FACILITY CONDITION ASSESSMENT

prepared for

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

Town Hall
6401 East Lincoln Drive
Paradise Valley, AZ 85253

PREPARED BY:
Bureau Veritas
6021 University Boulevard, Suite 200
Ellicott City, MD 21043
800.733.0660
www.bvna.com

BV CONTACT:
Gregg Young
Program Manager
800.733.0660 x7296228
Gregg.Young@bureauveritas.com

BV PROJECT #:
172662.25R000-002.468

DATE OF REPORT:
July 7, 2025

ON SITE DATE:
May 29, 2025

TABLE OF CONTENTS

1. Executive Summary

Property Overview and Assessment Details

General Information	
Property Type	Town Hall
Number of Buildings	1
Main Address	6401 East Lincoln Drive, Paradise Valley, AZ 85253
Site Developed	1973 Renovated 2019
Outside Occupants / Leased Spaces	None
Date(s) of Visit	May 29, 2025
Management Point of Contact	Paradise Valley Public Works Mr. Isaac Chavira, Public Works Director (480) 348-3540, ichavira@paradisevalleyaz.gov
On-site Point of Contact (POC)	Paradise Valley Public Works John Fraley, Lead Technician (480) 797-2060
Assessment and Report Prepared By	Paul Scanzillo
Reviewed By	*for,* Gregg Young Program Manager 800.733.0660 x7296228 Gregg.Young@bureauveritas.com
AssetCalc Link	Full dataset for this assessment can be found at: https://www.assetcalc.net/

Significant/Systemic Findings and Deficiencies

Historical Summary

The Town of Paradise Valley Public Works Complex was developed in 1974 with construction of the original Town Hall building. An addition to the Town Hall transpired in 1980 with a refurbishment in 1996. In 2005, the west wing was reported to be added with a renovation in 2019. This information was provided from town historical records and discussions with onsite personnel.

Architectural

The masonry structure appears to be sound overall. The exterior walls are free of cracks which would be indicative of settling or structural issues. The exterior stucco and paint are adequate for the short term but will need repainting in the future. Backfilling against the building allowed for a good visual of the metal roof, wood rafter tails and wood fascia. Some of the rafter tails and facia are dry rotted on the older section and are recommended for repair or replacement to maintain integrity of the roof structure. The metal roof finish on the older section appears to be worn with rust developing overall and will need replacement in the near future. Roof drainage appears to be functional as expected with no reported water infiltration or drainage problems. The two flat roof sections were inaccessible during the assessment. The exterior glazed doors, exterior steel doors and aluminum windows all appear to have been upgraded at some point and are adequate for the near term with no apparent issues observed. Interior finishes have been well-maintained over the years. Casework in the boardroom area and elsewhere is adequate with no anticipated short or near-term needs. Carpeting throughout the boardroom and adjacent offices was replaced in 2023 with 80% of the remaining useful life. Floor finishes in the newer 2019 remodeled area are adequate for the short term, but the carpeting will need upgrading in the future. All architectural assets are budgeted and anticipated for replacement based on condition and expected remaining useful life.

Mechanical, Electrical, Plumbing and Fire (MEPF)

An air-cooled chiller with a 2-pipe hydronic system is located at the exterior of the building. The chiller feeds fan-coil units located throughout the building. The chiller was replaced in 2023 with an expected useful life beyond the reserve term. The fan-coil units are located in the ceiling cavities above the ACT ceiling. The fan-coil units were accessible, and some data-plate information was available along with CSM equipment information. Some units have been replaced over the years with the newest replacements in 2023/2024. There are several original 2005 units that are functional but will need upgrading in the near term. Supplemental climatization is with ductless mini-split heat pumps which are anticipated for replacement in the term. The Building Automation System has been upgraded with a digital system in 2023 and is reported to function as expected. The electrical system appears to have been upgraded in 1996 and is of sufficient capacity and functionality for the near term but will need an additional upgrade in the term. There is no emergency backup power present for the building. The plumbing infrastructure is reported to being upgraded in 2005 during the west expansion. Restroom fixtures are reported to have been replaced during a 2019 renovation. An electric water heater was replaced in 2024, and an on-demand instantaneous water heater was installed in 2019. Both water heaters are functioning as expected. Except for fire extinguishers throughout the building with current inspection tags, there is not a system-wide fire suppression system. The fire alarm system is non-functional with connectivity issues with the fire alarm control panel. The exit lights appear to be functional throughout the building, but some older fixtures will need upgrading in the future. All MEPF assets are budgeted and anticipated for replacement based on condition and expected remaining useful life.

Site

The asphalt drives and parking areas are original pavements with recent sealing and striping. No open cracks or potholes are observed. The concrete sidewalks are observed to be adequate with no cracking observed. Site lighting is with LED pole fixtures and building-mounted fixtures. A fountain is located at the unused entrance and is non-functional with standing stagnant water.

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:

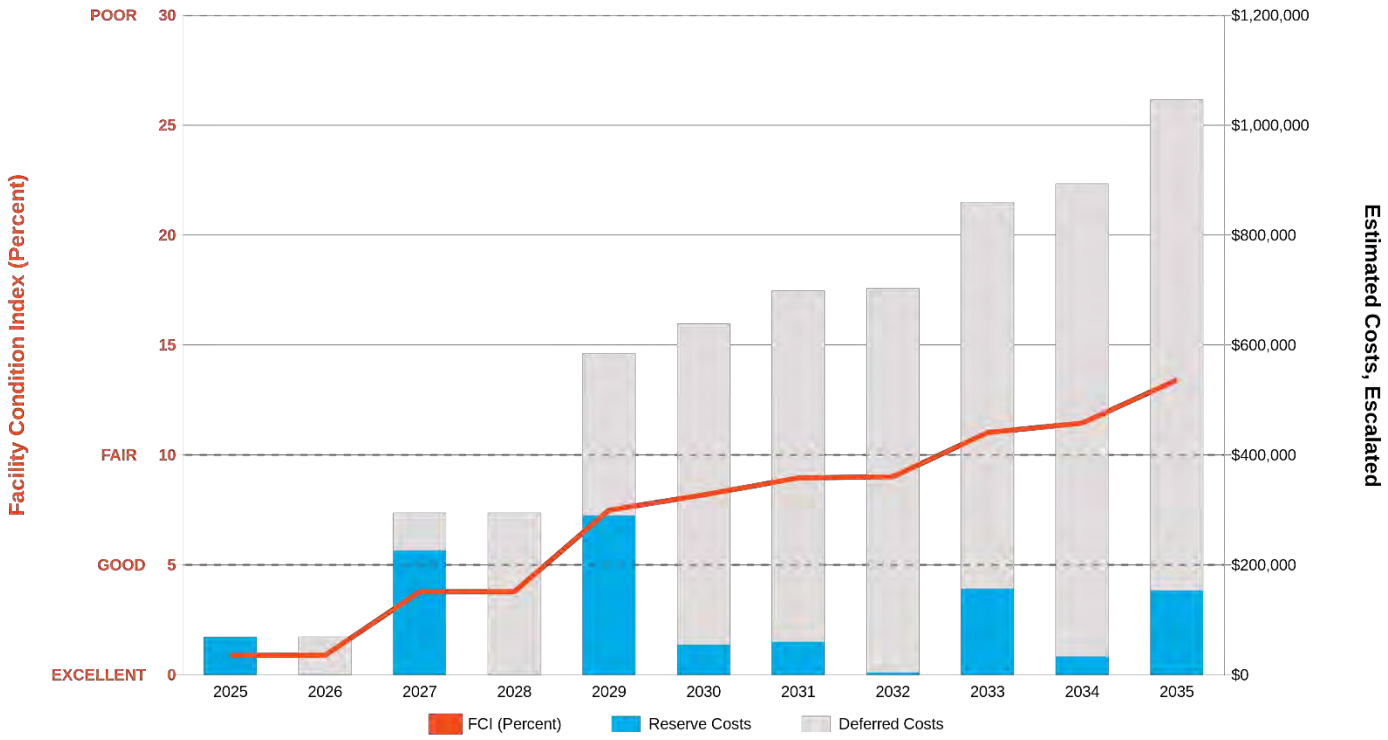
FCI Analysis		
Replacement Value *$7,804,650*	*Total SF* *14,866*	*Cost/SF* *$525*

	Est Reserve Cost	FCI
Current	$69,000	0.9 **%**
3-Year	$295,200	3.8 **%**
5-Year	$639,100	8.2 **%**
10-Year	$1,046,900	13.4 **%**

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: $7,804,650.00 **Inflation Rate: 3%** **Average Needs (per year - over next 10 years): $95,168.00**



Immediate Needs

Location	UF Code	Description	Condition	Plan Type	Cost
Town Hall	D5021	Switchboard, 277/480 V, Replace	Poor	Performance/Integrity	$52,000
Town Hall	D7051	Fire Alarm Panel, Fully Addressable, Replace	Failed	Safety	$15,000
Town Hall	G2061	Decorative Fountains, Aerator or Nozzle, 1 HP, Replace	Failed	Performance/Integrity	$2,000
TOTAL (3 items)					**$69,000**

Key Findings

Fire Alarm Panel in Failed condition.

Fully Addressable
Town Hall
Lobby

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

Plan Type: Safety

Cost Estimate: $15,000

Aged and not communicating. - AssetCALC ID: 9387282

Roofing in Poor condition.

Metal
Town Hall
Roof

Uniformat Code: B3010
Recommendation: **Replace in 2027**

Plan Type: Performance/Integrity

Cost Estimate: $193,300

Rusted metal - AssetCALC ID: 9387301

Exterior Walls in Poor condition.

any type, Repairs per Man-Day
Town Hall
Building Exterior

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

Plan Type: Performance/Integrity

Cost Estimate: $19,800

Dry rotted facia boards and rafters' tails - AssetCALC ID: 9387329

Switchboard in Poor condition.

277/480 V
Town Hall
Chiller Yard

Uniformat Code: D5020
Recommendation: **Replace in 2025**

Plan Type: Performance/Integrity

Cost Estimate: $52,000

Broken handle will not open. - AssetCALC ID: 9387348

Decorative Fountains in Failed condition.

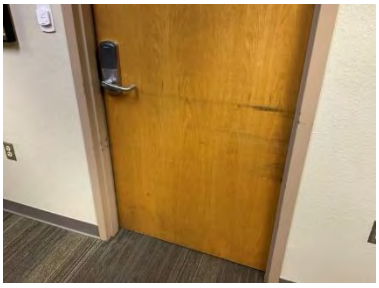
Aerator or Nozzle, 1 HP
Town Hall
Site

Uniformat Code: G2060
Recommendation: **Replace in 2025**

Plan Type: Performance/Integrity

Cost Estimate: $2,000

Non-functional fountain with stagnant, standing water. - AssetCALC ID: 9387288



Exterior Door in Poor condition.

Wood, any type
Town Hall
Post Office

Uniformat Code: B2050
Recommendation: **Refinish in 2026**

Plan Type: Performance/Integrity

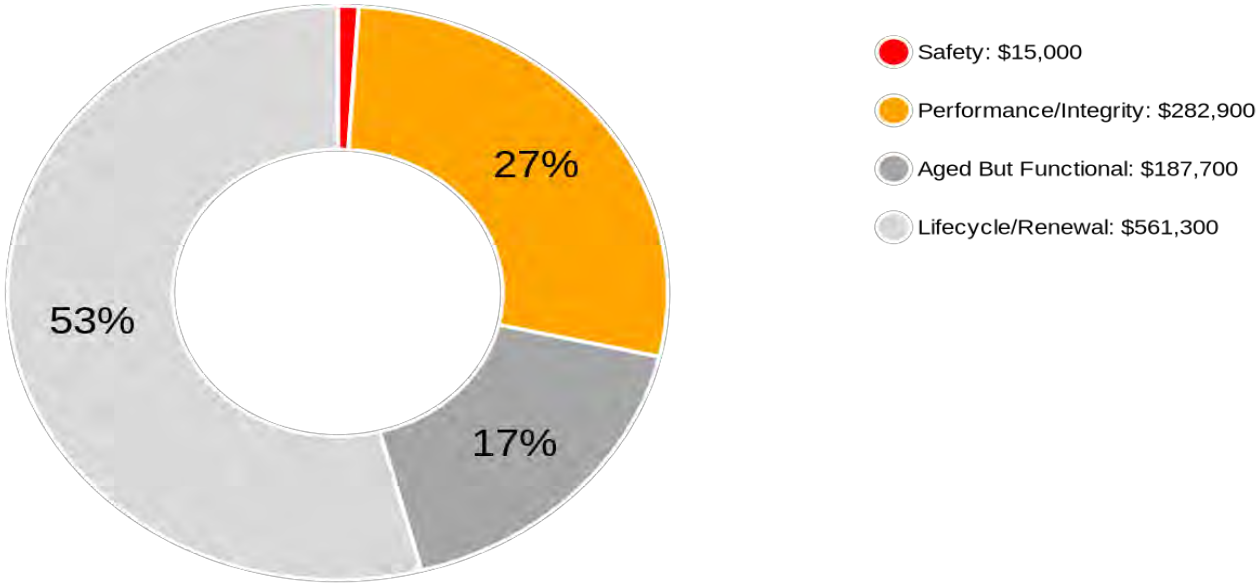
Cost Estimate: $200

Post Office door is scuffed, needs refinishing - AssetCALC ID: 9387279

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: $1,046,900

2. Building Systems and Site Elements

Building Systems Summary		
Address	6401 East Lincoln Drive, Paradise Valley, AZ 85253	
GPS Coordinates	33.5306974, -111.9493251	
Constructed/Renovated	1973 Renovated 2019	
Building Area	14,866 SF	
Number of Stories	1 above grade (mechanical mezzanines are present but not included in the count)	
System	*Description*	*Condition*
Structure	Masonry bearing walls with wood roof deck supported by wood joists and concrete strip/wall footing foundation system	Fair
Facade	Primary Wall Finish: Stucco Secondary Wall Finish: Wood eaves and facia Windows: Aluminum	Poor
Roof	Primary: Hip construction with metal finish Secondary: Flat construction with built-up finish	Fair
Interiors	Walls: Painted gypsum board, painted CMU, ceramic tile, plate glass, and unfinished Floors: Carpet, VCT, ceramic tile, and unfinished concrete Ceilings: Painted gypsum board, ACT, wood rafters, and unfinished/exposed	Fair

Building Systems Summary		
Elevators	None	-
Plumbing	Distribution: Copper supply and PVC waste and venting Hot Water: Electric water heater with integral tank and tankless water heater Fixtures: Toilets, urinals, and sinks in all restrooms	Good
HVAC	Central System: Chiller feeding fan coil terminal units Supplemental components: Ductless mini split-system heat pumps	Fair
Fire Suppression	Fire extinguishers only	Fair
Electrical	Source and Distribution: Main switchboards with copper wiring fed from pad-mount transformer with copper wiring Interior Lighting: LED Emergency Power: None	Fair
Fire Alarm	Alarm panel with smoke detectors, heat detectors, alarms, strobes, pull stations, back-up emergency lights, and exit signs	Failed
Equipment/Special	None	-
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 roofs. The sloped metal roofs were observed from ground level.	
Key Spaces Not Observed	Areas of note that were either inaccessible or not observed for other reasons are listed here: · The flat roofs were inaccessible without the use of a lift.	

Site Information		
Site Area	2.23 acres	
Parking Spaces	27 total spaces, all of which are in open lots; 3 of which are accessible.	
System	*Description*	*Condition*
Site Pavement	Asphalt lots with limited areas of concrete aprons and pavement and adjacent concrete sidewalks, curbs, ramps, and stairs	Fair
Site Development	Property entrance signage; fountain	Poor
Landscaping and Topography	Significant landscaping features including lawns, trees, bushes, and planters Irrigation present Concrete retaining walls Low to moderate site slopes throughout	Good
Utilities	Municipal water and sewer Local utility-provided electric	Good
Site Lighting	Pole-mounted: LED Building-mounted: LED	Fair
Ancillary Structures	CMU chiller building	Good
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.

Town Hall: System Expenditure Forecast						
System	**Immediate**	**Short Term (1-2 yr)**	**Near Term (3-5 yr)**	**Med Term (6-10 yr)**	**Long Term (11-20 yr)**	**TOTAL**
Structure	$0	$0	$0	$0	$0	$0
Facade	$0	$21,159	$25,323	$25,265	$63,571	$135,318
Roofing	$0	$205,027	$10,129	$22,577	$0	$237,733
Interiors	$0	$0	$112,669	$134,446	$334,167	$581,282
Plumbing	$0	$0	$0	$2,609	$136,855	$139,464
HVAC	$0	$0	$63,642	$93,350	$71,741	$228,733
Electrical	$52,000	$0	$33,384	$103,473	$246,008	$434,865
Fire Alarm and Electronic Systems	$15,000	$0	$50,195	$0	$115,047	$180,242
Equipment and Furnishings	$0	$0	$13,506	$4,400	$102,237	$120,143
Special Construction and Demo	$0	$0	$0	$0	$93,478	$93,478
Sitework	$2,000	$0	$35,047	$21,657	$335,585	$394,289
TOTALS	**$69,000**	**$226,200**	**$343,900**	**$407,800**	**$1,498,700**	**$2,545,600**

3. ADA Accessibility

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

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

However, this does not:

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

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

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

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

The facility was originally constructed in 1973. The facility was substantially renovated in 1996. Widespread accessibility improvements appear to have been implemented at that time.

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

4. Purpose and Scope

Purpose

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

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

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

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

Scope

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

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

5. Opinions of Probable Costs

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

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

Methodology

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

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

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

Definitions

Immediate Needs

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

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

Replacement Reserves

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

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

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

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

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

Key Findings

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

6. Certification

Town of Paradise Valley, FCA wInventory Program (the Client) retained Bureau Veritas to perform this Facility Condition Assessment in connection with its continued operation of Town Hall, 6401 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.

