



Immediate Needs

Location	UF Code	Description	Condition	Plan Type	Cost
EMT Ambulance Building	D7051	Fire Alarm Devices, Smoke/Carbon Monoxide Detector, residential by contractor, Replace	Poor	Performance/Integrity	$200
TOTAL (1 items)					**$200**

Key Findings

Exterior Walls in Poor condition.

Wood Siding
EMT Ambulance Building
Building Exterior

Uniformat Code: B2010
Recommendation: **Replace in 2027**

Plan Type: Performance/Integrity

Cost Estimate: $5,000

Degraded wood siding throughout - AssetCALC ID: 9384417

Parking Lots in Poor condition.

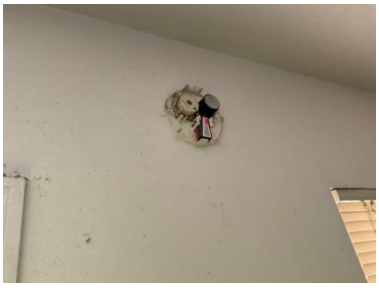
Pavement, Asphalt
EMT Ambulance Building
Site Parking Areas

Uniformat Code: G2020
Recommendation: **Mill and Overlay in 2027**

Plan Type: Performance/Integrity

Cost Estimate: $17,800

Cracked due to excessive wear and tear. No designated striped parking spaces. - AssetCALC ID: 9384419



Fire Alarm Devices in Poor condition.

Smoke/Carbon Monoxide Detector, residential by contractor
EMT Ambulance Building

Uniformat Code: D7050
Recommendation: **Replace in 2025**

Plan Type: Performance/Integrity

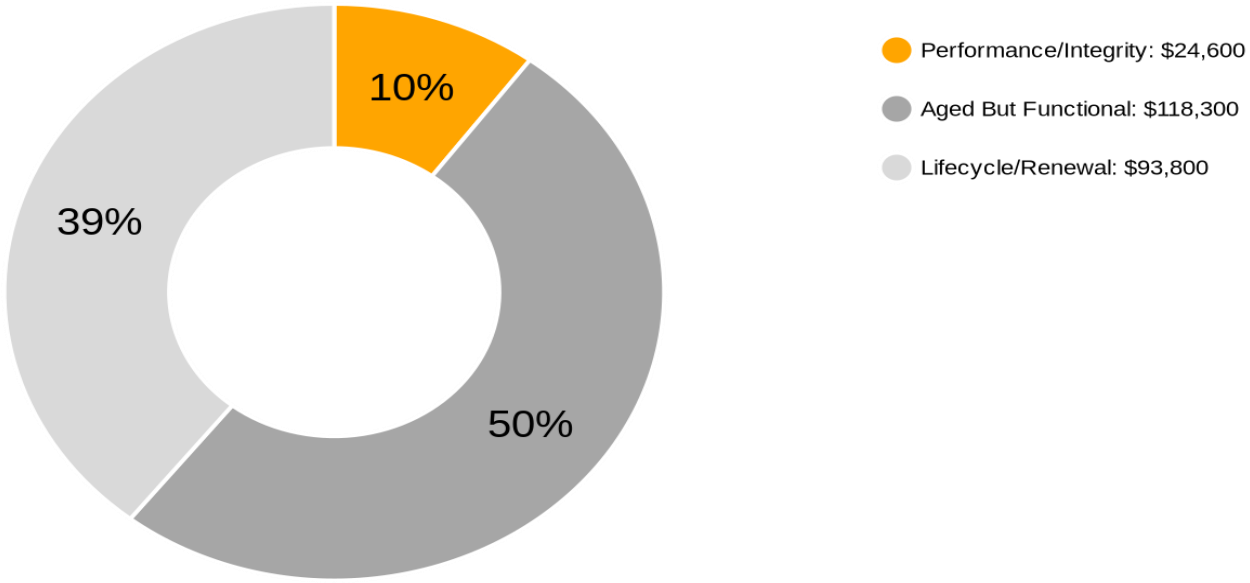
Cost Estimate: $200

Degraded smoke detector in kitchen - AssetCALC ID: 9401798

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 and 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: $236,600

2. Building Systems and Site Elements

Building Systems Summary		
Address	6517 East Lincoln Drive, Paradise Valley, AZ 85253	
GPS Coordinates	33.5305137, -111.9398897	
Constructed/Renovated	1966	
Building Area	3,701 SF	
Number of Stories	1 above grade	
System	*Description*	*Condition*
Structure	Conventional wood frame structure over concrete slab foundation	Fair
Facade	Primary Wall Finish: Brick Secondary Wall Finish: Wood siding Windows: Wood	Fair
Roof	Gable construction with asphalt shingles	Fair
Interiors	Walls: Painted gypsum board and brick Floors: Carpet, VCT, and ceramic tile Ceilings: Painted gypsum board	Fair
Elevators	None	n/a

Building Systems Summary		
Plumbing	Distribution: Copper. PVC waste and venting Hot Water: Gas water heater with integral tanks Fixtures: Toilets, showers, and sinks in all restrooms	Fair
HVAC	Non-Central System: Split system consisting of a fan coil unit and a condensing unit	Fair
Fire Suppression	Fire extinguishers only	Fair
Electrical	Source and Distribution: Main switchboard, Fed from Municipal Court building with copper wiring Interior Lighting: Incandescent Emergency Power: None	Fair
Fire Alarm	Smoke detector only. Kitchen smoke detector degraded.	Failed
Equipment/Special	None	n/a
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	0.04 acres	
Parking Spaces	0 total spaces all in open lots; 0 of which are accessible.	
System	*Description*	*Condition*
Site Pavement	Asphalt lot with limited areas of concrete aprons and pavement and adjacent concrete sidewalks and curbs	Poor
Site Development	Chain link, wrought iron and CMU wall fencing	Fair
Landscaping and Topography	Limited landscaping features including lawns, trees and bushes Irrigation not present Low to moderate site slopes throughout	Fair
Utilities	Municipal water, on-site septic Local utility-provided electric	Fair
Site Lighting	Pole-mounted: LED Building-mounted: Incandescent	Fair
Ancillary Structures	Carport	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	All key areas of the exterior site were accessible and observed.	

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

EMT Ambulance Building: 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	$168,795	$168,795
Facade	$0	$5,304	$26,861	$0	$0	$32,165
Roofing	$0	$0	$20,116	$0	$0	$20,116
Interiors	$0	$0	$52,037	$0	$88,267	$140,304
Plumbing	$0	$1,379	$58,667	$0	$2,148	$62,194
HVAC	$0	$0	$8,230	$5,492	$36,081	$49,803
Electrical	$0	$0	$19,999	$0	$0	$19,999
Fire Alarm and Electronic Systems	$180	$0	$6,117	$241	$325	$6,863
Equipment and Furnishings	$0	$0	$11,007	$0	$0	$11,007
Special Construction and Demo	$0	$0	$0	$0	$14,800	$14,800
Sitework	$0	$18,851	$0	$2,150	$758	$21,759
TOTALS	**$200**	**$25,600**	**$203,100**	**$7,900**	**$311,200**	**$548,000**

3. ADA Accessibility

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

Buildings completed and occupied after January 26, 1992 are required to comply fully with the ADAAG. Existing facilities constructed prior to this date are held to the lesser standard of compliance to the extent allowed by structural feasibility and the financial resources available. As an alternative, a reasonable accommodation pertaining to barrier removal must be made.

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 1966. The facility has not since been substantially renovated.