Prepared by: Paul Scanzillo
Project Assessor

Reviewed by: Rashad Alnial

Technical Report Reviewer
for
Gregg Young
Program Manager
800.733.0660 x7296228
Gregg.Young@bureauveritas.com

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

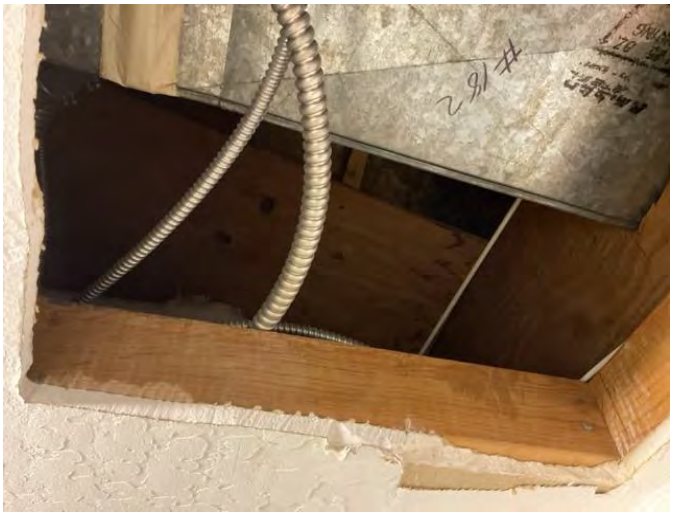
1 - FRONT ELEVATION

2 - LEFT ELEVATION

3 - REAR ELEVATION

4 - RIGHT ELEVATION

5 - MEZZANINE ROOF STRUCTURE



6 - ROOF STRUCTURE COMPONENTS

Photographic Overview

7 - PRIMARY ROOF OVERVIEW

8 - BOARDROOM OVERVIEW

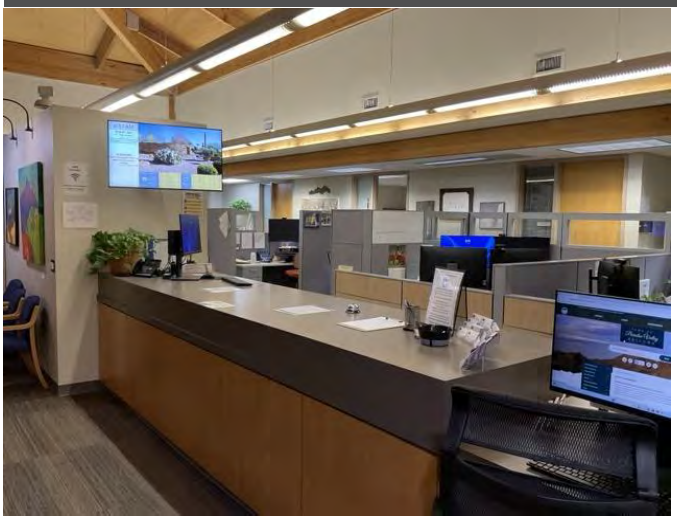
9 - BOARDROOM OVERVIEW

10 - MAYOR'S OFFICE

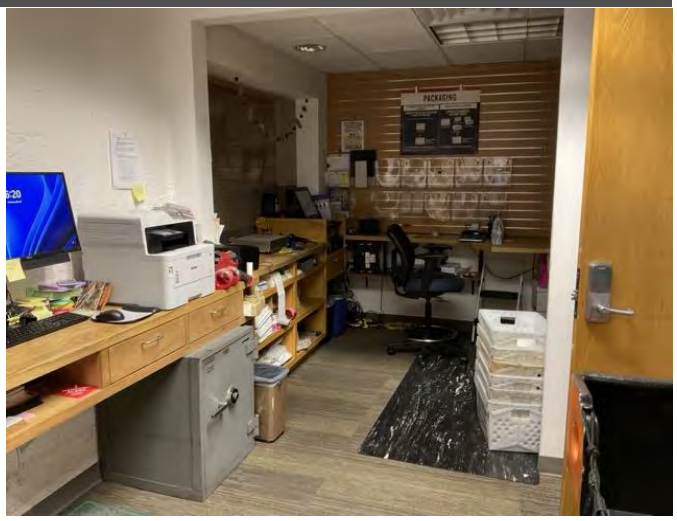
11 - TOWN MANAGER'S OFFICE

12 - TYPICAL OFFICE

Photographic Overview



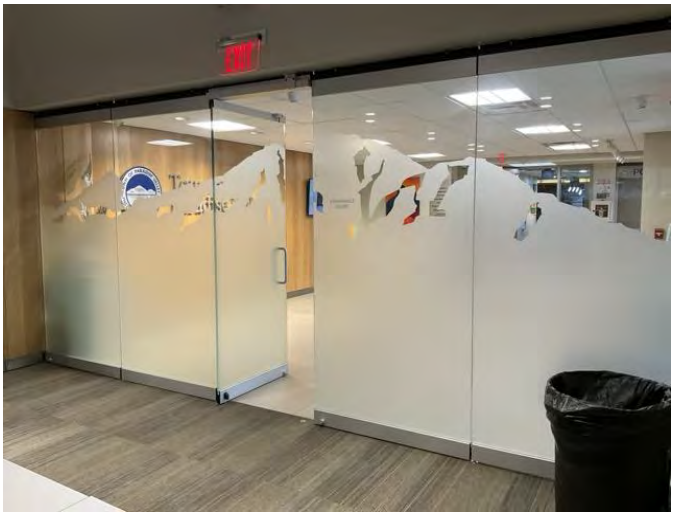
13 - SERVICE COUNTER



14 - POST OFFICE OVERVIEW

15 - COMMUNITY ROOM OVERVIEW

16 - MEZZANINE STORAGE



17 - PLATE GLASS PARTITION

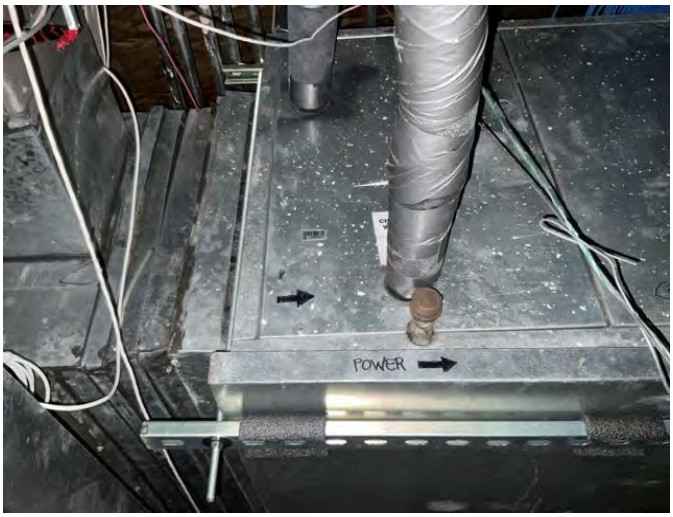
18 - FIRE ALARM DEVICES

Photographic Overview

19 - NONCOMPLIANT FIRE ALARM PANEL

20 - EMERGENCY AND EXIT LIGHTING

21 – AIR COOLED CHILLER AND PUMPS



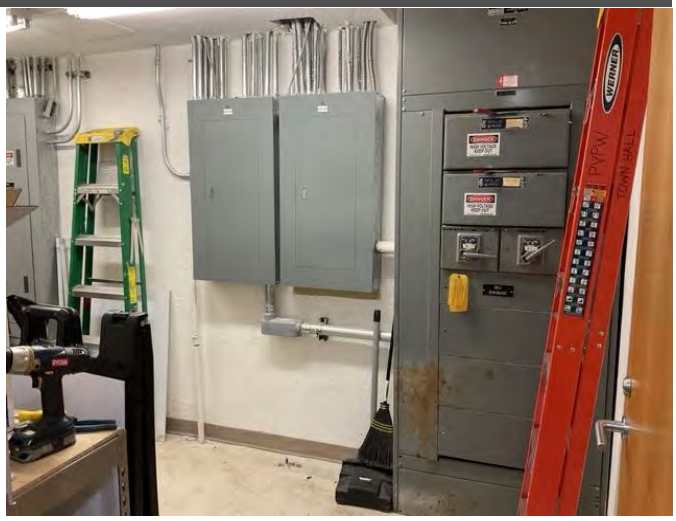
22 – FAN COIL UNIT

23 - DOMESTIC WATER PIPING

24 - WATER HEATER

Photographic Overview

25 - MAIN ELECTRICAL ROOM



26 - SECONDARY ELECTRICAL ROOM

27 - MAIN PARKING AREA

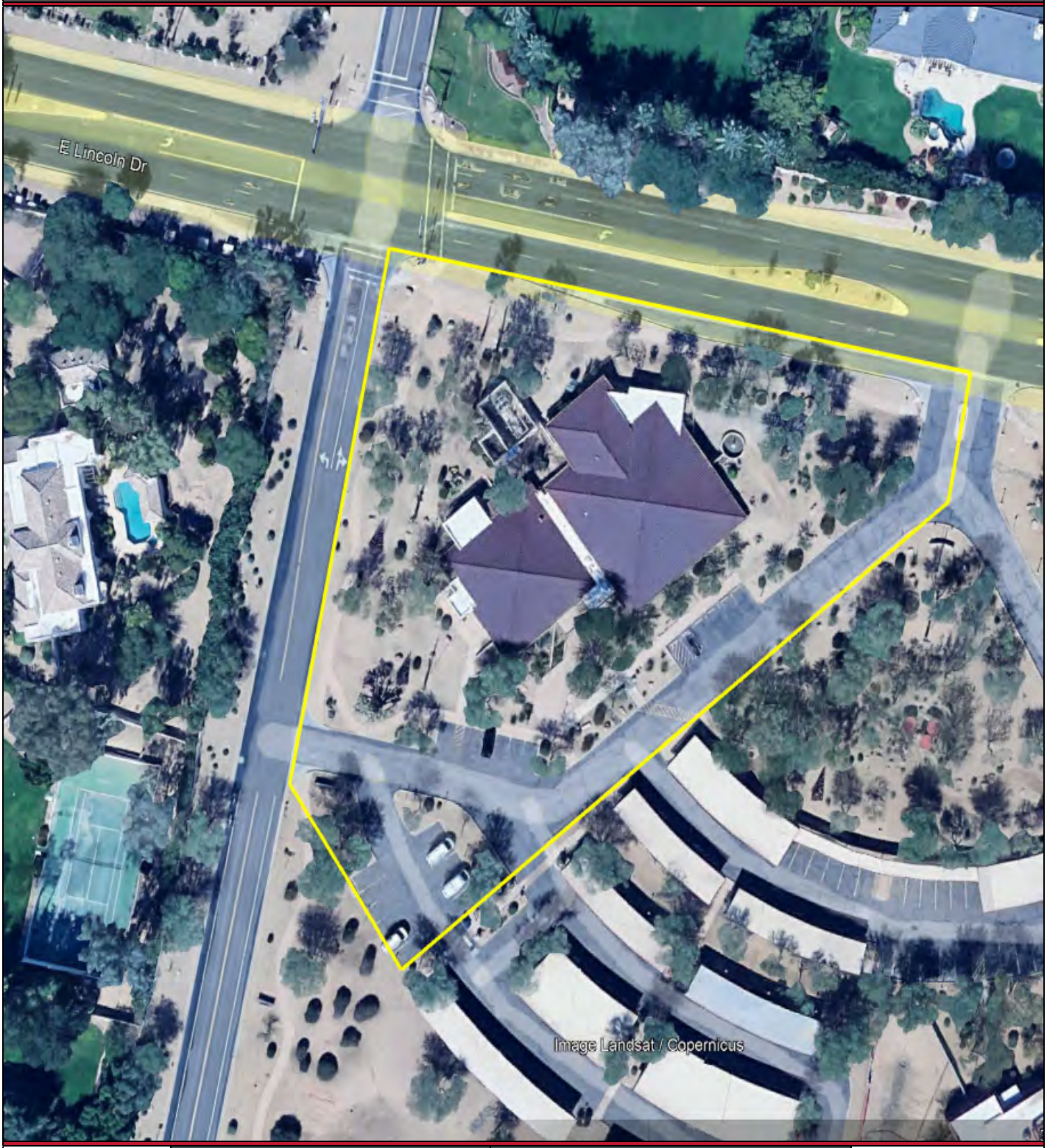
28 - SECONDARY PARKING AREA

29 - SIDEWALKS AND LANDSCAPING

30 - PROPERTY SIGNAGE

Appendix B:
Site Plan(s)

Site Plan



Project Number	Project Name
172662.25R000-002.468	Town Hall
Source	**On-Site Date**
Google	May 29, 2025

N

Appendix C:
Pre-Survey Questionnaire(s)

BV FACILITY CONDITION ASSESSMENT: PRE-SURVEY QUESTIONNAIRE

Building / Facility Name: Town Hall

Name of person completing form: John Fraley

Title / Association w/ property: Lead Technician

Length of time associated w/ property: 4 Years

Date Completed: 5/29/2025

Phone Number: 480-797-2060

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: 1973	Renovated: 2019	
2	Building size in SF	14,866 **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).	None		
5	List any major capital expenditures planned/requested for the next few years. Have they been budgeted?	None		
6	Describe any on-going extremely problematic, historically chronic, or immediate facility needs.	None		

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

	Question	Response				Comments
		Yes	No	Unk	NA	
7	Are there any problems with foundations or structures, like excessive settlement?		X			
8	Are there any wall, window, basement or roof leaks?		X			
9	Has any part of the facility ever contained visible suspect mold growth, or have there been any indoor air quality complaints?		X			
10	Are your elevators unreliable, with frequent service calls?				X	
11	Are there any plumbing leaks, water pressure, or clogging/backup issues?		X			
12	Have there been any leaks or pressure problems with natural gas, HVAC piping, or steam service?	X				Main drain pipes leaked but repaired
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: Town Hall

BV Project Number: 172662.25R000-002.468

Facility History & Interview

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

002 - Town Hall: Accessibility Issues

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

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

002 - Town Hall: Photographic Overview

OVERVIEW OF ACCESSIBLE PARKING AREA

2ND AREA OF ACCESSIBLE PARKING

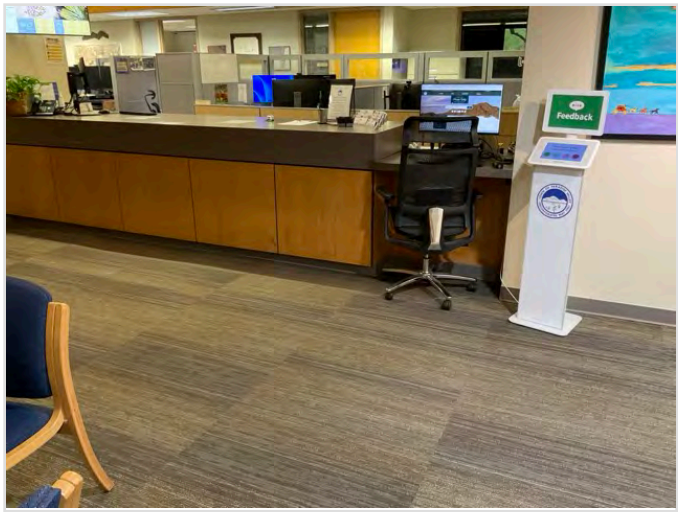
ACCESSIBLE PATH

CURB CUT

ACCESSIBLE ENTRANCE

DOOR THRESHOLD

002 - Town Hall: Photographic Overview



ACCESSIBLE INTERIOR PATH

DOOR HARDWARE

TOILET STALL OVERVIEW

SINK, FAUCET HANDLES AND ACCESSORIES

Appendix E:
Component Condition Report

Component Condition Report | 002 - Town Hall

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
Structure						
A1010	Substructure	Fair	Foundations, Concrete or CMU Walls w/ Continuous Footings, 1-2 Story Building	648 LF	23	9402961
B1010	Superstructure	Fair	Structural Framing, Masonry (CMU) Bearing Walls, 1-2 Story Building	14,866 SF	23	9402962
Facade						
B2010	Building Exterior	Poor	Exterior Walls, any type, Repairs per Man-Day, Repair	18	2	9387329
B2010	Building Exterior	Fair	Exterior Walls, any painted surface, 1-2 Story Building, Prep & Paint	7,500 SF	4	9387352
B2020	Building Exterior	Fair	Glazing, any type by SF	200 SF	10	9387284
B2050	Post Office	Poor	Exterior Door, Wood, any type, Refinish	1	1	9387279
B2050	Building Exterior	Fair	Exterior Door, Aluminum-Framed & Glazed, Standard Swing	6	10	9387327
B2050	Building Exterior	Fair	Exterior Door, Steel, Commercial	4	20	9387307
Roofing						
B3010	Roof	Poor	Roofing, Metal	14,866 SF	2	9387301
B3010	Roof	Fair	Roofing, Built-Up	1,200 SF	10	9446479
B3020	Roof	Fair	Roof Appurtenances, Gutters & Downspouts, Aluminum w/ Fittings	1,000 LF	4	9387281
Interiors						
C1010	Community Room	Good	Movable Partition, Gym Divider, Deluxe/Operable	200 SF	19	9387346
C1030	Throughout Building	Fair	Interior Door, Wood, Solid-Core	45	20	9387300
C1070	Throughout Building	Fair	Suspended Ceilings, Acoustical Tile (ACT)	13,400 SF	5	9387335
C1090	Restrooms	Good	Toilet Partitions, Plastic/Laminate	6	14	9387323
C2010	Throughout Building	Fair	Wall Finishes, any surface, Prep & Paint	28,500 SF	6	9387319
C2010	Office Areas	Fair	Wall Finishes, Plate Glass	200 SF	20	9387304
C2010	Restrooms	Good	Wall Finishes, Ceramic Tile	1,000 SF	34	9387313
C2030	Storage	Fair	Flooring, Vinyl Tile (VCT)	300 SF	4	9387310
C2030	Newer Addition	Fair	Flooring, Carpet, Commercial Standard	6,600 SF	4	9387276

Component Condition Report | 002 - Town Hall

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
C2030	Breakroom	Fair	Flooring, Ceramic Tile	400 SF	20	9387299
C2030	Restrooms	Good	Flooring, Ceramic Tile	400 SF	34	9387343
C2030	Lobby	Good	Flooring, Ceramic Tile	600 SF	34	9387275
C2030	Board Area/Offices	Good	Flooring, Carpet, Commercial Standard	6,600 SF	8	9387316
C2050	Restrooms	Fair	Ceiling Finishes, any flat surface, Prep & Paint	400 SF	4	9387347
C2050	Council Area	Fair	Ceiling Finishes, Wood Paneling	1,100 SF	10	9387278
Plumbing						
D2010	Throughout Building	Good	Sink/Lavatory, Vanity Top, Stainless Steel	2	28	9387295
D2010	Restrooms	Good	Urinal, Standard	2	24	9387354
D2010	Mothering Room	Fair	Water Heater, Electric, Instant Hot	1	9	9387338
D2010	Chiller Yard	Good	Storage Tank, Domestic Water	1	28	9387289
D2010	Lobby	Fair	Drinking Fountain, Wall-Mounted, Bi-Level	1	9	9387269
D2010	Throughout Building	Fair	Plumbing System, Supply & Sanitary, Low Density (excludes fixtures)	14,866 SF	20	9387268
D2010	Restrooms	Good	Toilet, Commercial Water Closet	6	24	9387318
D2010	Restrooms	Good	Sink/Lavatory, Vanity Top, Enameled Steel	4	24	9387274
D2010	Janitor Closet	Fair	Sink/Lavatory, Service Sink, Floor	1	15	9387337
D2010	Storage	Good	Water Heater, Electric, Residential	1	14	9387287
HVAC						
D3020	Chiller Yard	Good	Boiler Supplemental Components, Expansion Tank	1	38	9387328
D3030	Chiller Yard	Good	Chiller, Air-Cooled	1	23	9387333
D3030	Building Exterior	Fair	Split System Ductless, Single Zone	1	9	9387341
D3030	Building Exterior	Fair	Split System Ductless, Single Zone	1	9	9387314
D3030	Building Exterior	Fair	Split System Ductless, Single Zone	1	7	9387334
D3050	Duncan Miller	Fair	Fan Coil Unit, Hydronic Terminal [FC-1]	1	4	9387321
D3050	Throughout Building	Good	HVAC System, Hydronic Piping, 2-Pipe	14,866 SF	39	9387294

Component Condition Report | 002 - Town Hall

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D3050	Throughout Building	Fair	HVAC System, Ductwork, Medium Density	14,866 SF	10	9387349
D3050	Chiller Yard	Good	Pump, Distribution, HVAC Chilled or Condenser Water [P-4]	1	13	9387332
D3050	By Dawn Jacobs	Fair	Fan Coil Unit, Hydronic Terminal [FC-4]	1	4	9387320
D3050	SW Lobby	Good	Fan Coil Unit, Hydronic Terminal [FC-10]	1	19	9387290
D3050	Womens Restroom	Fair	Fan Coil Unit, Hydronic Terminal [FC-12]	1	4	9387296
D3050	Goldwater Conference Room	Fair	Fan Coil Unit, Hydronic Terminal [FC-5]	1	4	9387342
D3050	Finance	Fair	Fan Coil Unit, Hydronic Terminal [FC-8]	1	4	9387326
D3050	C.R. / Attorney	Good	Fan Coil Unit, Hydronic Terminal [FC-17]	1	18	9387353
D3050	Chiller Yard	Good	Pump, Distribution, HVAC Chilled or Condenser Water [P-2]	1	13	9387325
D3050	Chuck Ransom	Fair	Fan Coil Unit, Hydronic Terminal [FC-3]	1	4	9387273
D3050	Large Conference	Good	Fan Coil Unit, Hydronic Terminal [FC-14]	1	18	9387308
D3050	Attorney	Good	Fan Coil Unit, Hydronic Terminal [FC-13]	1	18	9387322
D3050	Chiller Yard	Good	Pump, Distribution, HVAC Chilled or Condenser Water [P-1]	1	13	9387305
D3050	NE Lobby	Fair	Fan Coil Unit, Hydronic Terminal [FC-9]	1	4	9387339
D3050	Employee Lounge	Good	Fan Coil Unit, Hydronic Terminal [FC-16]	1	18	9387293
D3050	IT Office	Fair	Fan Coil Unit, Hydronic Terminal [FC-11]	1	4	9387340
D3050	By Post Office	Fair	Fan Coil Unit, Hydronic Terminal [FC-6]	1	4	9387351
D3050	Copy Room	Fair	Fan Coil Unit, Hydronic Terminal [FC-7]	1	4	9387291
D3050	Paul Michaud	Fair	Fan Coil Unit, Hydronic Terminal [FC-2]	1	4	9387355
D3050	Chiller Yard	Good	Pump, Distribution, HVAC Chilled or Condenser Water [P-3]	1	13	9387344
Electrical						
D5020	TH-121 Electrical Room	Fair	Switchboard, 120/208 V	1	11	9387280
D5020	Chiller Yard	Fair	Switchboard, 277/480 V [SWBD HA]	1	11	9387350
D5020	Chiller Yard	Poor	Switchboard, 277/480 V	1	0	9387348
D5020	Chiller Yard	Fair	Secondary Transformer, Dry, Stepdown	1	4	9387336

Component Condition Report | 002 - Town Hall

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D5020	Electrical Room	Fair	Switchboard, 120/208 V [SWBD-LC]	1	11	9387283
D5020	Electrical Room	Fair	Distribution Panel, 120/208 V [HA]	1	6	9387317
D5030	Throughout Building	Fair	Electrical System, Wiring & Switches, Average or Low Density/Complexity	14,866 SF	11	9387331
D5040	Throughout Building	Fair	Emergency & Exit Lighting System, Full Interior Upgrade, LED	14,866 SF	4	9387302
D5040	Building Exterior	Fair	Exterior Light, any type, w/ LED Replacement	4	10	9387345
D5040	Throughout Building	Fair	Interior Lighting System, Full Upgrade, High Density & Standard Fixtures	14,866 SF	8	9387324
Fire Alarm & Electronic Systems						
D6060	Throughout Building	Fair	Intercom/PA System, Public Address Upgrade, Facility-Wide	14,866 SF	14	9387286
D7050	Lobby	Failed	Fire Alarm Panel, Fully Addressable	1	0	9387282
D7050	Throughout Building	Fair	Fire Alarm System, Full System Upgrade, Standard Addressable, Upgrade/Install	14,866 SF	4	9387303
D8010	Throughout Building	Good	BAS/HVAC Controls, Basic System or Legacy Upgrades, Upgrade/Install	14,866 SF	13	9387315
Equipment & Furnishings						
E1040	Lobby	Fair	Healthcare Equipment, Defibrillator (AED), Cabinet-Mounted	1	6	9387271
E2010	Throughout Building	Good	Casework, Cabinetry, Standard	220 LF	14	9387311
E2010	Restrooms	Fair	Casework, Countertop, Plastic Laminate	40 LF	9	9387309
E2010	Breakroom	Fair	Casework, Cabinetry, Standard	40 LF	4	9387270
Special Construction & Demo						
F1020	Chiller Building	Fair	Ancillary Building, Wood-Framed or CMU, Standard	600 SF	15	9387330
Pedestrian Plazas & Walkways						
G2020	Site	Good	Parking Lots, Curb & Gutter, Concrete	1,300 LF	44	9387306
G2020	Site	Fair	Parking Lots, Pavement, Asphalt, Mill & Overlay	21,200 SF	12	9387298
G2020	Site	Good	Parking Lots, Pavement, Asphalt, Seal & Stripe	21,200 SF	4	9387297
G2030	Site	Fair	Sidewalk, Brick/Masonry Pavers	1,300 SF	15	9402453
G2030	Site	Fair	Sidewalk, Concrete, Large Areas	6,500 SF	15	9387272
Sitework						

Component Condition Report | 002 - Town Hall

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
G2060	Site	Fair	Retaining Wall, Concrete Masonry Unit (CMU)	300 SF	20	9387292
G2060	Site	Good	Signage, Property, Monument, Replace/Install	1	14	9387277
G2060	Site	Failed	Decorative Fountains, Aerator or Nozzle, 1 HP	1	0	9387288
G2080	Site	Fair	Irrigation System, Control Panel	1	9	9387285
G4050	Site	Fair	Pole Light Fixture, LED Lamp only	18	4	9387312

Appendix F:
Replacement Reserves

Replacement Reserves Report

002 - Town Hall

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
002 - Town Hall	$69,000	$155	$226,033	$0	$289,538	$54,370	$60,001	$4,305	$156,864	$33,324	$153,292	$231,603	$105,791	$84,536	$288,801	$276,072	$71,008	$0	$117,502	$35,736	$287,659	**$2,545,592**
Grand Total	**$69,000**	**$155**	**$226,033**	**$0**	**$289,538**	**$54,370**	**$60,001**	**$4,305**	**$156,864**	**$33,324**	**$153,292**	**$231,603**	**$105,791**	**$84,536**	**$288,801**	**$276,072**	**$71,008**	**$0**	**$117,502**	**$35,736**	**$287,659**	**$2,545,592**

Uniformat Code	Location Description	ID	Cost Description	Lifespan (EUL)	EAge	RUL	Quantity	Unit	Unit Cost*	Subtotal	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Deficiency Repair Estimate
B2010	Building Exterior	9387329	Exterior Walls, any type, Repairs per Man-Day, Repair	0	-2	2	18	EA	$1,100.00	$19,800			$19,800																				**$19,800**
B2010	Building Exterior	9387352	Exterior Walls, any painted surface, 1-2 Story Building, Prep & Paint	10	6	4	7500	SF	$3.00	$22,500					$22,500										$22,500								**$45,000**
B2020	Building Exterior	9387284	Glazing, any type by SF, Replace	30	20	10	200	SF	$55.00	$11,000											$11,000												**$11,000**
B2050	Post Office	9387279	Exterior Door, Wood, any type, Refinish	10	9	1	1	EA	$150.00	$150		$150										$150											**$300**
B2050	Building Exterior	9387327	Exterior Door, Aluminum-Framed & Glazed, Standard Swing, Replace	30	20	10	6	EA	$1,300.00	$7,800											$7,800												**$7,800**
B2050	Building Exterior	9387307	Exterior Door, Steel, Commercial, Replace	40	20	20	4	EA	$4,060.00	$16,240																						$16,240	**$16,240**
B3010	Roof	9387301	Roofing, Metal, Replace	40	38	2	14866	SF	$13.00	$193,258			$193,258																				**$193,258**
B3010	Roof	9446479	Roofing, Built-Up, Replace	25	15	10	1200	SF	$14.00	$16,800											$16,800												**$16,800**
B3020	Roof	9387281	Roof Appurtenances, Gutters & Downspouts, Aluminum w/ Fittings, Replace	20	16	4	1000	LF	$9.00	$9,000					$9,000																		**$9,000**
C1010	Community Room	9387346	Movable Partition, Gym Divider, Deluxe/Operable, Replace	25	6	19	200	SF	$22.30	$4,460																					$4,460		**$4,460**
C1030	Throughout Building	9387300	Interior Door, Wood, Solid-Core, Replace	40	20	20	45	EA	$700.00	$31,500																						$31,500	**$31,500**
C1070	Throughout Building	9387335	Suspended Ceilings, Acoustical Tile (ACT), Replace	25	20	5	13400	SF	$3.50	$46,900						$46,900																	**$46,900**
C1090	Restrooms	9387323	Toilet Partitions, Plastic/Laminate, Replace	20	6	14	6	EA	$750.00	$4,500															$4,500								**$4,500**
C2010	Office Areas	9387304	Wall Finishes, Plate Glass, Replace	40	20	20	200	SF	$50.00	$10,000																						$10,000	**$10,000**
C2010	Throughout Building	9387319	Wall Finishes, any surface, Prep & Paint	10	4	6	28500	SF	$1.50	$42,750							$42,750										$42,750						**$85,500**
C2030	Breakroom	9387299	Flooring, Ceramic Tile, Replace	40	20	20	400	SF	$18.00	$7,200																						$7,200	**$7,200**
C2030	Storage	9387310	Flooring, Vinyl Tile (VCT), Replace	15	11	4	300	SF	$5.00	$1,500					$1,500																$1,500		**$3,000**
C2030	Newer Addition	9387276	Flooring, Carpet, Commercial Standard, Replace	10	6	4	6600	SF	$7.50	$49,500					$49,500										$49,500								**$99,000**
C2030	Board Area/Offices	9387316	Flooring, Carpet, Commercial Standard, Replace	10	2	8	6600	SF	$7.50	$49,500									$49,500										$49,500				**$99,000**
C2050	Council Area	9387278	Ceiling Finishes, Wood Paneling, Replace	30	20	10	1100	SF	$14.00	$15,400											$15,400												**$15,400**
C2050	Restrooms	9387347	Ceiling Finishes, any flat surface, Prep & Paint	10	6	4	400	SF	$2.00	$800					$800										$800								**$1,600**
D2010	Mothering Room	9387338	Water Heater, Electric, Instant Hot, Replace	15	6	9	1	EA	$500.00	$500										$500													**$500**
D2010	Storage	9387287	Water Heater, Electric, Residential, Replace	15	1	14	1	EA	$900.00	$900															$900								**$900**
D2010	Throughout Building	9387268	Plumbing System, Supply & Sanitary, Low Density (excludes fixtures), Replace	40	20	20	14866	SF	$5.00	$74,330																						$74,330	**$74,330**
D2010	Lobby	9387269	Drinking Fountain, Wall-Mounted, Bi-Level, Replace	15	6	9	1	EA	$1,500.00	$1,500										$1,500													**$1,500**
D2010	Janitor Closet	9387337	Sink/Lavatory, Service Sink, Floor, Replace	35	20	15	1	EA	$800.00	$800																$800							**$800**
D3030	Building Exterior	9387334	Split System Ductless, Single Zone, Replace	15	8	7	1	EA	$3,500.00	$3,500								$3,500															**$3,500**
D3030	Building Exterior	9387341	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$3,500.00	$3,500										$3,500													**$3,500**
D3030	Building Exterior	9387314	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$3,500.00	$3,500										$3,500													**$3,500**
D3050	Chiller Yard	9387332	Pump, Distribution, HVAC Chilled or Condenser Water, Replace	15	2	13	1	EA	$5,100.00	$5,100														$5,100									**$5,100**
D3050	Chiller Yard	9387325	Pump, Distribution, HVAC Chilled or Condenser Water, Replace	15	2	13	1	EA	$5,100.00	$5,100														$5,100									**$5,100**
D3050	Chiller Yard	9387305	Pump, Distribution, HVAC Chilled or Condenser Water, Replace	15	2	13	1	EA	$5,100.00	$5,100														$5,100									**$5,100**
D3050	Chiller Yard	9387344	Pump, Distribution, HVAC Chilled or Condenser Water, Replace	15	2	13	1	EA	$5,100.00	$5,100														$5,100									**$5,100**
D3050	Duncan Miller	9387321	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	By Dawn Jacobs	9387320	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	Womens Restroom	9387296	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	Goldwater Conference Room	9387342	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	Finance	9387326	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	Chuck Ransom	9387273	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	NE Lobby	9387339	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	IT Office	9387340	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	By Post Office	9387351	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	Copy Room	9387291	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$4,880.00	$4,880					$4,880																		**$4,880**
D3050	Paul Michaud	9387355	Fan Coil Unit, Hydronic Terminal, Replace	20	16	4	1	EA	$7,750.00	$7,750					$7,750																		**$7,750**
D3050	Throughout Building	9387349	HVAC System, Ductwork, Medium Density, Replace	30	20	10	14866	SF	$4.00	$59,464											$59,464												**$59,464**
D3050	C.R. / Attorney	9387353	Fan Coil Unit, Hydronic Terminal, Replace	20	2	18	1	EA	$4,880.00	$4,880																			$4,880				**$4,880**
D3050	Large Conference	9387308	Fan Coil Unit, Hydronic Terminal, Replace	20	2	18	1	EA	$4,880.00	$4,880																			$4,880				**$4,880**
D3050	Attorney	9387322	Fan Coil Unit, Hydronic Terminal, Replace	20	2	18	1	EA	$4,880.00	$4,880																			$4,880				**$4,880**
D3050	Employee Lounge	9387293	Fan Coil Unit, Hydronic Terminal, Replace	20	2	18	1	EA	$4,880.00	$4,880																			$4,880				**$4,880**
D3050	SW Lobby	9387290	Fan Coil Unit, Hydronic Terminal, Replace	20	1	19	1	EA	$4,880.00	$4,880																				$4,880			**$4,880**
D5020	Chiller Yard	9387348	Switchboard, 277/480 V, Replace	40	40	0	1	EA	$52,000.00	$52,000	$52,000																						**$52,000**
D5020	Chiller Yard	9387336	Secondary Transformer, Dry, Stepdown, Replace	30	26	4	1	EA	$20,000.00	$20,000					$20,000																		**$20,000**
D5020	TH-121 Electrical Room	9387280	Switchboard, 120/208 V, Replace	40	29	11	1	EA	$50,000.00	$50,000												$50,000											**$50,000**
D5020	Chiller Yard	9387350	Switchboard, 277/480 V, Replace	40	29	11	1	EA	$35,000.00	$35,000												$35,000											**$35,000**

Replacement Reserves Report

002 - Town Hall

7/7/2025

Uniformat Code	Location Description	ID	Cost Description	Lifespan (EUL)	EAge	RUL	Quantity	Unit	Unit Cost*	Subtotal	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Deficiency Repair Estimate
D5020	Electrical Room	9387283	Switchboard, 120/208 V, Replace	40	29	11	1	EA	$45,000.00	$45,000												$45,000										**$45,000**
D5020	Electrical Room	9387317	Distribution Panel, 120/208 V, Replace	30	24	6	1	EA	$6,000.00	$6,000							$6,000															**$6,000**
D5030	Throughout Building	9387331	Electrical System, Wiring & Switches, Average or Low Density/Complexity, Replace	40	29	11	14866	SF	$2.50	$37,165												$37,165										**$37,165**
D5040	Throughout Building	9387302	Emergency & Exit Lighting System, Full Interior Upgrade, LED, Replace	10	6	4	14866	SF	$0.65	$9,663					$9,663										$9,663							**$19,326**
D5040	Throughout Building	9387324	Interior Lighting System, Full Upgrade, High Density & Standard Fixtures, Replace	20	12	8	14866	SF	$5.00	$74,330									$74,330													**$74,330**
D5040	Building Exterior	9387345	Exterior Light, any type, w/ LED Replacement, Replace	20	10	10	4	EA	$400.00	$1,600											$1,600											**$1,600**
D6060	Throughout Building	9387286	Intercom/PA System, Public Address Upgrade, Facility-Wide, Replace	20	6	14	14866	SF	$1.65	$24,529															$24,529							**$24,529**
D7050	Lobby	9387282	Fire Alarm Panel, Fully Addressable, Replace	15	15	0	1	EA	$15,000.00	$15,000	$15,000															$15,000						**$30,000**
D7050	Throughout Building	9387303	Fire Alarm System, Full System Upgrade, Standard Addressable, Upgrade/Install	20	16	4	14866	SF	$3.00	$44,598					$44,598																	**$44,598**
D8010	Throughout Building	9387315	BAS/HVAC Controls, Basic System or Legacy Upgrades, Upgrade/Install	15	2	13	14866	SF	$2.50	$37,165														$37,165								**$37,165**
E1040	Lobby	9387271	Healthcare Equipment, Defibrillator (AED), Cabinet-Mounted, Replace	10	4	6	1	EA	$1,500.00	$1,500							$1,500										$1,500					**$3,000**
E2010	Breakroom	9387270	Casework, Cabinetry, Standard, Replace	20	16	4	40	LF	$300.00	$12,000					$12,000																	**$12,000**
E2010	Restrooms	9387309	Casework, Countertop, Plastic Laminate, Replace	15	6	9	40	LF	$50.00	$2,000										$2,000												**$2,000**
E2010	Throughout Building	9387311	Casework, Cabinetry, Standard, Replace	20	6	14	220	LF	$300.00	$66,000															$66,000							**$66,000**
F1020	Chiller Building	9387330	Ancillary Building, Wood-Framed or CMU, Standard, Replace	35	20	15	600	SF	$100.00	$60,000																$60,000						**$60,000**
G2020	Site	9387297	Parking Lots, Pavement, Asphalt, Seal & Stripe	5	1	4	21200	SF	$0.45	$9,540					$9,540					$9,540					$9,540					$9,540		**$38,160**
G2020	Site	9387298	Parking Lots, Pavement, Asphalt, Mill & Overlay	25	13	12	21200	SF	$3.50	$74,200													$74,200									**$74,200**
G2030	Site	9402453	Sidewalk, Brick/Masonry Pavers, Replace	30	15	15	1300	SF	$33.00	$42,900																$42,900						**$42,900**
G2030	Site	9387272	Sidewalk, Concrete, Large Areas, Replace	50	35	15	6500	SF	$9.00	$58,500																$58,500						**$58,500**
G2060	Site	9387288	Decorative Fountains, Aerator or Nozzle, 1 HP, Replace	10	50	0	1	EA	$2,000.00	$2,000	$2,000										$2,000										$2,000	**$6,000**
G2060	Site	9387277	Signage, Property, Monument, Replace/Install	20	6	14	1	EA	$3,000.00	$3,000															$3,000							**$3,000**
G2060	Site	9387292	Retaining Wall, Concrete Masonry Unit (CMU), Replace	40	20	20	300	SF	$60.00	$18,000																					$18,000	**$18,000**
G2080	Site	9387285	Irrigation System, Control Panel, Replace	15	6	9	1	EA	$5,000.00	$5,000										$5,000												**$5,000**
G4050	Site	9387312	Pole Light Fixture, LED Lamp only, Replace	20	16	4	18	EA	$1,200.00	$21,600					$21,600																	**$21,600**
Totals, Unescalated											**$69,000**	**$150**	**$213,058**	**$0**	**$257,251**	**$46,900**	**$50,250**	**$3,500**	**$123,830**	**$25,540**	**$114,064**	**$167,315**	**$74,200**	**$57,565**	**$190,932**	**$177,200**	**$44,250**	**$0**	**$69,020**	**$20,380**	**$159,270**	**$1,863,675**
Totals, Escalated (3.0% inflation, compounded annually)											**$69,000**	**$155**	**$226,033**	**$0**	**$289,538**	**$54,370**	**$60,001**	**$4,305**	**$156,864**	**$33,324**	**$153,292**	**$231,603**	**$105,791**	**$84,536**	**$288,801**	**$276,072**	**$71,008**	**$0**	**$117,502**	**$35,736**	**$287,659**	**$2,545,592**