No costs or detailed follow-up study are currently recommended since this facility is neither accessible to the general public nor a place where employees regularly work or reside. Accessibility accommodations will reportedly be made when and if use changes or specific needs arise. 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 wInventory Program (the Client) retained Bureau Veritas to perform this Facility Condition Assessment in connection with its continued operation of EMT Ambulance Building, 6517 East Lincoln Drive, 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 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 - REAR ELEVATION

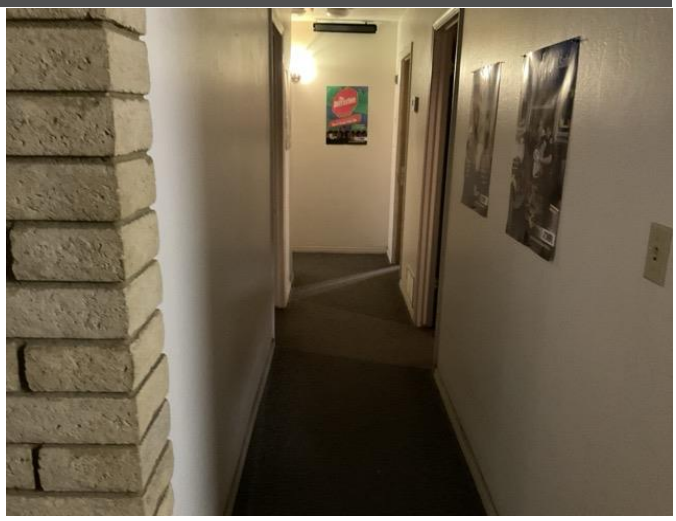
4 - RIGHT ELEVATION

5 - OVERVIEW OF THE ROOF

6 - ASPHALT SHINGLES ROOFING

Photographic Overview

7 - ENTRY



8 - INTERIOR CORRIDOR

9 - TYPICAL BUNKROOM #1

10 - TYPICAL BUNKROOM #2

11 - DAY ROOM

12 - KITCHEN

Photographic Overview

13 - LAUNDRY ROOM

14 - RESTROOM

15 - UTILITY CLOSET

16 - CARPORT

17 - SHED STRUCTURE

18 - PARKING LOT

Appendix B:
Site Plan(s)

Site Plan

Project Number	Project Name
172662.25R000-001.468	EMT Ambulance Building
Source	**On-Site Date**
Google	May 28, 2025

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Appendix C:
Pre-Survey Questionnaire(s)

BV FACILITY CONDITION ASSESSMENT: PRE-SURVEY QUESTIONNAIRE

Building / Facility Name: EMT Ambulance Building

Name of person completing form: Fraley, John

Title / Association w/ property: Lead Technician

Length of time associated w/ property: 4

Date Completed: 5/28/2025

Phone Number: 4807972060

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: 1966	Renovated:	
2	Building size in SF	3,701 **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			Septic
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: **EMT Ambulance Building**

BV Project Number: **172662.25R000-001.468**

Accessibility aspects were not evaluated at this facility/building/location.

Appendix E:
Component Condition Report

Component Condition Report | 001 - EMT Ambulance Building

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
Structure						
A4010	Substructure	Fair	Foundation, Concrete Slab-on-Grade, w/ Integral Perimeter Footings	3,518 SF	16	9384409
B1010	Superstructure	Fair	Structural Framing, Wood, Conventional Stud	3,518 SF	16	9384430
Facade						
B2010	Building Exterior	Fair	Exterior Walls, Brick/Masonry/Stone, Clean & Seal, Maintain	2,300 SF	3	9384406
B2010	Building Exterior	Poor	Exterior Walls, Wood Siding	500 SF	2	9384417
B2020	Building Exterior	Fair	Glazing, any type by SF	300 SF	5	9384426
B2050	Building Exterior	Fair	Exterior Door, Wood, Solid-Core	4	3	9384410
Roofing						
B3010	Roof	Fair	Roofing, Asphalt Shingle, 20-Year Standard	3,700 SF	3	9384438
B3080	Building Exterior	Fair	Soffit/Fascia, Wood	300 SF	3	9384439
Interiors						
C1010	Throughout Building	Fair	Interior Wall, Brick	100 SF	5	9401549
C1030	Throughout Building	Fair	Interior Door, Wood, Solid-Core Commercial	9	3	9384424
C2010	Throughout Building	Fair	Wall Finishes, any surface, Prep & Paint	6,900 SF	3	9384428
C2030	Throughout Building	Fair	Flooring, Carpet, Commercial Standard	2,400 SF	3	9384414
C2030	Throughout Building	Fair	Flooring, Ceramic Tile	1,100 SF	20	9384429
C2030	Restrooms	Fair	Flooring, Vinyl Tile (VCT)	70 SF	3	9384415
C2050	Throughout Building	Fair	Ceiling Finishes, any flat surface, Prep & Paint	3,500 SF	3	9384422
Plumbing						
D2010	Utility Rooms/Areas	Fair	Water Heater, Gas, Residential, 30 to 50 GAL	1	2	9384412
D2010	Restrooms	Fair	Shower, Valve & Showerhead	2	3	9384433
D2010	Restrooms	Fair	Shower, Ceramic Tile	2	3	9384441
D2010		Fair	Plumbing System, Supply & Sanitary, Medium Density (excludes fixtures)	3,701 SF	5	9433472

Component Condition Report | 001 - EMT Ambulance Building

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D2010	Restrooms	Fair	Toilet, Commercial Water Closet	3	3	9384436
HVAC						
D3030	Site General	Fair	Split System, Condensing Unit/Heat Pump	1	5	9384434
D3030	Utility Rooms/Areas	Fair	Split System, Fan Coil Unit, DX, 3.5 to 5 TON	1	6	9384416
D3050	Throughout Building	Fair	HVAC System, Ductwork, Medium Density	3,518 SF	17	9384427
Electrical						
D5030	Electrical Room	Fair	Electrical System, Wiring & Switches, Average or Low Density/Complexity	3,518 SF	3	9384423
D5040	Throughout Building	Fair	Interior Lighting System, Full Upgrade, Low Density & Standard Fixtures	3,518 SF	3	9384418
D5040	Building Exterior	Fair	Exterior Light, any type, w/ LED Replacement	5	5	9384437
Fire Alarm & Electronic Systems						
D6060	Throughout Building	Fair	Intercom/PA System, Intercom System Upgrade, Facility-Wide	3,518 SF	5	9384432
D7050		Poor	Fire Alarm Devices, Smoke/Carbon Monoxide Detector, residential by contractor	1	0	9401798
Equipment & Furnishings						
E1030	Commercial Kitchen	Fair	Foodservice Equipment, Sink, 2-Bowl	1	3	9384425
E2010	Hallways & Common Areas	Fair	Casework, Cabinetry, Economy	25 LF	3	9384420
E2010	Restrooms	Fair	Casework, Bathroom Vanity Cabinet, Wood w/ Cultured Marble Sink Top	3	3	9384431
Special Construction & Demo						
F1020	Site General	Fair	Shed/Gazebo/Shade Structure, Wood or Metal-Framed, Basic/Minimal	380 SF	15	9384408
Pedestrian Plazas & Walkways						
G2020	Site Parking Areas	Poor	Parking Lots, Pavement, Asphalt, Mill & Overlay	5,077 SF	2	9384419
Sitework						
G2060	Site General	Fair	Fences & Gates, Fence, Chain Link 6'	20 LF	20	9384440
G2060	Building Exterior	Good	Fences & Gates, Screen Walls, Concrete Masonry Unit (CMU)	1,320 SF	40	9384413
G2060	Site General	Fair	Fences & Gates, Pedestrian Gate, Wrought Iron	1	10	9384442
G4050	Site General	Fair	Site Lighting, Wall Pack or Walkway Ceiling/Pole-Mounted, any type w/ LED, Higher-Lumen	1	10	9384407

Appendix F:
Replacement Reserves

Replacement Reserves Report

001 - EMT Ambulance Building

7/7/2025

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
001 - EMT Ambulance Building	$180	$0	$25,535	$113,912	$0	$89,134	$5,493	$0	$0	$0	$2,392	$0	$0	$51,913	$0	$14,801	$168,796	$25,408	$596	$0	$49,668	**$547,828**
Grand Total	**$180**	**$0**	**$25,535**	**$113,912**	**$0**	**$89,134**	**$5,493**	**$0**	**$0**	**$0**	**$2,392**	**$0**	**$0**	**$51,913**	**$0**	**$14,801**	**$168,796**	**$25,408**	**$596**	**$0**	**$49,668**	**$547,828**

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
A4010	Substructure	9384409	Foundation, Concrete Slab-on-Grade, w/ Integral Perimeter Footings	75	59	16	3518	SF	$11.90	$41,864																	$41,864					**$41,864**
B1010	Superstructure	9384430	Structural Framing, Wood, Conventional Stud	75	59	16	3518	SF	$18.00	$63,324																	$63,324					**$63,324**
B2010	Building Exterior	9384417	Exterior Walls, Wood Siding, Replace	30	28	2	500	SF	$10.00	$5,000			$5,000																			**$5,000**
B2010	Building Exterior	9384406	Exterior Walls, Brick/Masonry/Stone, Clean & Seal, Maintain	20	17	3	2300	SF	$1.86	$4,278				$4,278																		**$4,278**
B2020	Building Exterior	9384426	Glazing, any type by SF, Replace	30	25	5	300	SF	$55.00	$16,500						$16,500																**$16,500**
B2050	Building Exterior	9384410	Exterior Door, Wood, Solid-Core, Replace	25	22	3	4	EA	$700.00	$2,800				$2,800																		**$2,800**
B3010	Roof	9384438	Roofing, Asphalt Shingle, 20-Year Standard, Replace	20	17	3	3700	SF	$3.80	$14,060				$14,060																		**$14,060**
B3080	Building Exterior	9384439	Soffit/Fascia, Wood, Replace	20	17	3	300	SF	$14.50	$4,350				$4,350																		**$4,350**
C1010	Throughout Building	9401549	Interior Wall, Brick, Replace	50	45	5	100	SF	$53.00	$5,300						$5,300																**$5,300**
C1030	Throughout Building	9384424	Interior Door, Wood, Solid-Core Commercial, Replace	40	37	3	9	EA	$700.00	$6,300				$6,300																		**$6,300**
C2010	Throughout Building	9384428	Wall Finishes, any surface, Prep & Paint	10	7	3	6900	SF	$1.50	$10,350				$10,350										$10,350								**$20,700**
C2030	Throughout Building	9384429	Flooring, Ceramic Tile, Replace	40	20	20	1100	SF	$18.00	$19,800																				$19,800		**$19,800**
C2030	Restrooms	9384415	Flooring, Vinyl Tile (VCT), Replace	15	12	3	70	SF	$5.00	$350				$350															$350			**$700**
C2030	Throughout Building	9384414	Flooring, Carpet, Commercial Standard, Replace	10	7	3	2400	SF	$7.50	$18,000				$18,000										$18,000								**$36,000**
C2050	Throughout Building	9384422	Ceiling Finishes, any flat surface, Prep & Paint	10	7	3	3500	SF	$2.00	$7,000				$7,000										$7,000								**$14,000**
D2010	Utility Rooms/Areas	9384412	Water Heater, Gas, Residential, 30 to 50 GAL, Replace	15	13	2	1	EA	$1,300.00	$1,300			$1,300															$1,300				**$2,600**
D2010	001 - EMT Ambulance Building	9433472	Plumbing System, Supply & Sanitary, Medium Density (excludes fixtures), Replace	40	35	5	3701	SF	$11.00	$40,711						$40,711																**$40,711**
D2010	Restrooms	9384433	Shower, Valve & Showerhead, Replace	30	27	3	2	EA	$800.00	$1,600				$1,600																		**$1,600**
D2010	Restrooms	9384441	Shower, Ceramic Tile, Replace	30	27	3	2	EA	$2,500.00	$5,000				$5,000																		**$5,000**
D2010	Restrooms	9384436	Toilet, Commercial Water Closet, Replace	30	27	3	3	EA	$1,300.00	$3,900				$3,900																		**$3,900**
D3030	Site General	9384434	Split System, Condensing Unit/Heat Pump, Replace	15	10	5	1	EA	$7,100.00	$7,100						$7,100															$7,100	**$14,200**
D3030	Utility Rooms/Areas	9384416	Split System, Fan Coil Unit, DX, 3.5 to 5 TON, Replace	15	9	6	1	EA	$4,600.00	$4,600							$4,600															**$4,600**
D3050	Throughout Building	9384427	HVAC System, Ductwork, Medium Density, Replace	30	13	17	3518	SF	$4.00	$14,072																		$14,072				**$14,072**
D5030	Electrical Room	9384423	Electrical System, Wiring & Switches, Average or Low Density/Complexity, Replace	40	37	3	3518	SF	$2.50	$8,795				$8,795																		**$8,795**
D5040	Throughout Building	9384418	Interior Lighting System, Full Upgrade, Low Density & Standard Fixtures, Replace	20	17	3	3518	SF	$2.10	$7,388				$7,388																		**$7,388**
D5040	Building Exterior	9384437	Exterior Light, any type, w/ LED Replacement, Replace	20	15	5	5	EA	$400.00	$2,000						$2,000																**$2,000**
D6060	Throughout Building	9384432	Intercom/PA System, Intercom System Upgrade, Facility-Wide, Replace	20	15	5	3518	SF	$1.50	$5,277						$5,277																**$5,277**
D7050	001 - EMT Ambulance Building	9401798	Fire Alarm Devices, Smoke/Carbon Monoxide Detector, residential by contractor, Replace	10	10	0	1	EA	$180.00	$180	$180																$180				$180	**$540**
E1030	Commercial Kitchen	9384425	Foodservice Equipment, Sink, 2-Bowl, Replace	30	27	3	1	EA	$2,100.00	$2,100				$2,100																		**$2,100**
E2010	Hallways & Common Areas	9384420	Casework, Cabinetry, Economy, Replace	20	17	3	25	LF	$175.00	$4,375				$4,375																		**$4,375**
E2010	Restrooms	9384431	Casework, Bathroom Vanity Cabinet, Wood w/ Cultured Marble Sink Top, Replace	20	17	3	3	EA	$1,200.00	$3,600				$3,600																		**$3,600**
F1020	Site General	9384408	Shed/Gazebo/Shade Structure, Wood or Metal-Framed, Basic/Minimal, Replace	30	15	15	380	SF	$25.00	$9,500																$9,500						**$9,500**
G2020	Site Parking Areas	9384419	Parking Lots, Pavement, Asphalt, Mill & Overlay	25	23	2	5077	SF	$3.50	$17,770			$17,770																			**$17,770**
G2060	Site General	9384442	Fences & Gates, Pedestrian Gate, Wrought Iron, Replace	25	15	10	1	EA	$800.00	$800																	$800					**$800**
G2060	Site General	9384440	Fences & Gates, Fence, Chain Link 6', Replace	40	20	20	20	LF	$21.00	$420																					$420	**$420**
G4050	Site General	9384407	Site Lighting, Wall Pack or Walkway Ceiling/Pole-Mounted, any type w/ LED, Higher-Lumen, Replace	20	10	10	1	EA	$800.00	$800																	$800					**$800**
Totals, Unescalated											**$180**	**$0**	**$24,070**	**$104,246**	**$0**	**$76,888**	**$4,600**	**$0**	**$0**	**$0**	**$1,780**	**$0**	**$0**	**$35,350**	**$0**	**$9,500**	**$105,188**	**$15,372**	**$350**	**$0**	**$27,500**	**$405,024**
Totals, Escalated (3.0% inflation, compounded annually)											**$180**	**$0**	**$25,535**	**$113,912**	**$0**	**$89,134**	**$5,493**	**$0**	**$0**	**$0**	**$2,392**	**$0**	**$0**	**$51,913**	**$0**	**$14,801**	**$168,796**	**$25,408**	**$596**	**$0**	**$49,668**	**$547,828**