* 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	9387289	D2010	**Storage Tank**	Domestic Water		002 - Town Hall	Chiller Yard	Inaccessible	Inaccessible	Inaccessible	2023	2045852	
2	9387338	D2010	**Water Heater**	Electric, Instant Hot	4160 Watts	002 - Town Hall	Mothering Room	Chronomite	CM-20L/208-ADJ	1554190	2019	2045799	
3	9387287	D2010	**Water Heater**	Electric, Residential	40 GAL	002 - Town Hall	Storage	Rheem	XE40M06ST45U1	M392311983	2024	2045816	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D30 HVAC													
1	9387328	D3020	**Boiler Supplemental Components**	Expansion Tank	150 PSI	002 - Town Hall	Chiller Yard		383926	CRN R3840.5C L-85-150	2023	2045875	
2	9387333	D3030	**Chiller**	Air-Cooled	51 TON	002 - Town Hall	Chiller Yard	Daikin Industries	AGZ051EDSEMNN0B	SLPU221145603	2023	2045788	
3	9387341	D3030	**Split System Ductless**	Single Zone	1 TON	002 - Town Hall	Building Exterior	Daikin Industries	RXB12AXVJU	KWD0A5SLY15FR	2019	2045870	
4	9387314	D3030	**Split System Ductless**	Single Zone	1 TON	002 - Town Hall	Building Exterior	Mitsubishi Electric	MUY-GE12NA	2006760 T	2019	2045845	
5	9387334	D3030	**Split System Ductless**	Single Zone	1 TON	002 - Town Hall	Building Exterior	Mitsubishi Electric	MUZ-WR12NA	25C26117	2017	2045846	
6	9387305	D3050	**Pump** [P-1]	Distribution, HVAC Chilled or Condenser Water	2 HP	002 - Town Hall	Chiller Yard	Armstrong	74352016-081	1895200-001	2023	2045815	
7	9387325	D3050	**Pump** [P-2]	Distribution, HVAC Chilled or Condenser Water	2 HP	002 - Town Hall	Chiller Yard	Armstrong	74352016-081	1895200-001	2023	2045809	
8	9387344	D3050	**Pump** [P-3]	Distribution, HVAC Chilled or Condenser Water	2 HP	002 - Town Hall	Chiller Yard	Armstrong	74350136-081	XAZ90D3_11	2023	2045876	
9	9387332	D3050	**Pump** [P-4]	Distribution, HVAC Chilled or Condenser Water	2 HP	002 - Town Hall	Chiller Yard	Armstrong	74350136-081	XAZ90D3_11	2023	2045844	
10	9387321	D3050	**Fan Coil Unit** [FC-1]	Hydronic Terminal	2000 CFM	002 - Town Hall	Duncan Miller		HH 08B-C6BL-E005-00310-BMA16+FT2	050296AHU	2005	2045840	
11	9387290	D3050	**Fan Coil Unit** [FC-10]	Hydronic Terminal	2000 CFM	002 - Town Hall	SW Lobby	Enviro-Tec	HDD	6HMM 005624	2024	2045873	
12	9387340	D3050	**Fan Coil Unit** [FC-11]	Hydronic Terminal	2000 CFM	002 - Town Hall	IT Office	Environmental Technologies	HH 16B-C6BL-E008-01410-CMA15-FT	050296AHU	2005	2045879	
13	9387296	D3050	**Fan Coil Unit** [FC-12]	Hydronic Terminal	13 KW	002 - Town Hall	Womens Restroom	Enviro-Tec	H	AHU090529-01P10	2009	2045841	
14	9387322	D3050	**Fan Coil Unit** [FC-13]	Hydronic Terminal	1.5 TON	002 - Town Hall	Attorney	No dataplate	No dataplate	No dataplate	2023	2045881	
15	9387308	D3050	**Fan Coil Unit** [FC-14]	Hydronic Terminal	1.5 TON	002 - Town Hall	Large Conference	No dataplate	No dataplate	No dataplate	2023	2045878	
16	9387293	D3050	**Fan Coil Unit** [FC-16]	Hydronic Terminal	3.5 TON	002 - Town Hall	Employee Lounge	Enviro-Tec	CDH	AHU000823-01	2023	2045842	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
17	9387353	D3050	**Fan Coil Unit** [FC-17]	Hydronic Terminal	1.5 TON	002 - Town Hall	C.R. / Attorney	Enviro-Tec	CDH	AHU000823-01	2023	2045880	
18	9387355	D3050	**Fan Coil Unit** [FC-2]	Hydronic Terminal	2500 CFM	002 - Town Hall	Paul Michaud	No dataplate	No dataplate	No dataplate	2005	2045848	
19	9387273	D3050	**Fan Coil Unit** [FC-3]	Hydronic Terminal	2000 CFM	002 - Town Hall	Chuck Ransom	Environmental Technologies	HH 12B-06BR-E005-01010-A16-FV2	050296AHU	2005	2045877	
20	9387320	D3050	**Fan Coil Unit** [FC-4]	Hydronic Terminal	2000 CFM	002 - Town Hall	By Dawn Jacobs	Environmental Technologies	HH 12B-C5BR-E005-01010-BMA16-FTR	0502	2005	2045865	
21	9387342	D3050	**Fan Coil Unit** [FC-5]	Hydronic Terminal	2000 CFM	002 - Town Hall	Goldwater Conference Room	Environmental Technologies	HH 30B-C6BR-E020-03010-EMA09-FT2	050296AHU	2005	2045874	
22	9387351	D3050	**Fan Coil Unit** [FC-6]	Hydronic Terminal	2000 CFM	002 - Town Hall	By Post Office	Environmental Technologies	HH 30B-C6BR-E020-03010-EMA09-FT2	050296AHU	2005	2045867	
23	9387291	D3050	**Fan Coil Unit** [FC-7]	Hydronic Terminal	2000 CFM	002 - Town Hall	Copy Room	Trane	BCHC054G1A0A1G04F000000A0000000000000000	T06H43142	2006	2045871	
24	9387326	D3050	**Fan Coil Unit** [FC-8]	Hydronic Terminal	2000 CFM	002 - Town Hall	Finance	Environmental Technologies	0B-C6BR-E010-01810-DMA15-FT2	050296AHU	2005	2045872	
25	9387339	D3050	**Fan Coil Unit** [FC-9]	Hydronic Terminal	2000 CFM	002 - Town Hall	NE Lobby	Environmental Technologies	HH 12B-C6BL-E008-01210-CMA16-FT2	050296AHU	2005	2045866	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D50 Electrical													
1	9387336	D5020	**Secondary Transformer**	Dry, Stepdown	150 KVA	002 - Town Hall	Chiller Yard	Acme Electric Corporation	TP533163S	No dataplate	1996	2045869	
2	9387280	D5020	**Switchboard**	120/208 V	800 AMP	002 - Town Hall	TH-121 Electrical Room	General Electric	No dataplate	No dataplate	1996	2045825	
3	9387348	D5020	**Switchboard**	277/480 V	1200 AMP	002 - Town Hall	Chiller Yard	General Electric	Inaccessible	Inaccessible	1996	2045847	
4	9387350	D5020	**Switchboard** [SWBD HA]	277/480 V	400 AMP	002 - Town Hall	Chiller Yard	Siemens	No dataplate	No dataplate	1996	2045868	
5	9387283	D5020	**Switchboard** [SWBD-LC]	120/208 V	600 AMP	002 - Town Hall	Electrical Room	Square D	No dataplate	No dataplate	1996	2045810	
6	9387317	D5020	**Distribution Panel** [HA]	120/208 V	400 AMP	002 - Town Hall	Electrical Room	Siemens	S3E42JX300FTS	No dataplate	1996	2045787	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
D70 Electronic Safety & Security													
1	9387282	D7050	**Fire Alarm Panel**	Fully Addressable		002 - Town Hall	Lobby	Simplex	4005	I30360 EQW	1996	2045864	

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
E10 Equipment													
1	9387271	E1040	**Healthcare Equipment**	Defibrillator (AED), Cabinet-Mounted		002 - Town Hall	Lobby						

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
G20 OTHER													
1	9387285	G2080	**Irrigation System**	Control Panel		002 - Town Hall	Site	Irritrol	No dataplate	No dataplate	2019	2045849	

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:

TOWN HALL

6401 E. Lincoln Drive

Paradise Valley, AZ 85253

TOWN HALL

6401 E. Lincoln 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: 6-25-2025

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 Town Hall located at 6401 E. Lincoln 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 the site is the following:

- SWBD HA is a 400 amp, 480/277V, 3-phase service fed from a 400-amp fused circuit from the Police station's SES-PD switchboard. The calculated Short Circuit current determined by the Police Station's SKM report is calculated to be 26,021 Amps.

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. The report relied upon the more conservative three phase analysis vs one phase for this 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.

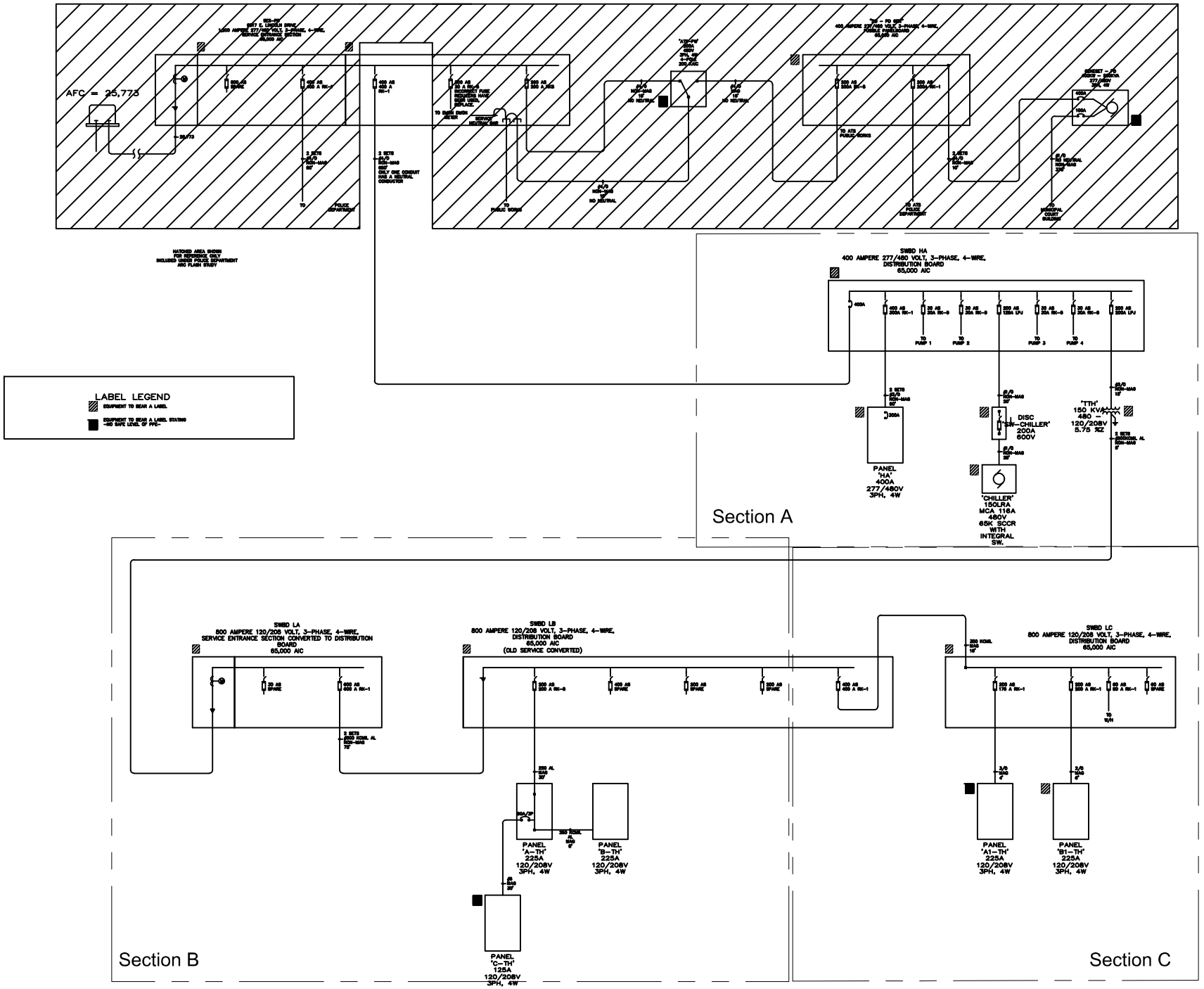
The Occupational Safety and Health Administration, under 29 CFR 1910.303(g)(2)(i), considers electrical systems rated 50 volts or more as hazardous. By extension, those systems rated less than 50 volts are not considered to be hazardous. NFPA 70E, section 130.5(C), under Table 130.5(C), indicates that 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.

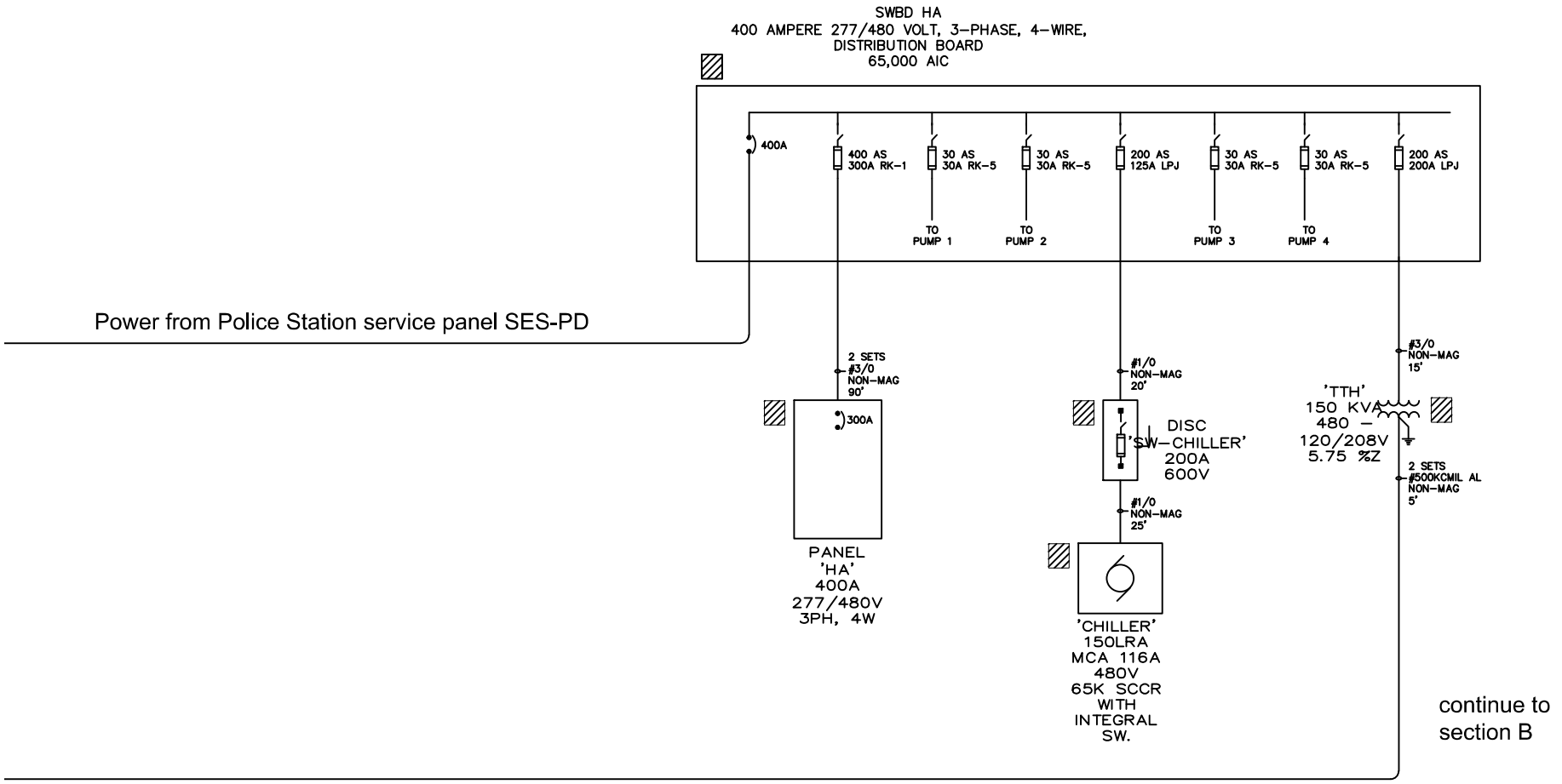
TOWN HALL

SINGLE-LINE OVERVIEW



TOWN HALL

SINGLE-LINE Section A



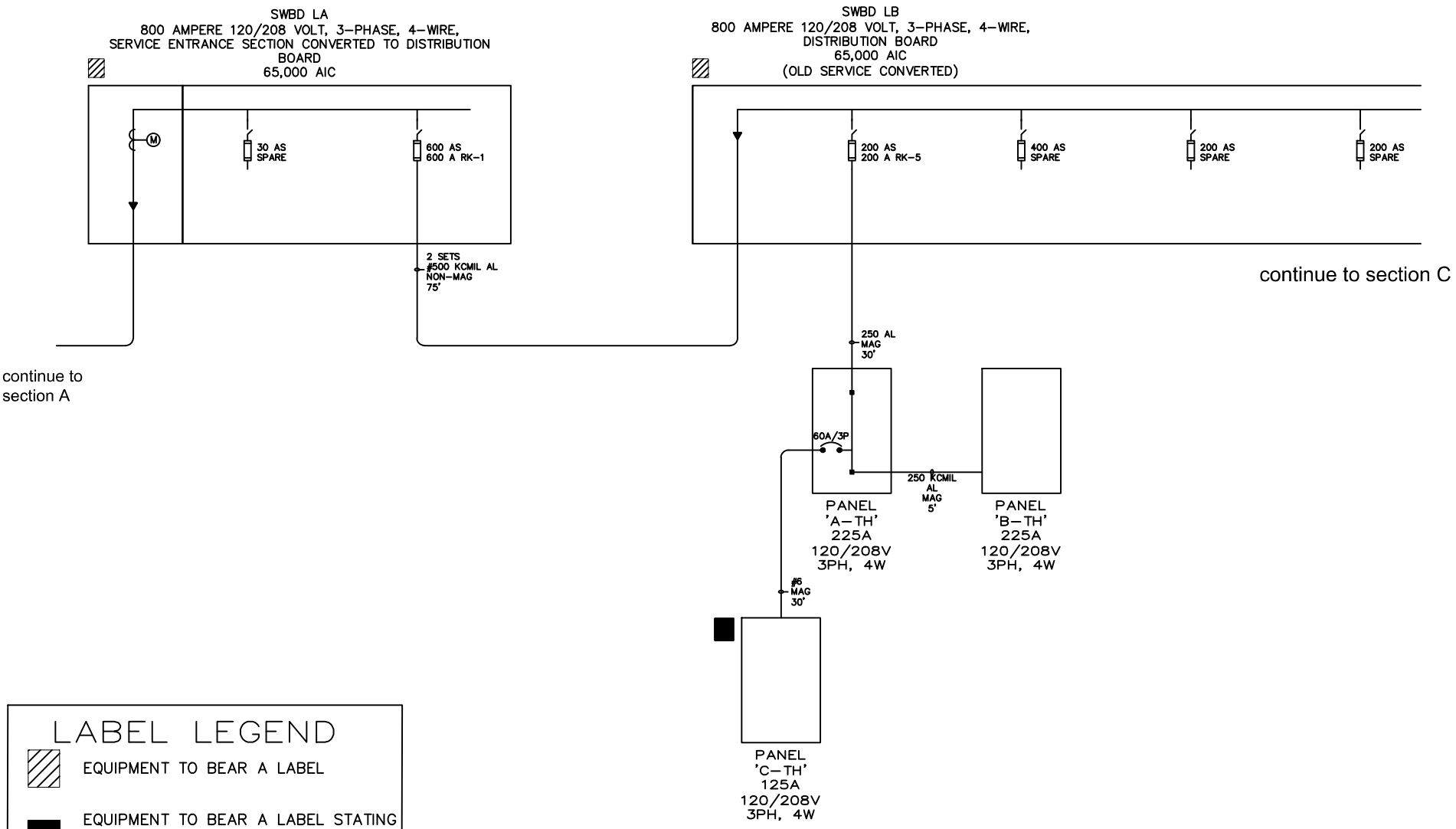
LABEL LEGEND

EQUIPMENT TO BEAR A LABEL

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

TOWN HALL

SINGLE-LINE Section B



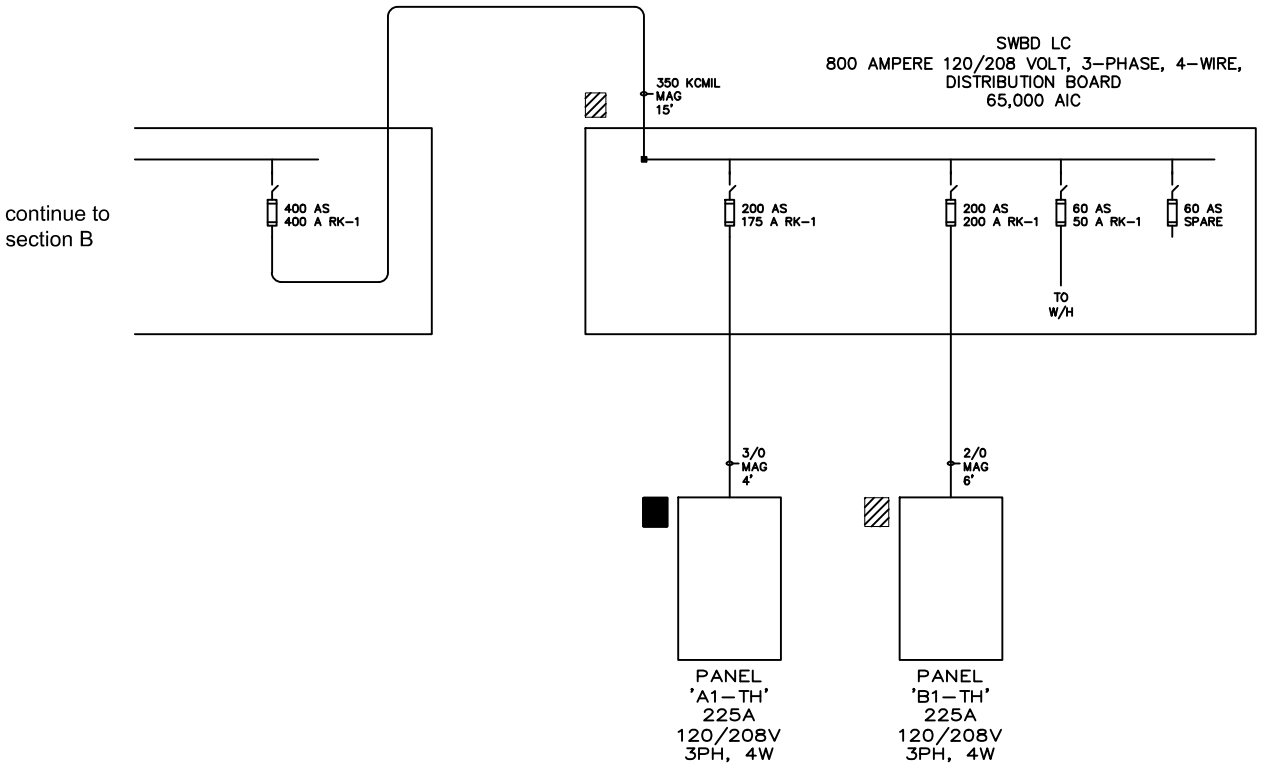
LABEL LEGEND

EQUIPMENT TO BEAR A LABEL

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

TOWN HALL

SINGLE-LINE Section C



LABEL LEGEND

EQUIPMENT TO BEAR A LABEL

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

THIS SECTION SHOWN FOR REFERENCE ONLY

FACILITY	TOWN HALL	ADDRESS:	6401 E. LINCOLN DRIVE, PARADISE VALLEY

FACILITY	POLICE DEPARTMENT	ADDRESS:	6433 E. LINCOLN DRIVE, PARADISE VALLEY

UTILITY:	APS
TRANSFORMER SIZE:	1,000
TRANSFORMER %Z:	5.35%
SECONDARY COND SIZE:	(3) x 750 KCMIL AL
LENGTH:	
AFC (PER UTILITY TABLES)	25,773
VOLTAGE:	277/480
PHASE:	3Ø-4W

OTHER COMMENTS

THE ARIZONA PUBLIC SERVICE TRANSFORMER IS LEAKING OIL.
IT IS RECOMMENDED THAT THE UTILITY BE CONTACTED TO ASSESS THE EQUIPMENT CONDITION, RECOMMEND REPLACEMENT.