* 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
D20 Plumbing													
1	9384412	D2010	**Water Heater**	Gas, Residential, 30 to 50 GAL	40 GAL	001 - EMT Ambulance Building	Utility Rooms/Areas	Rheem	222440F1	RHLHM511211404	2012	3003808	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D30 HVAC													
1	9384434	D3030	**Split System**	Condensing Unit/Heat Pump	5 TON	001 - EMT Ambulance Building	Site General	York	YHJF60T41S1B	W1L5060624	2015	3003810	
2	9384416	D3030	**Split System**	Fan Coil Unit, DX, 3.5 to 5 TON	5 Ton	001 - EMT Ambulance Building	Utility Rooms/Areas	York	AHE60D3XH21B	W1C6462326	2016	3003813	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
E10 Equipment													
1	9384425	E1030	**Foodservice Equipment**	Sink, 2-Bowl		001 - EMT Ambulance Building	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:

EMT BUILDING

6517 E. Lincon Drive

Paradise Valley, AZ 85253

EMT BUILDING

6517 E. Lincon Drive

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: 6-19-2025

TABLE OF CONTENTS PAGE

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 EMT Building located at 6517 E. Lincon Drive, 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-EMT is a 200 amp 240/120V, 1-phase service fed from 25 KVA utility transformer with a Short Circuit current determined by the power company to be 14,318 Amps. This service was installed per the NEC's 6 switch rule i.e. the panel has 6 circuits or less that when added together will not exceed the bus rating of the panel (200 amps). There is no main breaker to perform overcurrent analysis. The panel has issues that are noted in the Excel field report.

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.

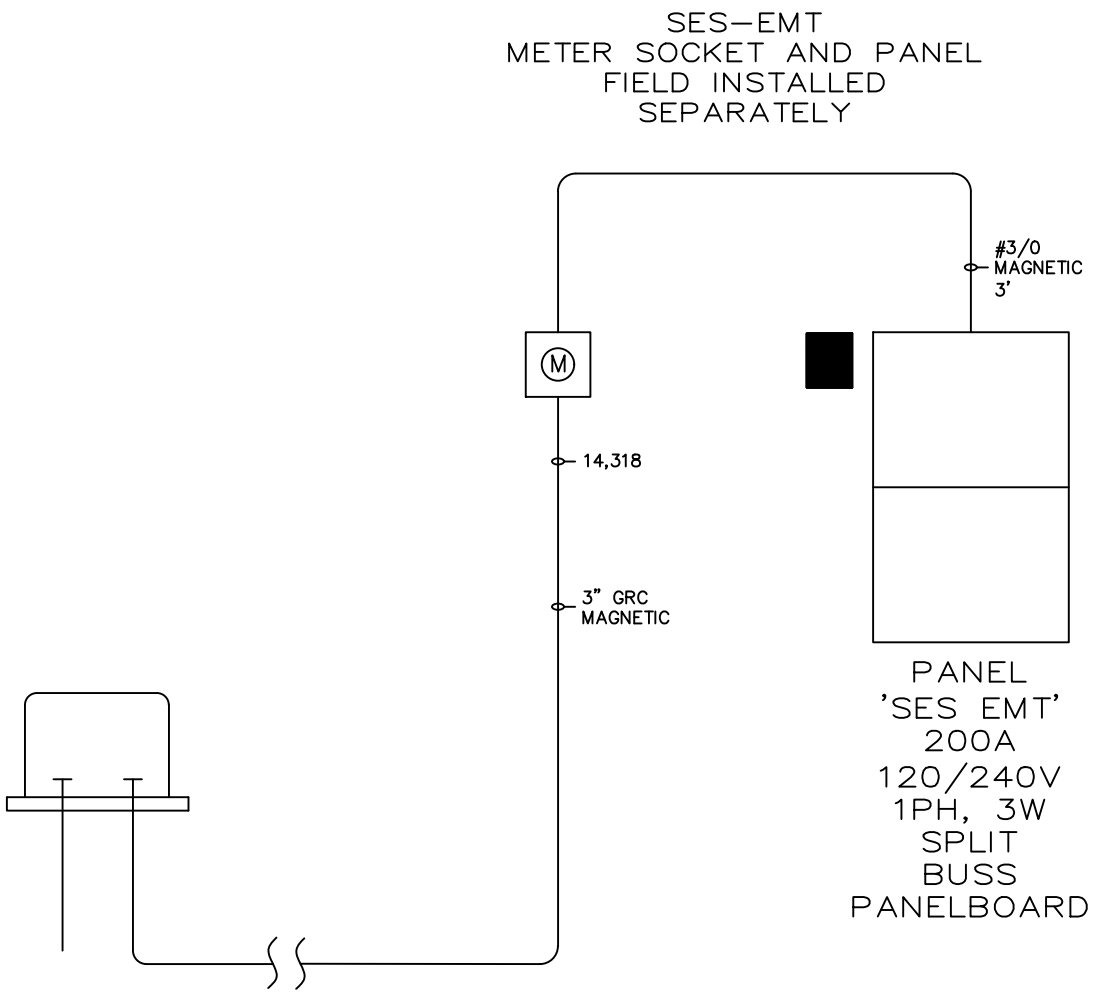
1.2.2 DC systems less than 50 volts.

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.

EMT – AMBULANCE BUILDING



LABEL LEGEND

EQUIPMENT TO BEAR A LABEL

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

FACILITY	**EMT AMBULANCE BLDG**	**ADDRESS:**	**6517 E. LINCOLN DRIVE, PARADISE VALLEY AZ**

UTILITY:	**APS**
TRANSFORMER SIZE:	**25 KVA**
TRANSFORMER %Z:	**2.70%**
SECONDARY COND SIZE:	**(1) x 1/0 AL**
LENGTH:	
AFC (PER UTILITY TABLES)	**14,318**
VOLTAGE:	**120/240**
PHASE:	**1Ø-3W**

OTHER COMMENTS

NOTE: **METER NUMBER 1256154**

EQUIPMENT NAME:	**SES - EMT**	**VOLTAGE:**	**120/240**	**PHASE:**	**1Ø-3W**	**AMPS:**	**200**	**SCCR:**	**10K**	**MAIN:**	**6 SW RULE**
EQUIPMENT TYPE:	**PANELBOARD**									**MODEL:**	
MANUFACTURER:	**GE**									**AMPS**	
MODEL:											
TYPE:											
FED FROM:	**UTILITY XFMR**										
AFC:	**14,318**										
FEEDER SIZE:											
CONDUCTOR TYPE:											
RACEWAY TYPE:											
LENGTH:											
MAIN:											

OTHER COMMENTS

THE EQUIPMENT HAS A MIX OF 10K AIC CIRCUIT BREAKERS FROM DIFFERENT MANUFACTURERS
THE EQUIPMENT HAS A NEMA 1 (INDOOR) RATING AND IS INSTALLED ON THE EXTERIOR OF THE BUILDING.
THE SERVICE IS IN POOR CONDITION AND SHOULD BE REPLACED.
THE AVAILABLE FAULT CURRENT EXCEEDS THE RATING OF THE EQUIPMENT
A LABEL STATING THAT THERE IS NO SAFE LEVEL OF PPE WILL BE APPLIED.

SUB-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 fault exceeded the 10 KAIC rating of SES-EMT.

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-EMT service feeders (TCC Report) show no over current protection coordination. However, this service was installed per the NEC's 6 switch rule and the design is NEC code compliant.

1.3.2.2. The protective device settings in this report (Refer to TCC reports), are **not applicable**. 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-EMT:** 121 amps (reference Load Flow One Line).

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 fault exceeded the 10 KAIC rating of SES-EMT.

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-EMT is a single phase 240/120V system with an APS utility provided 14.3 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, SES-EMT exceeds its KAIC value. Issues with the electrical system are noted in the Excel report. Typically, this panel would receive a Red label for an insufficient KAIC rating. Hower, this panel has other issues and will receive a Red label for other deficiencies. *Reference Excel field report.*

Eq. Name	SES-EMT					
SC RATING(KASCw)	10KA ☒					
$I_{k"-3Ph.-Init.Sym.}$	12.9KA					

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.

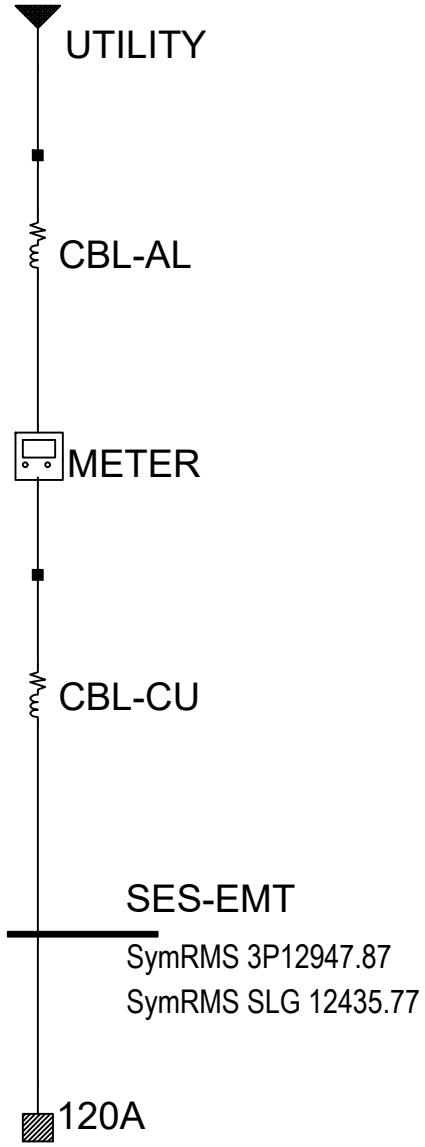
OCPD: Over Current Protection Device (Fuse/Breaker) are acceptable based upon estimated loads.

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

EMT Ambulance Building
Short Circuit



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		

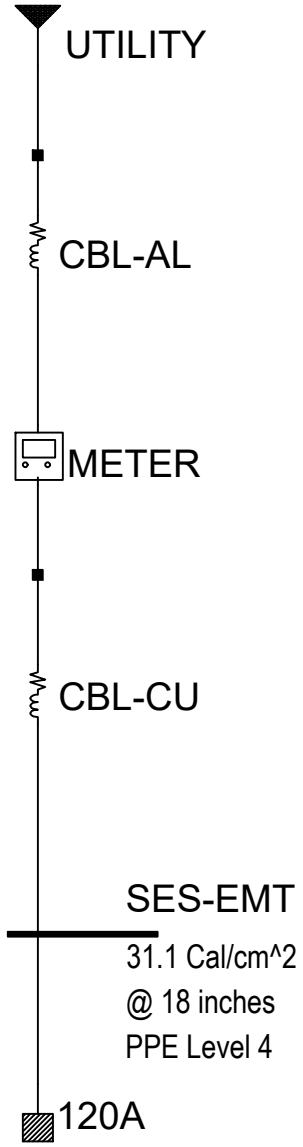
				Initial Symmetrical Amps				Asymmetrical Amps				Init Sym Neutral Amps	
Bus Name	**Contributions**			**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
BUS-0003				**14,318**	**14,318**	**0**	**0**	**19,798**	**19,798**	**0**	**0**		
CBL-AL	CABLE	In		0	0	0	0	0	0	0	0		
UTILITY	UTILITY	In		14,318	14,318	0	0	19,798	19,798	0	0	14,318	
SES-EMT				**12,948**	**12,436**	**0**	**0**	**14,306**	**13,412**	**0**	**0**		
CBL-CU	CABLE	In		12,948	12,436	0	0	14,306	13,412	0	0	12,436	
BUS-0006				**13,226**	**12,856**	**0**	**0**	**14,779**	**14,080**	**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
CBL-AL	CABLE	In	13,226	12,856	0	0	14,779	14,080	0	0	12,856	
CBL-CU	CABLE	In	0	0	0	0	0	0	0	0		

APPENDIX 2

ARC FLASH SKM REPORT

EMT Ambulance Building
Arc Flash



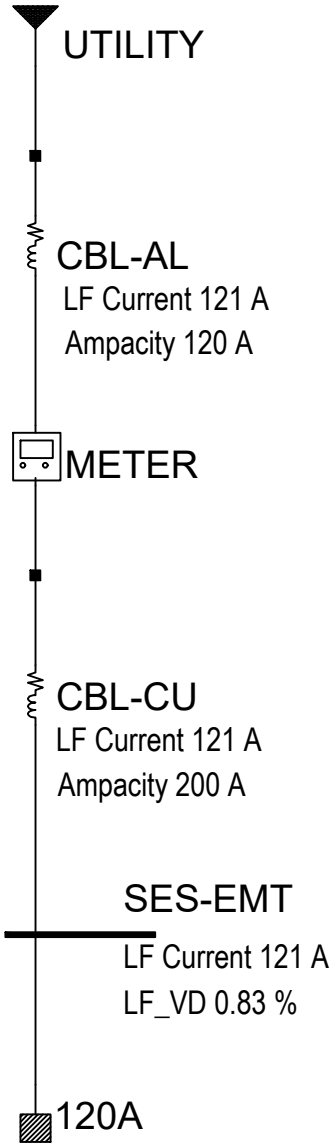
Arc Flash Evaluation Report

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
SES-EMT	0.240	MaxTripTime @2.0s	12.95	0.00	2.000	PNL	VCB	14	10	137.88	18.00	31.06	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
			6.69	0.00	0.000	25	VCB	12					

APPENDIX 3

LOAD FLOW STUDY

EMT Ambulance Building
Load Flow



Project: EMT-Ambulance Building
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
UTILITY	In	1.00	0.00	40.0	30.0	0.59	2.08 +*j* 16.67