NOTE: METER NUMBER V91517

EQUIPMENT NAME:	SES - PD	VOLTAGE:	277/480	PHASE:	3Ø 4w	AMPS:	1200	SCCR:	65K	MAIN:	6 SW RULE
EQUIPMENT TYPE:	SWITCHBOARD									MODEL:	
MANUFACTURER:	GENERAL ELECTRIC									AMPS	
MODEL:	AV-2										
TYPE:											
FED FROM:	UTILITY XFMR										
AFC:	25,773										
FEEDER SIZE:											
CONDUCTOR TYPE:											
RACEWAY TYPE:											
LENGTH:											
MAIN:											

OTHER COMMENTS

THE EQUIPMENT IS IN NEED OF PREVENTATIVE MAINTENANCE
SEE DEFICIENCY REPORT UNDER SEPARATE COVER FOR ADDITIONAL ISSUES

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
EMON-DMON MTR	200	20	RK5	100K			INCORRECT FUSE REDUCER
DPB1-PD	400	400	RK1	100K			
ATS-PW	200	200	RK5	100K			SEE DEFICIENCY REPORT
SWBD-HA (TOWN HALL)	400	400	RK1	100K			SEE DEFICIENCY REPORT
SPARE	800		RK1				

EQUIPMENT NAME:	SWBD HA	VOLTAGE:	277/480	PHASE:	3Ø 4w	AMPS:	400	SCCR:	65K	MAIN:	MCB
EQUIPMENT TYPE:	SWITCHBOARD									MODEL:	HJD63F400
MANUFACTURER:	SIEMENS									AMPS	400
MODEL:	SB										
TYPE:											
FED FROM:	SES - PD										
SETS:	2 SETS										
FEEDER SIZE:	#4/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	NON-MAG										
LENGTH:	650'										
MAIN:	400A										

OTHER COMMENTS

THE EQUIPMENT IS IN NEED OF PREVENTATIVE MAINTENANCE
THE EQUIPMENT PARALLEL FEEDER ONLY HAS A NEUTRAL IN ONE OF THE PARALLEL FEEDERS.

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
PANEL "HA-TH"	400	300	LPJ	100K			
"XFMR T-TH"	200	200	LPJ	100K			
DISC "SW-CHILLER"	200	125	LPJ	100K			

EQUIPMENT NAME:	"XFMR T-TH"
EQUIPMENT TYPE:	TRANSFORMER
KVA:	150
PRIMARY VOLT:	277/480
SECONDAY VOLT:	120/240
PHASE:	3Ø-4W
IMPEDANCE:	5.75
MANUFACTURER:	

OTHER COMMENTS

XFMR PRIMARY		XFMR SECONDARY		XFMR SECONDARY	
FED FROM:	SWBD HA				
FEEDER PRIMARY:	#3/0	FEEDER SECONDARY:	500 KCMIL	FEEDER SECONDARY:	
CONDUCTOR TYPE:	CU	CONDUCTOR TYPE:	AL	CONDUCTOR TYPE:	
RACEWAY TYPE:	NON-MAG	RACEWAY TYPE:	NON-MAG	RACEWAY TYPE:	
FEEDER LENGTH:	15'	FEEDER LENGTH:	5'	FEEDER LENGTH:	
		FEEDS:	SWBD LA	FEEDS:	

EQUIPMENT NAME:	PANEL "HA-TH"	VOLTAGE:	277/480	PHASE:	3Ø 4w	AMPS:	400	SCCR:	14K	MAIN:	MCB
EQUIPMENT TYPE:	PANELBOARD									MODEL:	
MANUFACTURER:	SIEMENS									AMPS:	300
MODEL:	S3					OTHER COMMENTS					
TYPE:						BQD BRANCH BREAKERS					
FED FROM:	SWBD HA										
AFC:											
SETS:	2										
FEEDER SIZE:	#3/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	NON-MAG										
LENGTH:	90'										
MAIN:											

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

EQUIPMENT NAME:	DISC "SW-CHILLER"	VOLTAGE:	600	PHASE:	3Ø-3W	AMPS:	200	SCCR:	100K	MAIN:	SWITCH
EQUIPMENT TYPE:	DISCONNECT									MODEL:	
MANUFACTURER:	SQUARE D									AMPS	
MODEL:						OTHER COMMENTS					
TYPE:											
FED FROM:	SWBD HA										
AFC:											
FEEDER SIZE:	#1/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	NON-MAG										
LENGTH:	20'										
MAIN:											

FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
CHILLER	200	125	RK-5				

EQUIPMENT NAME:	CHILLER	VOLTAGE:	600	PHASE:	3Ø-3W	AMPS:	200	SCCR:	65K	MAIN:	SWITCH
EQUIPMENT TYPE:	DISCONNECT									MODEL:	
MANUFACTURER:	DAIKIN									AMPS	
MODEL:						OTHER COMMENTS					
TYPE:						INTEGRAL NON-FUSED SWITCH ON CONTROLLER - NAMEPLATE INDICATES SCCR OF 65K					
FED FROM:	DISC "SW-CHILLER"										
AFC:											
FEEDER SIZE:	#1/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	NON-MAG										
LENGTH:	25'										
MAIN:											

FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
CHILLER	200	125	RK-5				

EQUIPMENT NAME:	'SWBD LA'	VOLTAGE:	120/208	PHASE:	3Ø 4w	AMPS:	800	SCCR:	65K	MAIN:	6 SW RULE
EQUIPMENT TYPE:	SWITCHBOARD									MODEL:	
MANUFACTURER:	GE									AMPS	
MODEL:	SB3 REV. A					OTHER COMMENTS					
TYPE:						THE EQUIPMENT IS IN NEED OF PREVENTATIVE MAINTENANCE					
FED FROM:	"XFMR T-TH"										
SETS:	2					THE BLADE ON THE LINE SIDE OF THE 600A FUSE ON 'A' PHASE IS DISCOLORED (Top fuse). IT IS UNKNOWN IF THIS IS					
FEEDER SIZE:	500 KCMIL					DUE TO OVERHEATING WHICH MAY BE DUE TO IMPROPER INSTALLATION OR OVERLOADING OF THE DEVICE.					
CONDUCTOR TYPE:	AL					A THERMAL TEST SHOULD BE DONE TO VERIFY.					
RACEWAY TYPE:	NON-MAG					THIS SWITCHBOARD WAS THE ORIGINAL ELECTRICAL SERVICE FOR THE BUILDING, THE UTILITY METER STILL REMAINS					
LENGTH:	5'					HOWEVER, IT IS FED FROM TRANSFORMER 'TTH'.					
MAIN:						MAIN BONDING JUMPER IS INSTALLED HERE AND AT XFMR T-TH					

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
SPARE	30						NOT USED
'SWBD LB'	600	600	RK1	100K			

EQUIPMENT NAME:	'SWBD LB'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	400	SCCR:	65K	MAIN:	MLO
EQUIPMENT TYPE:	SWITCHBOARD									MODEL:	
MANUFACTURER:	SIEMENS									AMPS:	
MODEL:						OTHER COMMENTS					
TYPE:											
FED FROM:	'SWBD LA'					THIS EQUIPMENT WAS PREVIOUSLY THE ELECTRICAL SERVICE TO THE BUILDING AND HAS BEEN					
AFC:						CONVERTED TO A DISTRIBUTION BOAD. THERE IS NO INDICATION THAT THE EQUIPMENT HAS BEEN					
SETS:	2 SETS					RE-EVALUATED BY A NATIONALLY RECOGNIZED TESTING LABORATORY OR A FIELD EVALUATING BODY.					
FEEDER SIZE:	500 KCMIL										
CONDUCTOR TYPE:	AL					THERE IS NO EQUIPMENT GROUNDING CONDUCTOR BROUGHT TO THE EQUIPMENT. THE ORIGINAL					
RACEWAY TYPE:	MAGNETIC					MAIN BONDING JUMPER REMIANS, BOTH IN VIOLATION OF THE ELECTRICAL CODE.					
LENGTH:	75'					THE EQUIPMENT WILL BE LABELED AS HAVING NO SAFE LEVEL OF PPE, DO NOT SERVICE WHILE ENERGIZED.					
MAIN:						SEE DEFICIENCY REPORT FOR ADDITIONAL INFORMATION					
OCPD:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
PANEL 'A-TH'	200	125	RK-1	65K			
'SWBD LC'	400	400	RK-5	65K			FUSE IS TOO LARGE FOR THE CONDUCTORS
SPARE	400	250	RK-5	65K			
(2) SPARE	200						(2) SPARE SWITCES
SPARE	60			65K			

EQUIPMENT NAME:	PANEL 'A-TH'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	225	SCCR:	10K	MAIN:	MLO
EQUIPMENT TYPE:	PANELBOARD									MODEL:	
MANUFACTURER:	GE									AMPS:	
MODEL:	NLTQ					OTHER COMMENTS					
TYPE:						AFC WILL EXCEED THE AIC RATING OF THE PANEL. NO SERIES RATINGS ARE SHOWN					
FED FROM:	'SWBD LB'					A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.					
AFC:						THERE ARE A MIX OF CIRCUIT BREAKERS MANUFACTURED BY OTHER EQUIPMENT MANUFACTURERS INSTALLED IN THE					
SETS:						PANELBOARD IN VIOLATION OF THE LISTING OF BOTH THE CIRCUIT BREAKERS AND THE PANELBOARD					
FEEDER SIZE:	250 KCMIL					ALL CIRCUIT BREAKERS THAT ARE NOT GE BEAKERS, MUST BE REPLACED.					
CONDUCTOR TYPE:	AL										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	30'										
MAIN:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
PANEL 'B-TH'							FEED THROUGH LUGS
PANEL 'C-TH'	100	60		10K			

EQUIPMENT NAME:	PANEL 'B-TH'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	225	SCCR:	10K	MAIN:	MLO
EQUIPMENT TYPE:	PANELBOARD									MODEL:	
MANUFACTURER:	GE									AMPS:	
MODEL:	NLTQ					OTHER COMMENTS					
TYPE:						AFC WILL EXCEED THE AIC RATING OF THE PANEL. NO SERIES RATINGS ARE SHOWN					
FED FROM:	'SWBD LB'					A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.					
AFC:											
SETS:											
FEEDER SIZE:	250 KCMIL										
CONDUCTOR TYPE:	AL										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	5'										
MAIN:											

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

EQUIPMENT NAME:	PANEL 'C-TH'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	125	SCCR:	10K	MAIN:	MLO
EQUIPMENT TYPE:	PANELBOARD									MODEL:	
MANUFACTURER:	SIEMENS									AMPS:	
MODEL:	S1					OTHER COMMENTS					
TYPE:						TYPE BL CIRCUIT BREAKERS - 10K AIC					
FED FROM:	PANEL 'A-TH'										
AFC:											
SETS:											
FEEDER SIZE:	#6										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	30'										
MAIN:											

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

EQUIPMENT NAME:	'SWBD-LC'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	800	SCCR:	65K	MAIN:	MLO
EQUIPMENT TYPE:	SWITCHBOARD									MODEL:	
MANUFACTURER:	GE									AMPS:	
MODEL:	AV-LINE					OTHER COMMENTS					
TYPE:		THE FEEDERS TO THIS SWITCHBOARD ARE TOO SMALL FOR THE OCPD PROVIDED, REDUCE FUSE SIZE AT SWBD LC OR,									
FED FROM:	'SWBD LB'	INCREASE THE SIZE OF THE CONDUCTORS.									
AFC:		THE SIZE OF THE OCPD TO PANEL B1-TH ARE TOO LARGE FOR THE CONDUCTORS. REDUCE TO 175 A FUSES.									
SETS:											
FEEDER SIZE:	350 KCMIL										
CONDUCTOR TYPE:	AL										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	15'										
MAIN:		SEE DEFICIENCY REPORT FOR ADDITIONAL INFORMATION									
OCPD:											

SUB-FEEDS	FRAME	SIZE	FUSE TYPE	AIC	CB MODEL	CB MAN	ADDITIONAL NOTES
PANEL 'A1-TH'	200	175	RK-1	65K			
PANEL 'B1-TH'	200	200	RK-1	65K			FUSE IS TOO LARGE FOR THE CONDUCTORS
WATER HEATER	60	50	RK-1	65K			
SPARE	60			65K			

EQUIPMENT NAME:	PANEL 'A1-TH'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	225	SCCR:	10K	MAIN:	MLO
EQUIPMENT TYPE:	PANELBOARD									MODEL:	
MANUFACTURER:	SQ D									AMPS:	
MODEL:	NQ					OTHER COMMENTS					
TYPE:	PANELBOARD					QOB BRANCH CIRCUIT BREAKERS					
FED FROM:	'SWBD-LC'	AFC WILL EXCEED THE AIC RATING OF THE PANEL. NO SERIES RATINGS ARE SHOWN									
AFC:		A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.									
SETS:											
FEEDER SIZE:	#3/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	4'										
MAIN:											

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

EQUIPMENT NAME:	PANEL 'B1-TH'	VOLTAGE:	120/208	PHASE:	3Ø-4W	AMPS:	225	SCCR:	65K	MAIN:	MLO
EQUIPMENT TYPE:	PANELBOARD									MODEL:	
MANUFACTURER:	SQ D									AMPS:	
MODEL:	NQ					OTHER COMMENTS					
TYPE:	PANELBOARD					QOB BRANCH CIRCUIT BREAKERS					
FED FROM:	'SWBD-LC'	AFC WILL EXCEED THE AIC RATING OF THE PANEL. NO SERIES RATINGS ARE SHOWN									
AFC:		A LABEL WILL BE PLACED INDICATING THERE IS NO SAFE LEVEL OF PPE.									
SETS:		THE UPSTREAM OCPD IS TOO LARGE FOR THE CONDUCTORS FEEDING THIS PANEL.									
FEEDER SIZE:	#2/0										
CONDUCTOR TYPE:	CU										
RACEWAY TYPE:	MAGNETIC										
LENGTH:	6'										
MAIN:											

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, none of the panels calculated faults exceed their KAIC ratings.

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 TCC reports show adequate over current protection coordination.

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

1.3.3. Arc Flash Evaluation

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

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

1.3.3. Load Flow Analysis

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

Refer to Section 3.4 for more detail.

1.4. Study Notes

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

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

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

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

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

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

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

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

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

2. ANALYSIS

2.1. Basis of Analysis

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

2.2. Campus as built Data Gathering Assumptions

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

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

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

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

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

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

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

Panelboard load estimates:

- **Main Distribution Board SWBD HA:** 339 amps (reference Load Flow One Line).
- **CHILLER:** 120 amps
- **150 KVA Xfmr:** 117 amps

2.3. Equipment Evaluation

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

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

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

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

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

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

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

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

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

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

2.4 Short Circuit Analysis

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

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

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

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

Based on the short circuit study, none of the panels calculated faults exceed their KAIC ratings.

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:

- SWBD HA is a 400 amp, 480/277V, 3-phase service fed from a 400-amp fused circuit from the Police station's SES-PD switchboard. The calculated Short Circuit current determined by the Police Station's SKM report is calculated to be 26,021 Amps.

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, none of the panels exceed their KAIC values. However, there are issues with the electrical system which are noted in the Excel report. *Reference Excel field report.*

Eq. Name	SWBD HA	Panel HA	SWBD LA	SWBD LB	SWBD LC	
SC RATING(KASCw)	65KA ☑	14KA ☑	65KA ☑	65KA ☑	65KA ☑	
$I_{k"-3Ph.-Init.Sym.}$	9.5KA ↗	8.4KA ↗	5.6KA ↗	5.2KA ↗	5.0KA ↗	

Eq. Name	Panel A-TH	Panel B-TH	Panel C-TH	Panel A1-TH	Panel B1-TH	
SC RATING(KASCw)	10KA ☑	10KA ☑	10KA ☑	10KA ☑	10KA ☑	
$I_{k"-3Ph.-Init.Sym.}$	4.8KA ↗	4.7KA ↗	3.4KA ↗	5.0KA ↗	4.9KA ↗	

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.

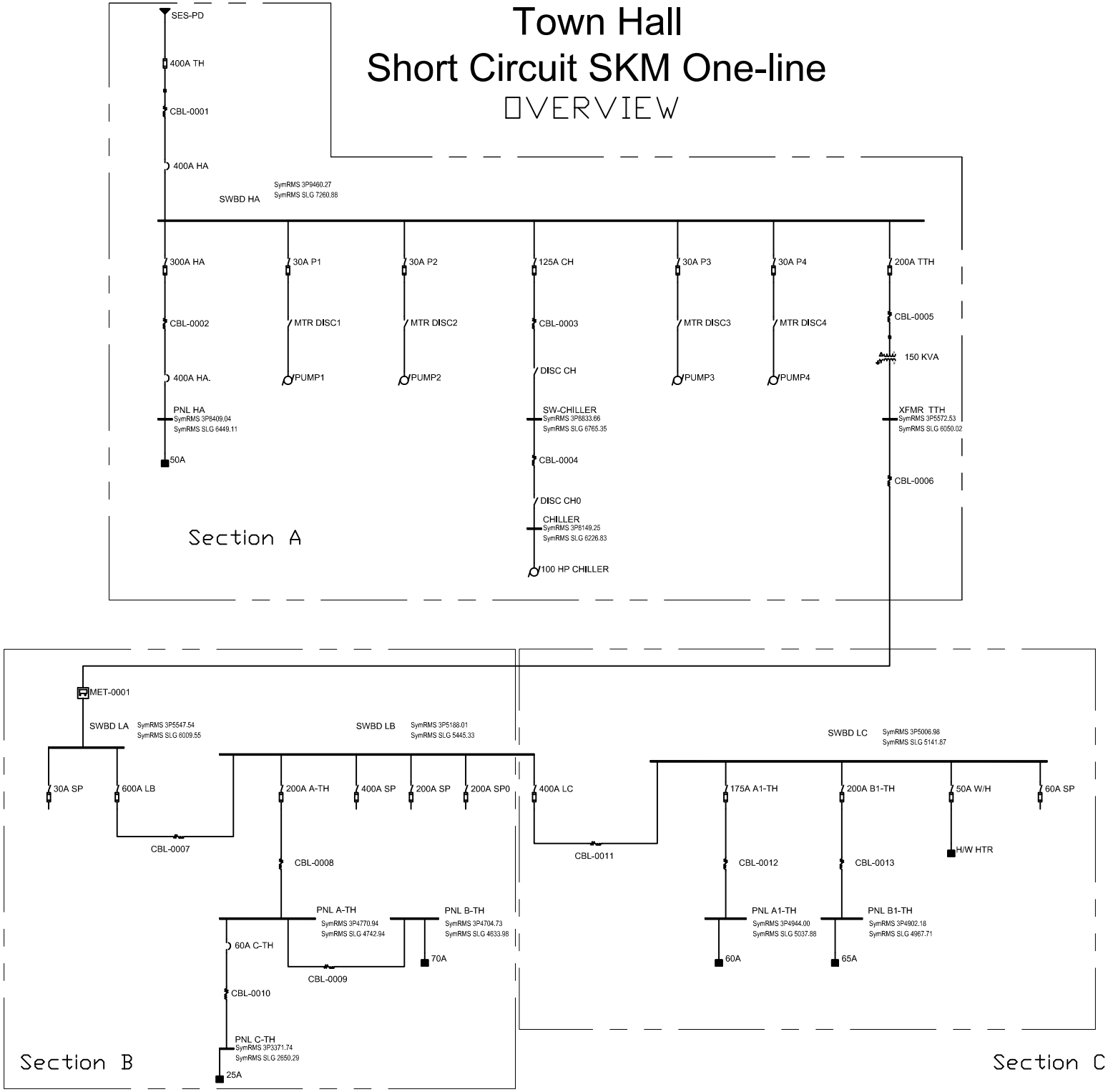
OCPD: Over Current Protection Device (Fuse/Breaker) are acceptable based upon estimated loads.