Buses

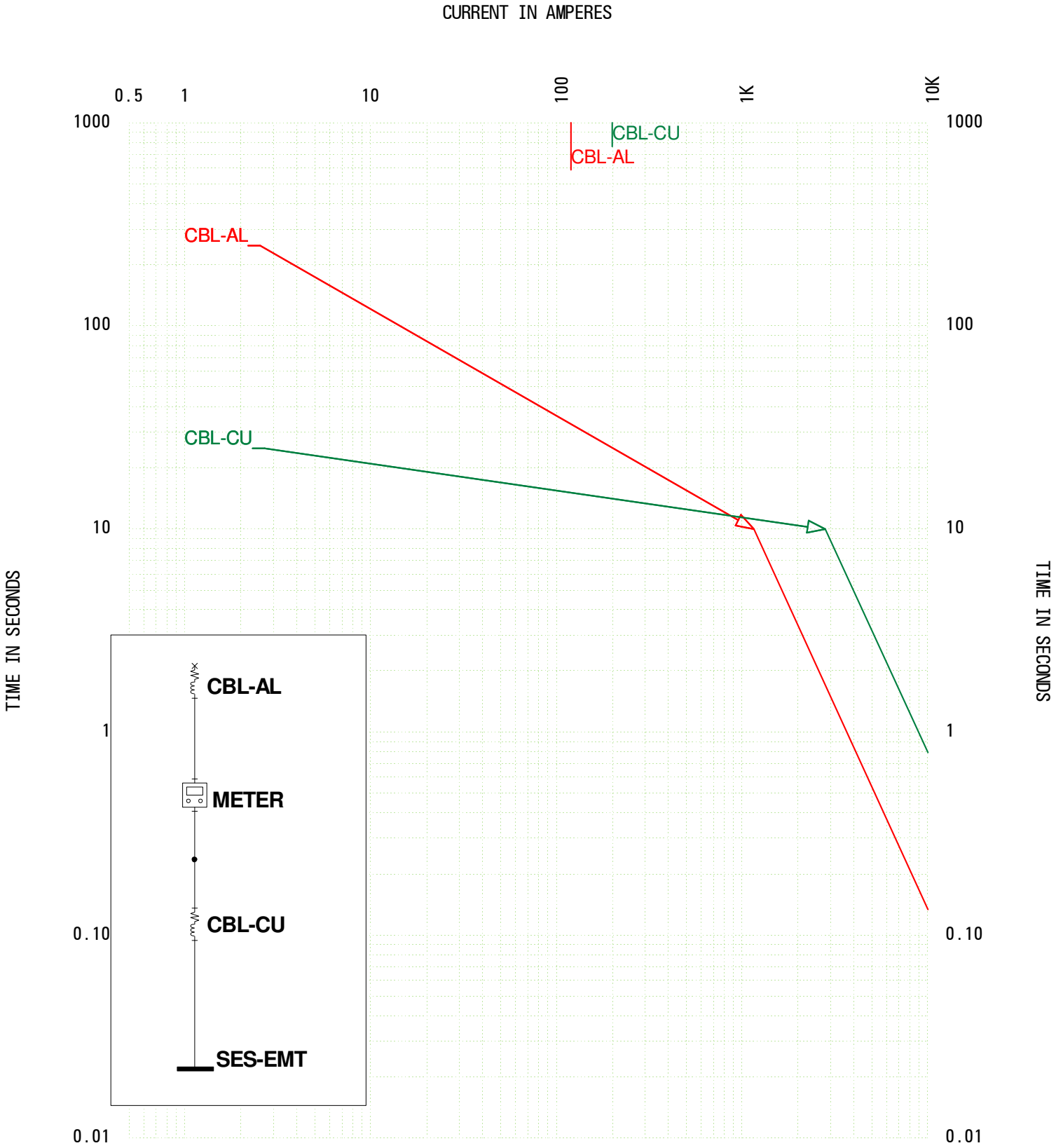
Bus Name	In/Out Service	Design Volts	LF Volts	Angle Degree	PU Volts	%VD
SES-EMT	In	240	238	-0.28	0.99	0.83

Cables

From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
BUS-0003	CBL-AL	In	0.22	40.0	30.0	50.0	121.0	0.80
BUS-0006				0.1	0.0	0.1	100.8	
BUS-0006	CBL-CU	In	0.03	39.9	29.9	49.9	121.0	0.80
SES-EMT				0.0	0.0	0.0	60.5	

APPENDIX 4

TCC REPORT



TCC Name: SES-EMT
Oneline: SES-EMT
June 19, 2025 6:53 PM

Current Scale x 1

Reference Voltage: 240

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!	

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

240 VAC

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

Location:	**SES-EMT**

120 DEGREEZ MEP ENGINEERING

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

Job#:	**25-040**	**Prepared on:**	**06/19/25**	**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

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:

EMT BUILDING

6517 E. Lincon Drive

Paradise Valley, AZ 85253

EMT BUILDING

6517 E. Lincon Drive

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: 6-19-2025

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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 EMT Building located at 6517 E. Lincon Drive, 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-EMT is a 200 amp 240/120V, 1-phase service fed from 25 KVA utility transformer with a Short Circuit current determined by the power company to be 14,318 Amps. This service was installed per the NEC's 6 switch rule i.e. the panel has 6 circuits or less that when added together will not exceed the bus rating of the panel (200 amps). There is no main breaker to perform overcurrent analysis. The panel has issues that are noted in the Excel field report.

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.

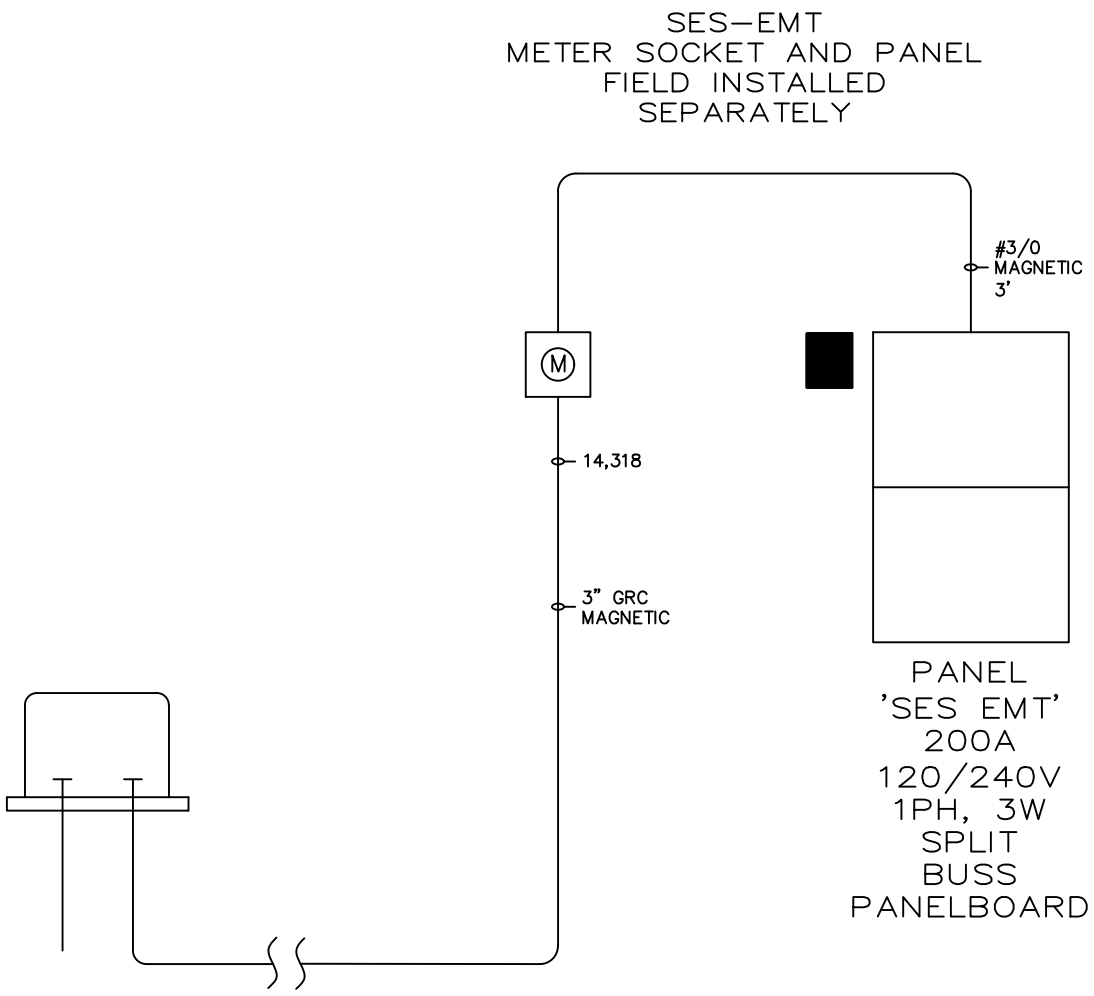
1.2.2 DC systems less than 50 volts.

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.

EMT – AMBULANCE BUILDING



LABEL LEGEND

EQUIPMENT TO BEAR A LABEL

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

FACILITY	**EMT AMBULANCE BLDG**	**ADDRESS:**	**6517 E. LINCOLN DRIVE, PARADISE VALLEY AZ**

UTILITY:	**APS**
TRANSFORMER SIZE:	**25 KVA**
TRANSFORMER %Z:	**2.70%**
SECONDARY COND SIZE:	**(1) x 1/0 AL**
LENGTH:	
AFC (PER UTILITY TABLES)	**14,318**
VOLTAGE:	**120/240**
PHASE:	**1Ø-3W**

OTHER COMMENTS

NOTE: **METER NUMBER 1256154**

EQUIPMENT NAME:	**SES - EMT**	**VOLTAGE:**	**120/240**	**PHASE:**	**1Ø-3W**	**AMPS:**	**200**	**SCCR:**	**10K**	**MAIN:**	**6 SW RULE**
EQUIPMENT TYPE:	**PANELBOARD**									**MODEL:**	
MANUFACTURER:	**GE**									**AMPS**	
MODEL:											
TYPE:											
FED FROM:	**UTILITY XFMR**										
AFC:	**14,318**										
FEEDER SIZE:											
CONDUCTOR TYPE:											
RACEWAY TYPE:											
LENGTH:											
MAIN:											

OTHER COMMENTS

THE EQUIPMENT HAS A MIX OF 10K AIC CIRCUIT BREAKERS FROM DIFFERENT MANUFACTURERS
THE EQUIPMENT HAS A NEMA 1 (INDOOR) RATING AND IS INSTALLED ON THE EXTERIOR OF THE BUILDING.
THE SERVICE IS IN POOR CONDITION AND SHOULD BE REPLACED.
THE AVAILABLE FAULT CURRENT EXCEEDS THE RATING OF THE EQUIPMENT
A LABEL STATING THAT THERE IS NO SAFE LEVEL OF PPE WILL BE APPLIED.

SUB-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 fault exceeded the 10 KAIC rating of SES-EMT.

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-EMT service feeders (TCC Report) show no over current protection coordination. However, this service was installed per the NEC's 6 switch rule and the design is NEC code compliant.

1.3.2.2. The protective device settings in this report (Refer to TCC reports), are **not applicable**. 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-EMT:** 121 amps (reference Load Flow One Line).

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 fault exceeded the 10 KAIC rating of SES-EMT.

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-EMT is a single phase 240/120V system with an APS utility provided 14.3 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, SES-EMT exceeds its KAIC value. Issues with the electrical system are noted in the Excel report. Typically, this panel would receive a Red label for an insufficient KAIC rating. Hower, this panel has other issues and will receive a Red label for other deficiencies. *Reference Excel field report.*

Eq. Name	SES-EMT					
SC RATING(KASCw)	10KA ☒					
$I_{k"-3Ph.-Init.Sym.}$	12.9KA					

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.

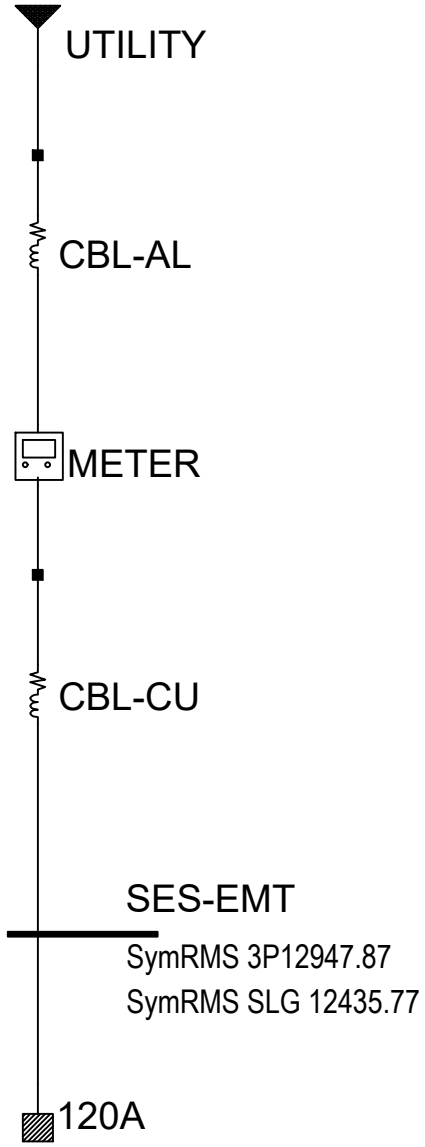
OCPD: Over Current Protection Device (Fuse/Breaker) are acceptable based upon estimated loads.

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

EMT Ambulance Building
Short Circuit



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		

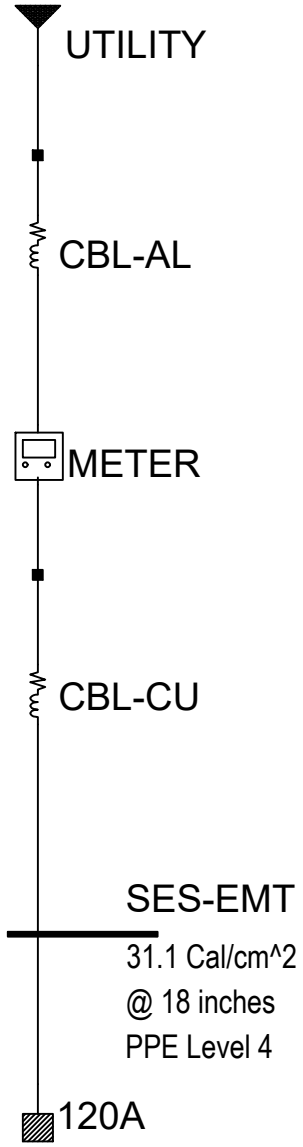
				Initial Symmetrical Amps				Asymmetrical Amps				Init Sym Neutral Amps	
Bus Name	**Contributions**			**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
BUS-0003				**14,318**	**14,318**	**0**	**0**	**19,798**	**19,798**	**0**	**0**		
CBL-AL	CABLE	In		0	0	0	0	0	0	0	0		
UTILITY	UTILITY	In		14,318	14,318	0	0	19,798	19,798	0	0	14,318	
SES-EMT				**12,948**	**12,436**	**0**	**0**	**14,306**	**13,412**	**0**	**0**		
CBL-CU	CABLE	In		12,948	12,436	0	0	14,306	13,412	0	0	12,436	
BUS-0006				**13,226**	**12,856**	**0**	**0**	**14,779**	**14,080**	**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
CBL-AL	CABLE	In	13,226	12,856	0	0	14,779	14,080	0	0	12,856	
CBL-CU	CABLE	In	0	0	0	0	0	0	0	0		