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.

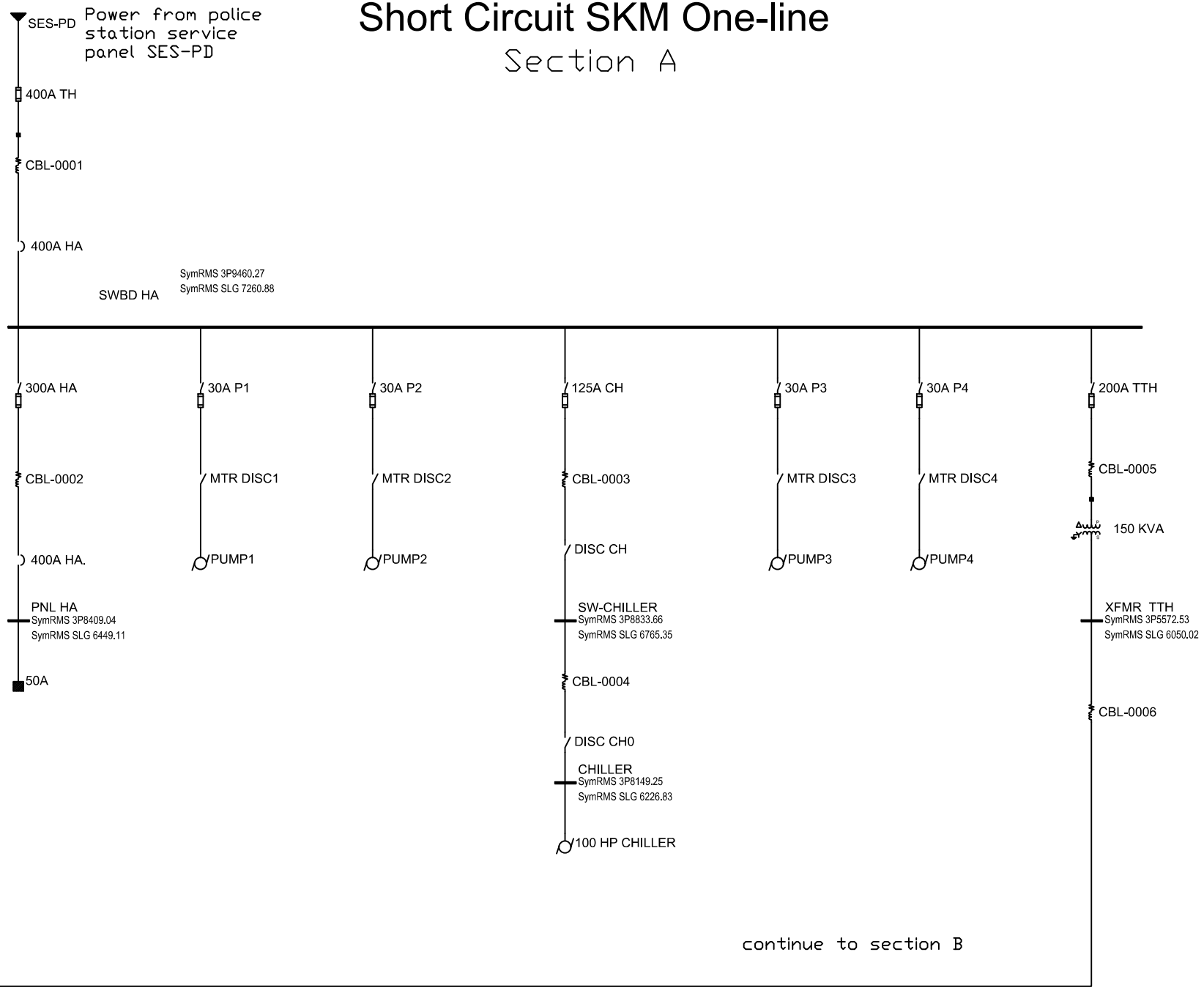
APPENDIX 1

SHORT CIRCUIT SKM REPORT

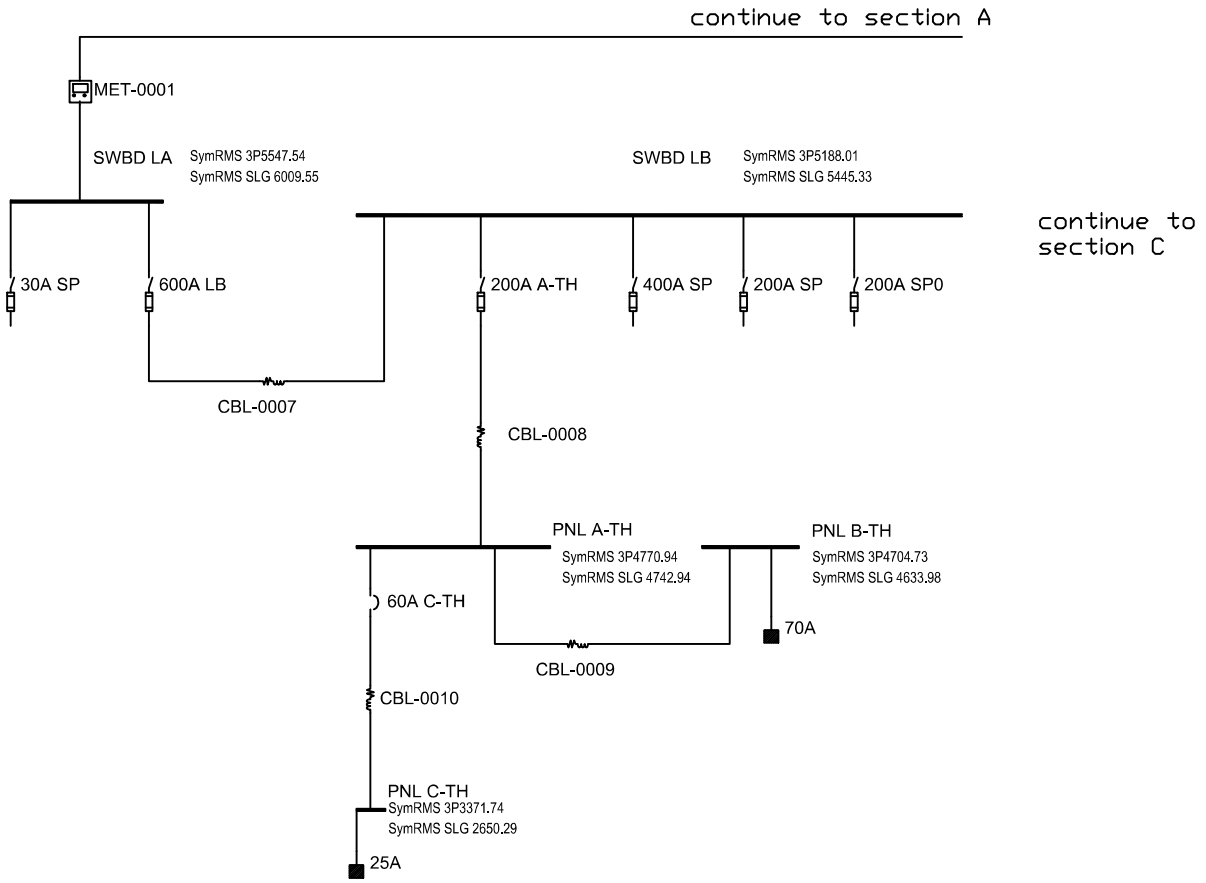
Town Hall
Short Circuit SKM One-line
OVERVIEW



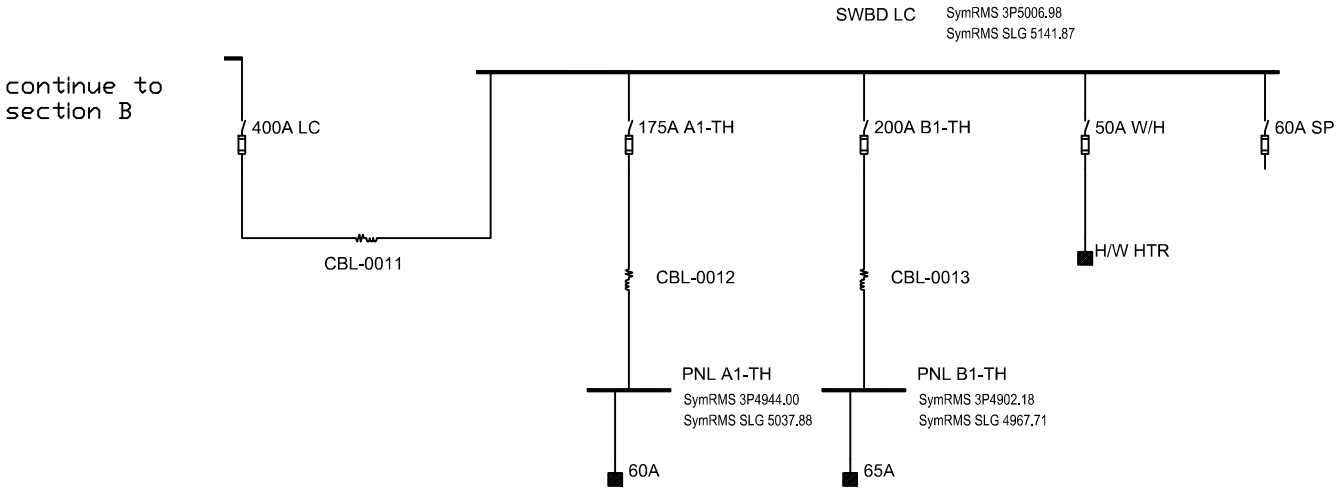
Town Hall
Short Circuit SKM One-line
Section A



Town Hall
Short Circuit SKM One-line
Section B



Town Hall
Short Circuit SKM One-line
Section C



DAPPER Fault Contribution Complete Report

Comprehensive Short Circuit Study Settings

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

				Initial Symmetrical Amps				Asymmetrical Amps				Init Sym Neutral Amps	
Bus Name	**Contributions**			**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
BUS-0001				**26,021**	**25,339**	**0**	**0**	**35,676**	**34,844**	**0**	**0**		
CBL-0001	CABLE	In		987	641	0	0	1,353	881	0	0		
SES-PD	UTILITY	In		25,045	24,706	0	0	34,338	33,973	0	0	25,339	
SWBD HA				**9,460**	**7,261**	**0**	**0**	**9,515**	**7,310**	**0**	**0**		
CBL-0001	CABLE	In		8,538	6,787	0	0	8,588	6,832	0	0	7,261	
CBL-0002	CABLE	In		0	0	0	0	0	0	0	0		
CBL-0003	CABLE	In		739	378	0	0	743	380	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-0005	CABLE	In	0	0	0	0	0	0	0	0		
PUMP1	IND-MTR	In	78	40	0	0	79	40	0	0		
PUMP2	IND-MTR	In	78	40	0	0	79	40	0	0		
PUMP3	IND-MTR	In	78	40	0	0	79	40	0	0		
PUMP4	IND-MTR	In	78	40	0	0	79	40	0	0		
PNL HA			**8,409**	**6,449**	**0**	**0**	**8,439**	**6,480**	**0**	**0**		
CBL-0002	CABLE	In	8,409	6,449	0	0	8,439	6,480	0	0	6,449	
SW-CHILLER			**8,834**	**6,765**	**0**	**0**	**8,870**	**6,798**	**0**	**0**		
CBL-0003	CABLE	In	8,195	6,438	0	0	8,228	6,469	0	0	6,765	
CBL-0004	CABLE	In	741	379	0	0	744	380	0	0		
CHILLER			**8,149**	**6,227**	**0**	**0**	**8,172**	**6,248**	**0**	**0**		
CBL-0004	CABLE	In	7,525	5,907	0	0	7,546	5,927	0	0	6,227	
100 HP CHILLER	IND-MTR	In	745	379	0	0	747	381	0	0		
BUS-0006			**9,084**	**6,969**	**0**	**0**	**9,128**	**7,011**	**0**	**0**		
CBL-0005	CABLE	In	9,084	6,969	0	0	9,128	7,011	0	0	6,969	
150 KVA	2W-XFMR	In	0	0	0	0	0	0	0	0		

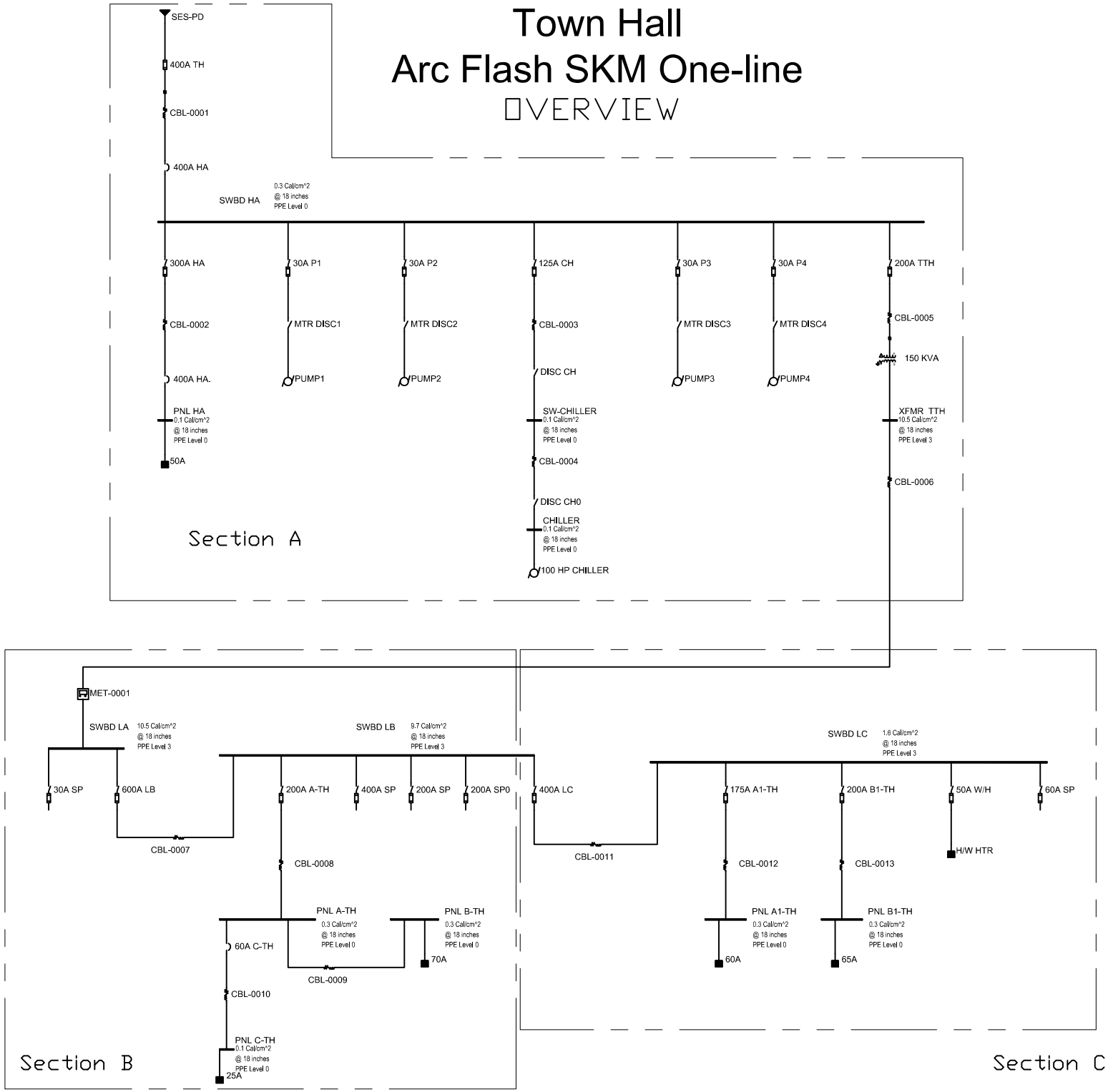
Bus Name	---------Contributions---------		----------Initial Symmetrical Amps---------- 3 Phase	SLG	LLG	LL	----------Asymmetrical Amps---------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
XFMR TTH			**5,573**	**6,050**	**0**	**0**	**6,593**	**7,478**	**0**	**0**		
CBL-0006	CABLE	In	0	0	0	0	0	0	0	0		
150 KVA	2W-XFMR	In	5,573	6,050	0	0	6,593	7,478	0	0	6,050	
SWBD LA			**5,548**	**6,010**	**0**	**0**	**6,537**	**7,382**	**0**	**0**		
CBL-0006	CABLE	In	5,548	6,010	0	0	6,537	7,382	0	0	6,010	
CBL-0007	CABLE	In	0	0	0	0	0	0	0	0		
SWBD LB			**5,188**	**5,445**	**0**	**0**	**5,821**	**6,230**	**0**	**0**		
CBL-0007	CABLE	In	5,188	5,445	0	0	5,821	6,230	0	0	5,445	
CBL-0008	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0011	CABLE	In	0	0	0	0	0	0	0	0		
PNL A-TH			**4,771**	**4,743**	**0**	**0**	**5,090**	**4,974**	**0**	**0**		
CBL-0008	CABLE	In	4,771	4,743	0	0	5,090	4,974	0	0	4,743	
CBL-0009	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0010	CABLE	In	0	0	0	0	0	0	0	0		
PNL B-TH			**4,705**	**4,634**	**0**	**0**	**4,991**	**4,825**	**0**	**0**		
CBL-0009	CABLE	In	4,705	4,634	0	0	4,991	4,825	0	0	4,634	

Bus Name	---------Contributions---------		----------Initial Symmetrical Amps---------- 3 Phase	SLG	LLG	LL	----------Asymmetrical Amps---------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
PNL C-TH			**3,372**	**2,650**	**0**	**0**	**3,378**	**2,651**	**0**	**0**		
CBL-0010	CABLE	In	3,372	2,650	0	0	3,378	2,651	0	0	2,650	
SWBD LC			**5,007**	**5,142**	**0**	**0**	**5,503**	**5,647**	**0**	**0**		
CBL-0011	CABLE	In	5,007	5,142	0	0	5,503	5,647	0	0	5,142	
CBL-0012	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0013	CABLE	In	0	0	0	0	0	0	0	0		
PNL A1-TH			**4,944**	**5,038**	**0**	**0**	**5,403**	**5,477**	**0**	**0**		
CBL-0012	CABLE	In	4,944	5,038	0	0	5,403	5,477	0	0	5,038	
PNL B1-TH			**4,902**	**4,968**	**0**	**0**	**5,328**	**5,353**	**0**	**0**		
CBL-0013	CABLE	In	4,902	4,968	0	0	5,328	5,353	0	0	4,968	

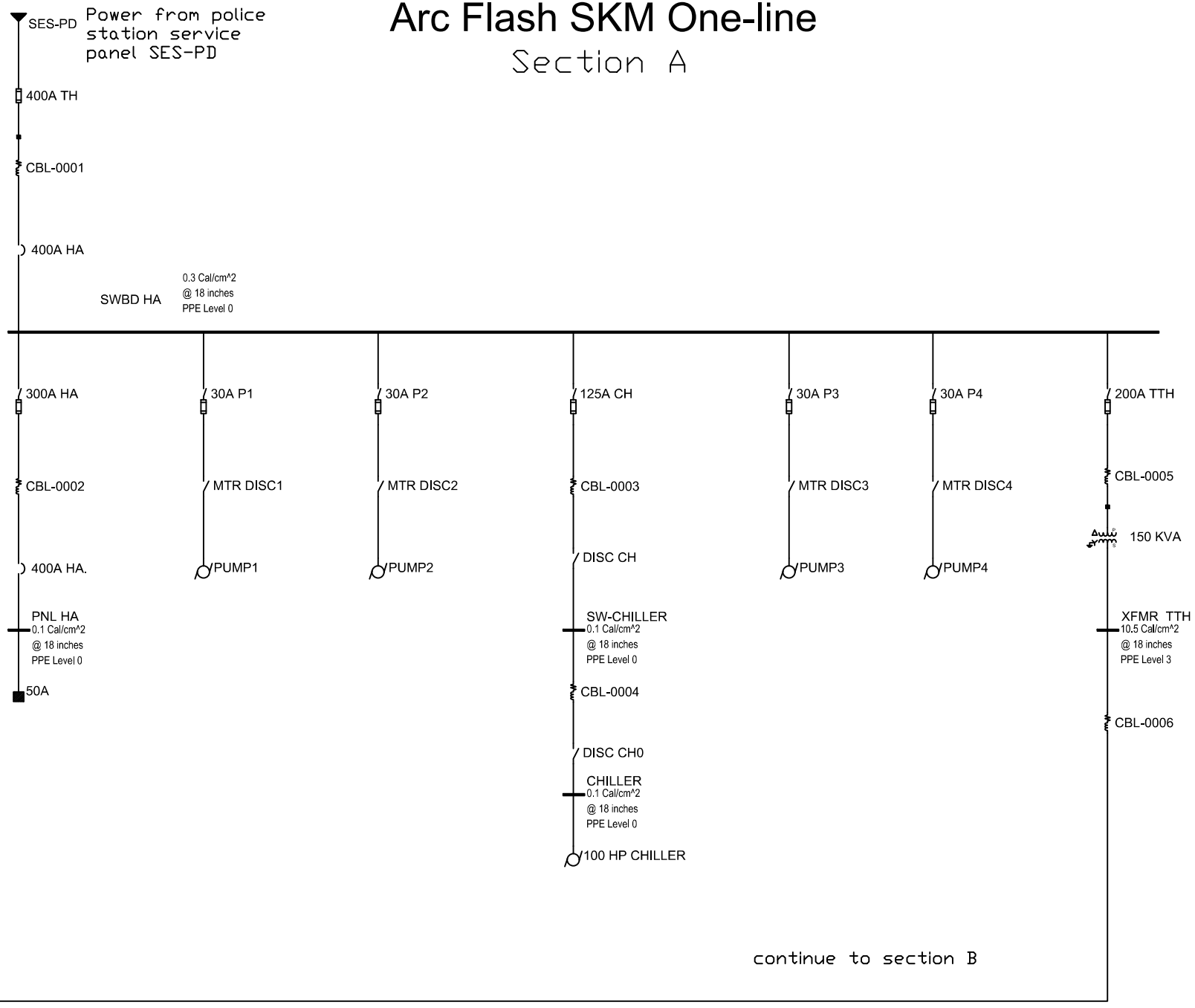
APPENDIX 2

ARC FLASH SKM REPORT

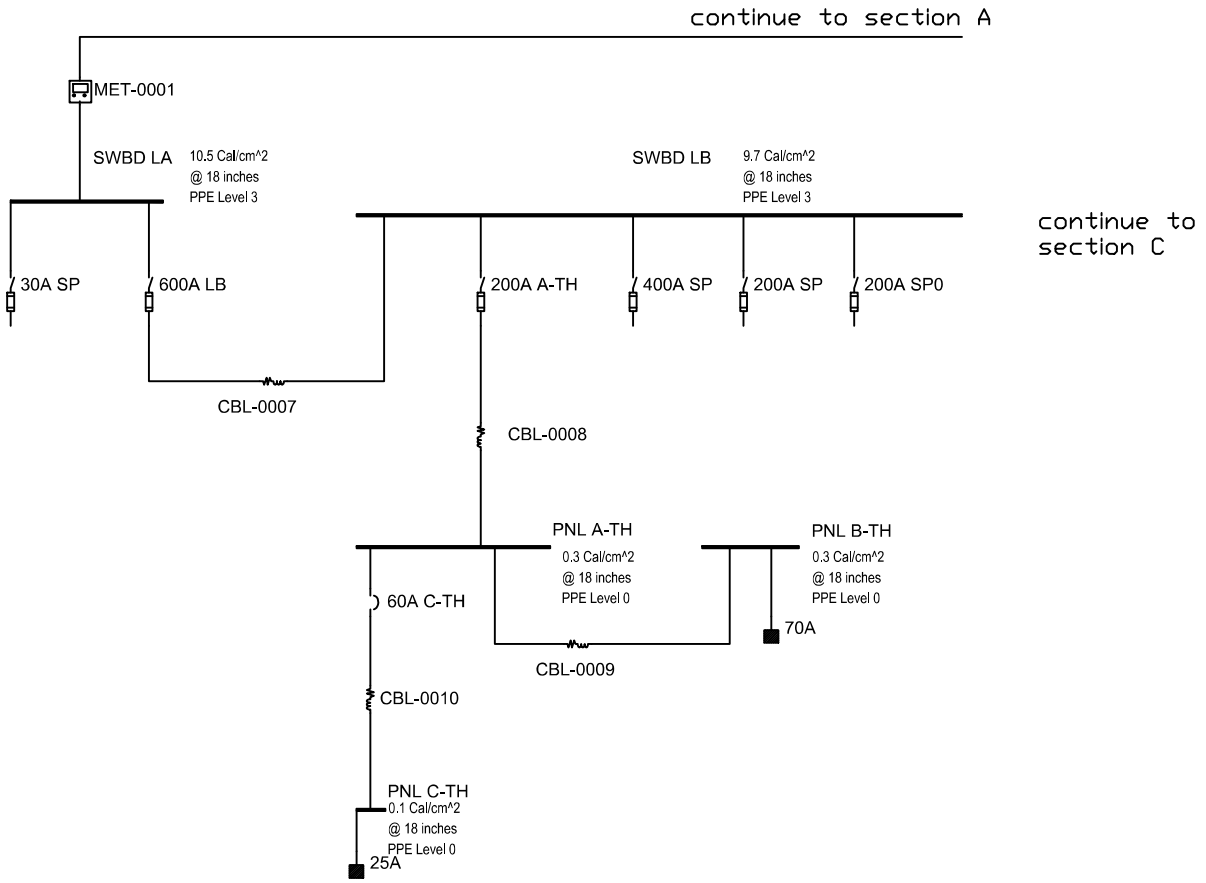
Town Hall
Arc Flash SKM One-line
OVERVIEW



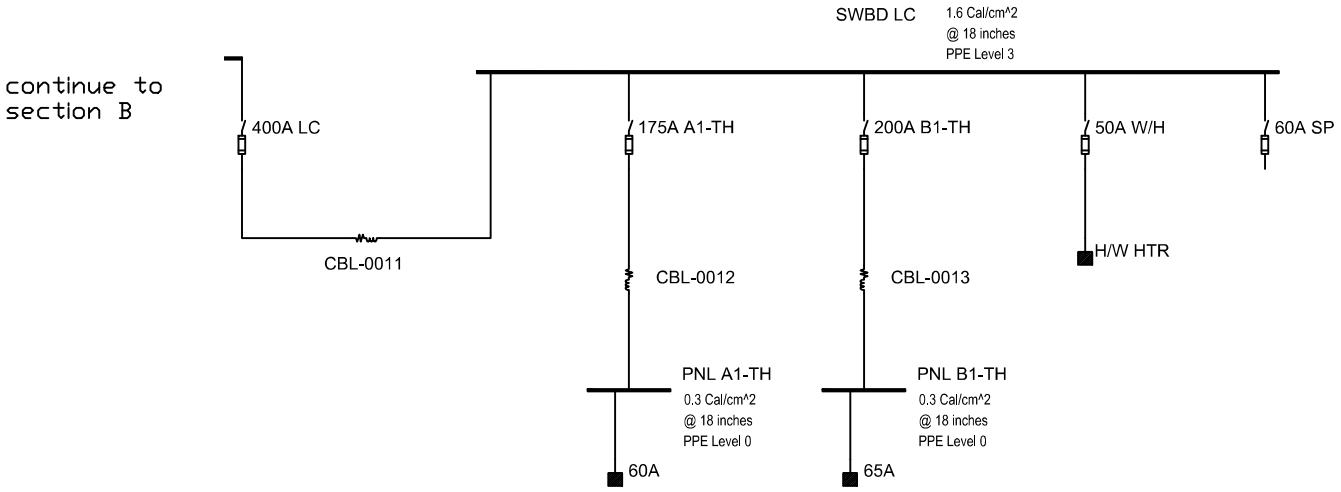
Town Hall
Arc Flash SKM One-line
Section A



Town Hall
Arc Flash SKM One-line
Section B



Town Hall
Arc Flash SKM One-line
Section C



Arc Flash Evaluation Report

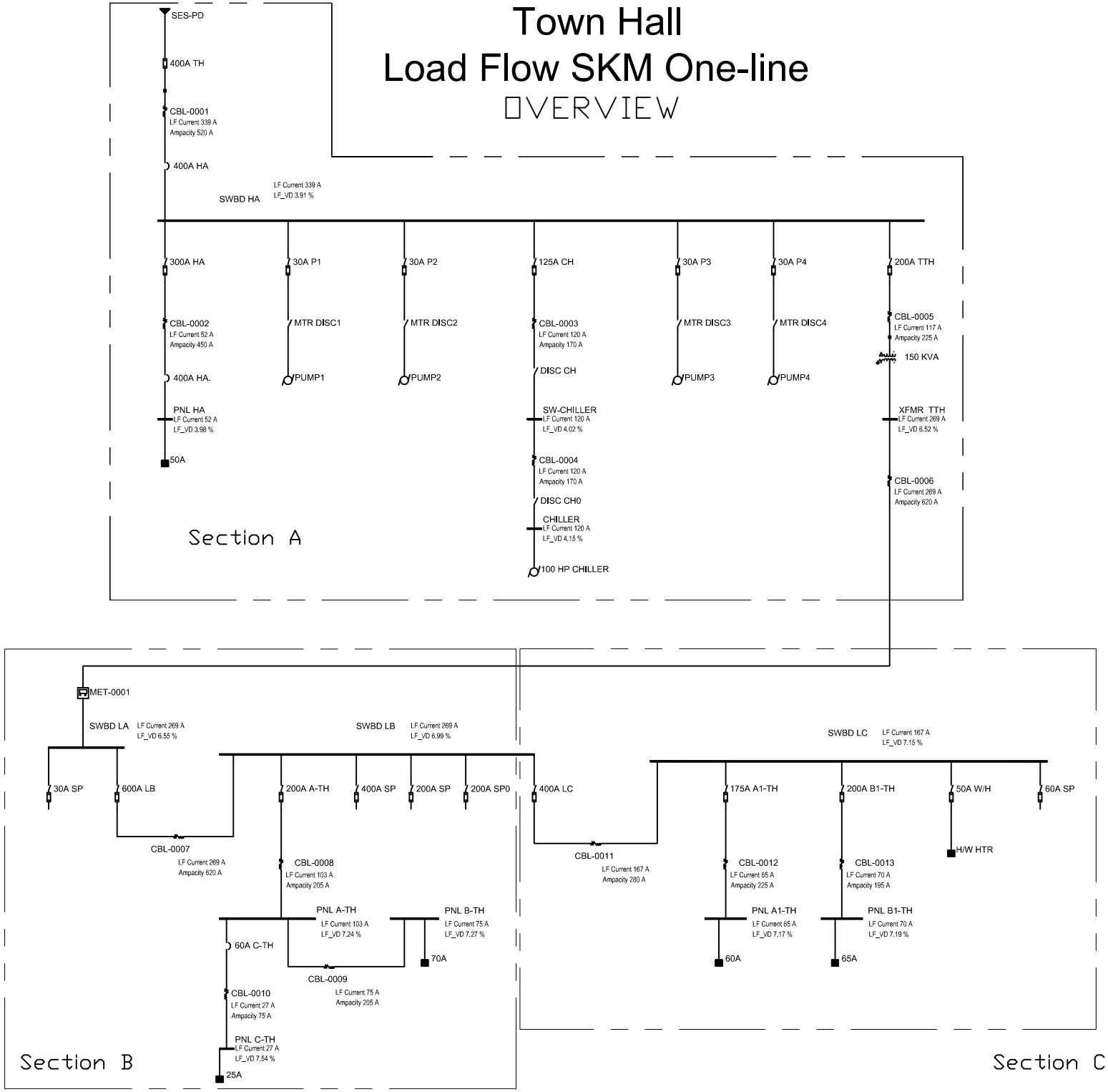
Bus Name	Bus kV	Protective Device Name	Bus Bolted/ Arcing (kA)	Prot Bolted/ Arcing (kA)	Trip/ Breaker Time (sec.)	Equip Type/ Gap (mm)	Electrode Config / WC Config	Box Height/ Width (in)	Box Depth (in)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
CHILLER	0.480	125A CH	8.15	7.53	0.004	PNL	VCB	14	10	2.68	18.00	0.06	No Arc-rated PPE Required
			6.18	5.70	0.000	25	VCB	12					
PNL A-TH	0.208	200A A-TH	4.77	4.77	0.008	PNL	VCB	14	10	6.74	18.00	0.25	No Arc-rated PPE Required
			2.04	2.04	0.000	25	VCB	12					
PNL A1-TH	0.208	175A A1-TH	4.94	4.94	0.008	PNL	VCB	14	10	6.74	18.00	0.25	No Arc-rated PPE Required
			2.12	2.12	0.000	25	VCB	12					
PNL B-TH	0.208	200A A-TH	4.70	4.70	0.008	PNL	VCB	14	10	6.74	18.00	0.25	No Arc-rated PPE Required
			2.01	2.01	0.000	25	VCB	12					
PNL B1-TH	0.208	200A B1-TH	4.94	4.94	0.062	PNL	VCB	14	10	6.74	18.00	0.25	No Arc-rated PPE Required
			2.12	2.12	0.000	25	VCB	12					
PNL C-TH	0.208	60A C-TH	3.37	3.37	0.030	PNL	VCB	14	10	3.25	18.00	0.08	No Arc-rated PPE Required
			1.21	1.21	0.000	25	VCB	12					
PNL HA	0.480	300A HA	8.41	8.41	0.008	PNL	VCB	14	10	4.22	18.00	0.12	No Arc-rated PPE Required
			6.38	6.38	0.000	25	VCB	12					
SW-CHILLER	0.480	125A CH	8.83	8.19	0.004	PNL	VCB	14	10	2.83	18.00	0.06	No Arc-rated PPE Required
			6.72	6.23	0.000	25	VCB	12					
SWBD HA	0.480	400A HA	9.46	8.54	0.020	PNL	VCB	14	10	7.84	18.00	0.32	No Arc-rated PPE Required
			7.21	6.51	0.000	25	VCB	12					

Bus Name	Bus kV	Protective Device Name	Bus Bolted/ Arcing (kA)	Prot Bolted/ Arcing (kA)	Trip/ Breaker Time (sec.)	Equip Type/ Gap (mm)	Electrode Config / WC Config	Box Height/ Width (in)	Box Depth (in)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
SWBD LA	0.208	200A TTH	5.55	5.55	2.000	PNL	VCB	14	10	69.90	18.00	10.49	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
			2.41	2.41	0.000	25	VCB	12					
SWBD LB	0.208	600A LB	5.19	5.19	2.000	PNL	VCB	14	10	66.60	18.00	9.71	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
			2.24	2.24	0.000	25	VCB	12					
SWBD LC	0.208	400A LC	5.00	5.00	1.094	PNL	VCB	14	10	21.32	18.00	1.57	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
			2.15	2.15	0.000	25	VCB	12					
XFMR TTH	0.208	200A TTH	5.57	5.57	2.000	PNL	VCB	14	10	70.13	18.00	10.54	Arc-rated shirt & pants or arc-rated coverall or arc-rated arc flash suit
			2.42	2.42	0.000	25	VCB	12					

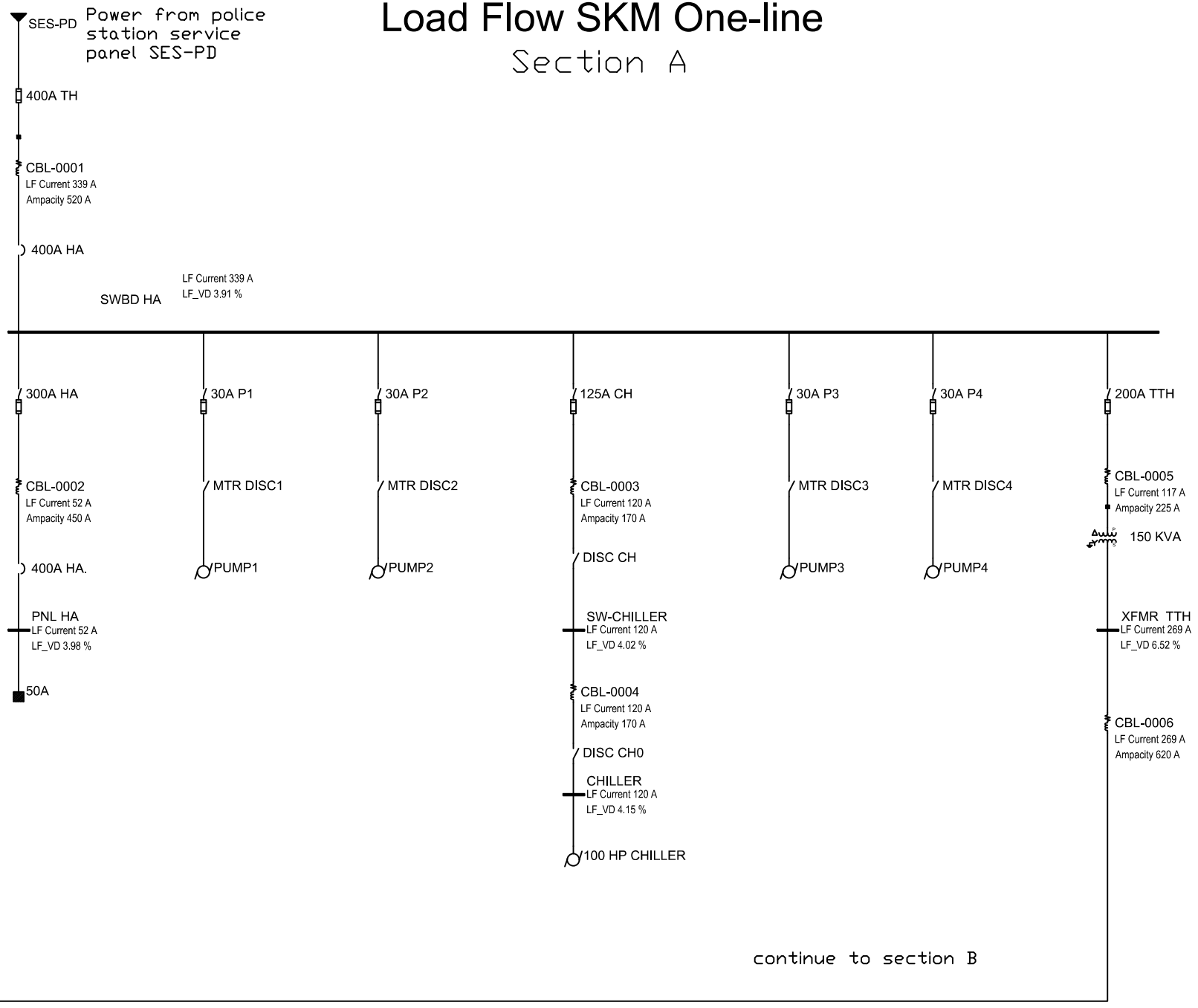
APPENDIX 3

LOAD FLOW STUDY

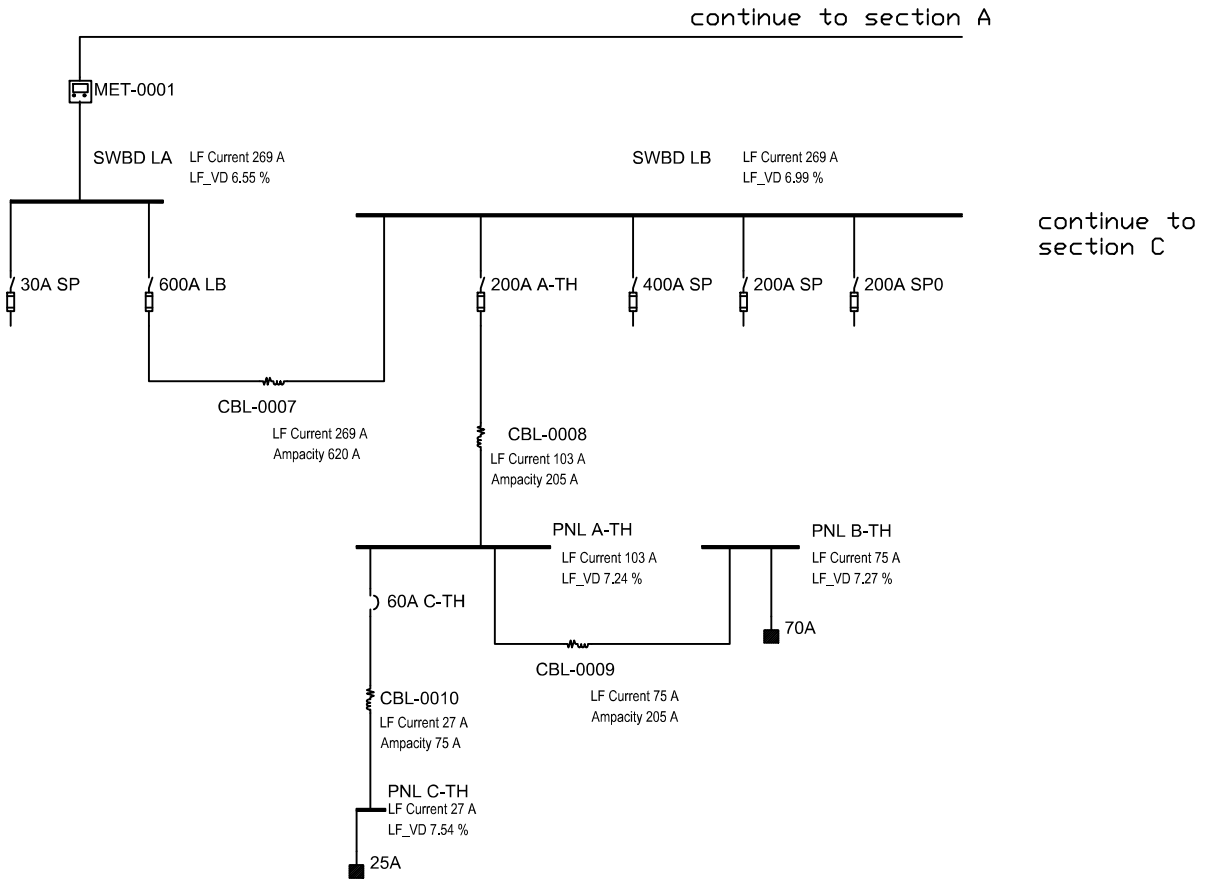
Town Hall
Load Flow SKM One-line
OVERVIEW