APPENDIX 2

ARC FLASH SKM REPORT

EMT Ambulance Building
Arc Flash



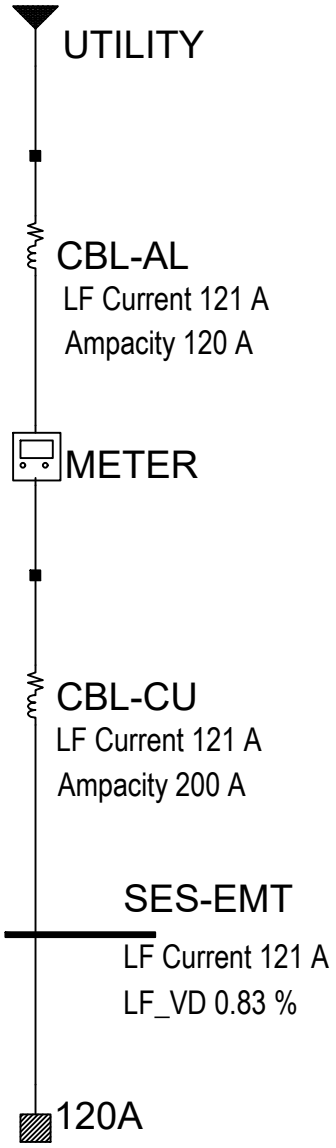
Arc Flash Evaluation Report

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
SES-EMT	0.240	MaxTripTime @2.0s	12.95	0.00	2.000	PNL	VCB	14	10	137.88	18.00	31.06	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
			6.69	0.00	0.000	25	VCB	12					

APPENDIX 3

LOAD FLOW STUDY

EMT Ambulance Building
Load Flow



Project: EMT-Ambulance Building
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
UTILITY	In	1.00	0.00	40.0	30.0	0.59	2.08 +*j* 16.67

Buses

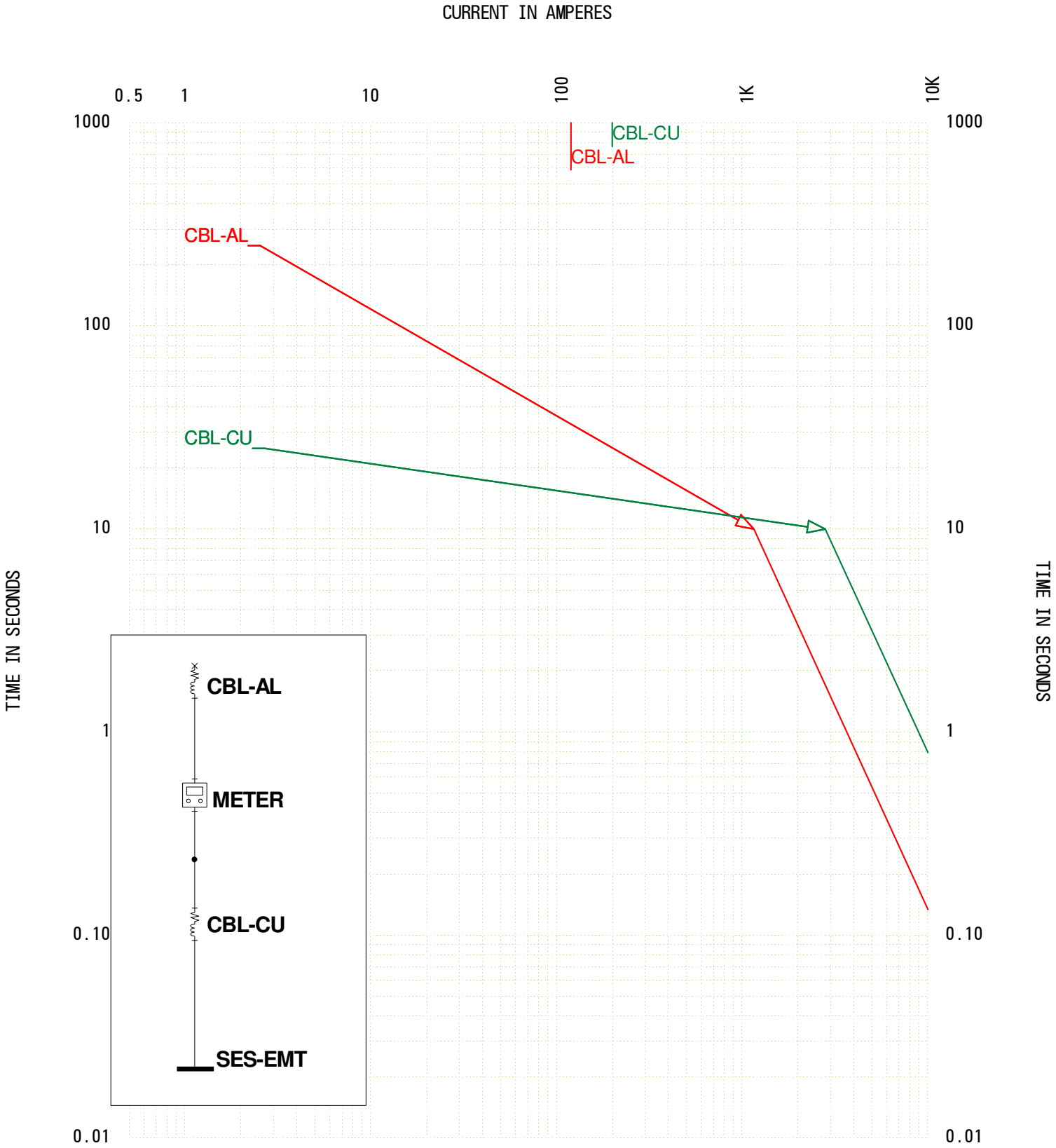
Bus Name	In/Out Service	Design Volts	LF Volts	Angle Degree	PU Volts	%VD
SES-EMT	In	240	238	-0.28	0.99	0.83

Cables

From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
BUS-0003	CBL-AL	In	0.22	40.0	30.0	50.0	121.0	0.80
BUS-0006				0.1	0.0	0.1	100.8	
BUS-0006	CBL-CU	In	0.03	39.9	29.9	49.9	121.0	0.80
SES-EMT				0.0	0.0	0.0	60.5	

APPENDIX 4

TCC REPORT



TCC Name: SES-EMT
Oneline: SES-EMT
June 19, 2025 6:53 PM

Current Scale x 1

Reference Voltage: 240

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!	

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

240 VAC

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

Location:	**SES-EMT**

120 DEGREEZ MEP ENGINEERING

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

Job#:	**25-040**	**Prepared on:**	**06/19/25**	**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