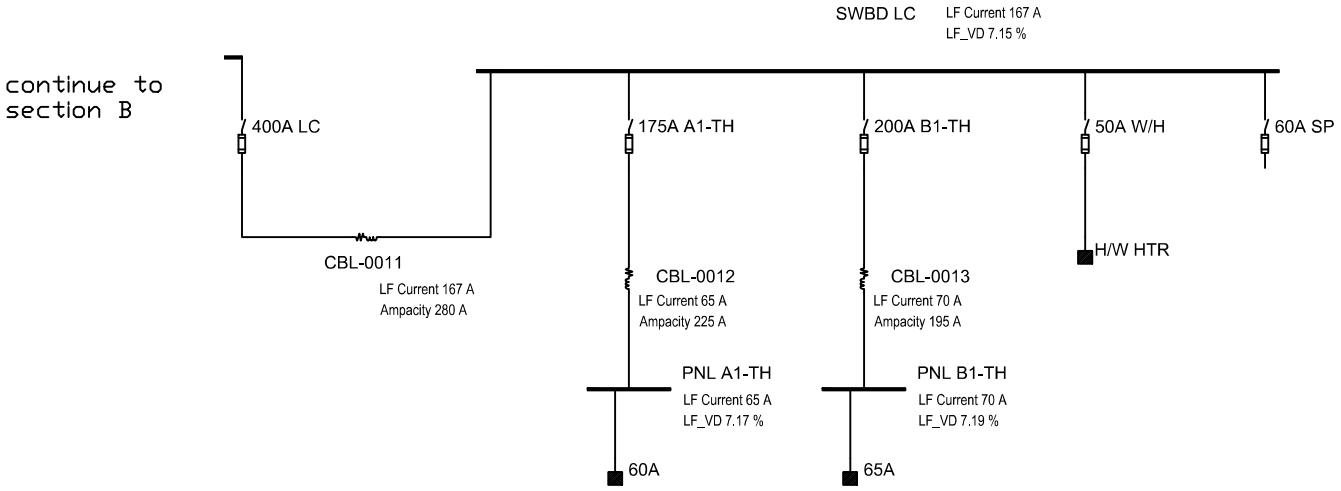
Town Hall
Load Flow SKM One-line
Section A



Town Hall
Load Flow SKM One-line
Section B



Town Hall
Load Flow SKM One-line
Section C



Project: Town Hall
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
SES-PD	In	1.00	0.00	222.0	168.7	0.95	0.60 +*j* 4.77

Buses

Bus Name	In/Out Service	Design Volts	LF Volts	Angle Degree	PU Volts	%VD
CHILLER	In	480	460	-0.35	0.96	4.15
PNL A1-TH	In	208	193	-1.99	0.93	7.17

Bus Name	In/Out Service	Design Volts	LF Volts	Angle Degree	PU Volts	%VD
PNL A-TH	In	208	193	-1.97	0.93	7.24
PNL B1-TH	In	208	193	-1.99	0.93	7.19
PNL B-TH	In	208	193	-1.96	0.93	7.27
PNL C-TH	In	208	192	-1.86	0.92	7.54
PNL HA	In	480	461	-0.39	0.96	3.98
SWBD HA	In	480	461	-0.40	0.96	3.91
SWBD LA	In	208	194	-2.03	0.93	6.55
SWBD LB	In	208	193	-2.00	0.93	6.99
SWBD LC	In	208	193	-1.99	0.93	7.15
SW-CHILLER	In	480	461	-0.38	0.96	4.02
XFMR TTH	In	208	194	-2.03	0.93	6.52

Cables

From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
BUS-0001	CBL-0001	In	2.96	222.0	168.7	278.8	338.6	0.80
SWBD HA				7.1	4.4	8.4	65.1	
PNL A-TH	CBL-0009	In	0.03	20.2	15.1	25.2	75.5	0.80
PNL B-TH				0.0	0.0	0.0	36.8	
PNL A-TH	CBL-0010	In	0.30	7.2	5.4	9.0	27.0	0.80
PNL C-TH				0.0	0.0	0.0	36.1	
SWBD HA	CBL-0005	In	0.05	73.1	58.0	93.3	116.8	0.78
BUS-0006				0.0	0.0	0.1	51.9	
SWBD HA	CBL-0002	In	0.07	33.3	25.0	41.6	52.1	0.80
PNL HA				0.0	0.0	0.0	11.6	

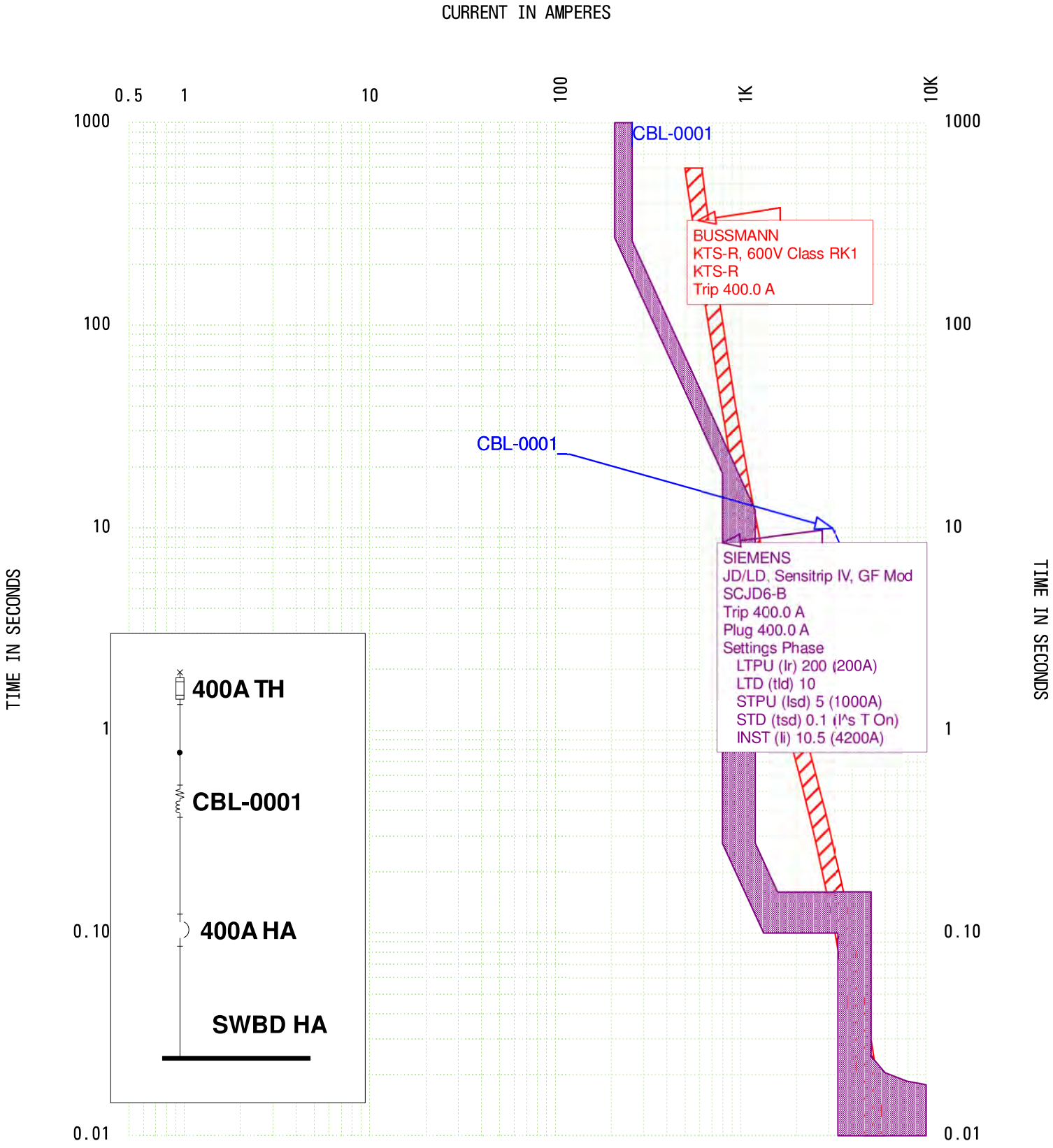
From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
SWBD HA	CBL-0003	In	0.11	76.4	57.2	95.5	119.5	0.80
SW-CHILLER				0.1	0.0	0.1	70.3	
SWBD LA	CBL-0007	In	0.45	72.6	54.4	90.7	269.5	0.80
SWBD LB				0.4	0.2	0.4	43.5	
SWBD LB	CBL-0008	In	0.24	27.5	20.6	34.4	102.5	0.80
PNL A-TH				0.1	0.0	0.1	50.0	
SWBD LB	CBL-0011	In	0.15	44.8	33.6	55.9	167.0	0.80
SWBD LC				0.1	0.0	0.1	59.6	
SWBD LC	CBL-0012	In	0.02	17.3	13.0	21.6	64.6	0.80
PNL A1-TH				0.0	0.0	0.0	28.7	
SWBD LC	CBL-0013	In	0.04	18.7	14.1	23.4	70.0	0.80
PNL B1-TH				0.0	0.0	0.0	35.9	
SW-CHILLER	CBL-0004	In	0.14	76.3	57.2	95.4	119.5	0.80
CHILLER				0.1	0.0	0.1	70.3	
XFMR TTH	CBL-0006	In	0.03	72.7	54.4	90.8	269.5	0.80
SWBD LA				0.0	0.0	0.0	43.5	

2-Winding Transformers

From Bus To Bus	Component Name	In/Out Service	%VD	kW Loss	kvar Loss	kVA Loss	LF Amps Rating %	PF
BUS-0006	150 KVA	In	2.55	73.0	58.0	93.2	117.0	0.78
XFMR TTH				0.4	3.6	3.6	64.7	

APPENDIX 4

TCC REPORT

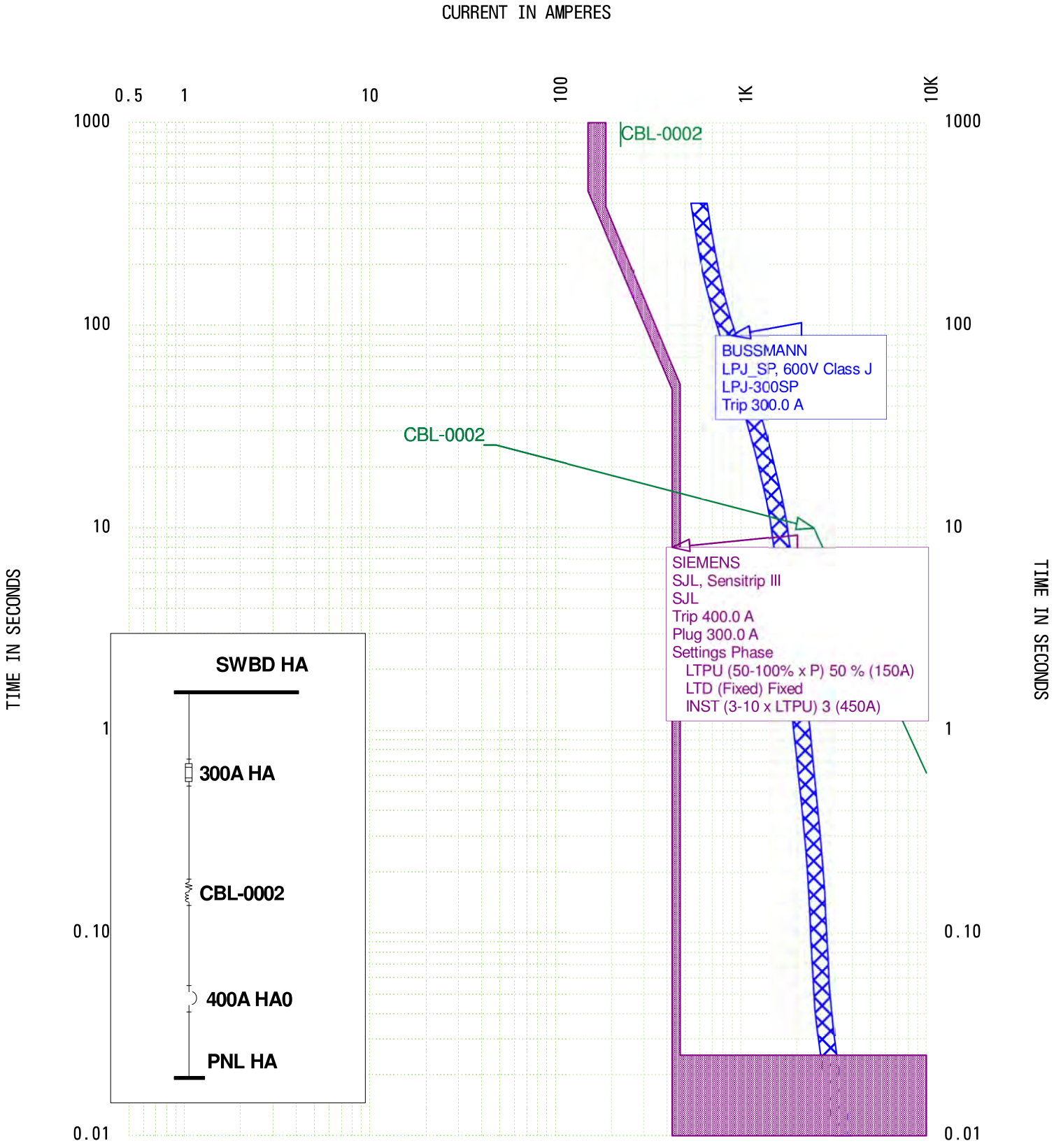


TCC Name: SWBD HA
Oneline: SWBD HA
June 21, 2025 10:32 AM

Current Scale x 1

Reference Voltage: 480

SKM Systems Analysis, Inc.

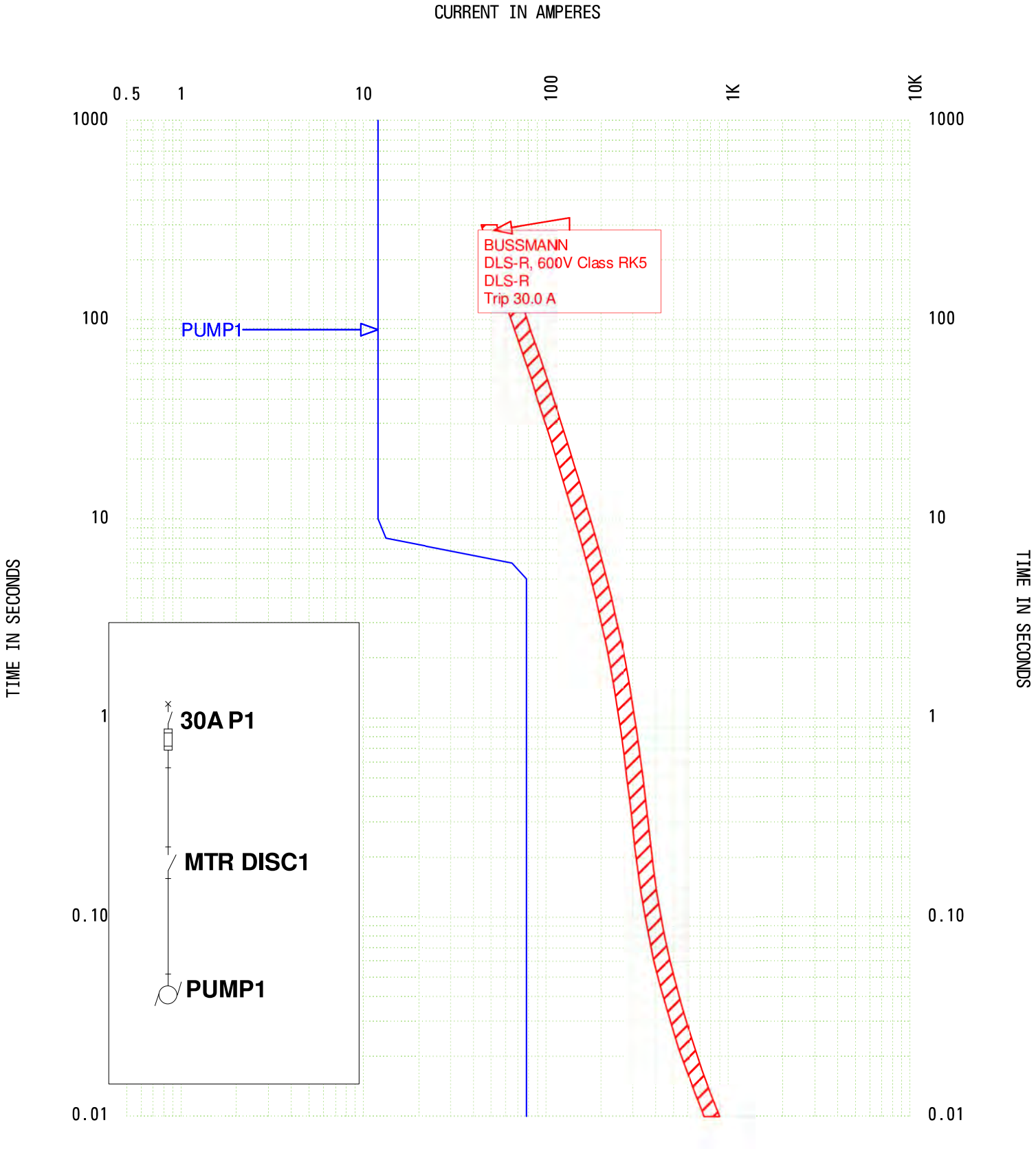


TCC Name: PNL HA
Oneline: PNL HA
June 21, 2025 10:34 AM

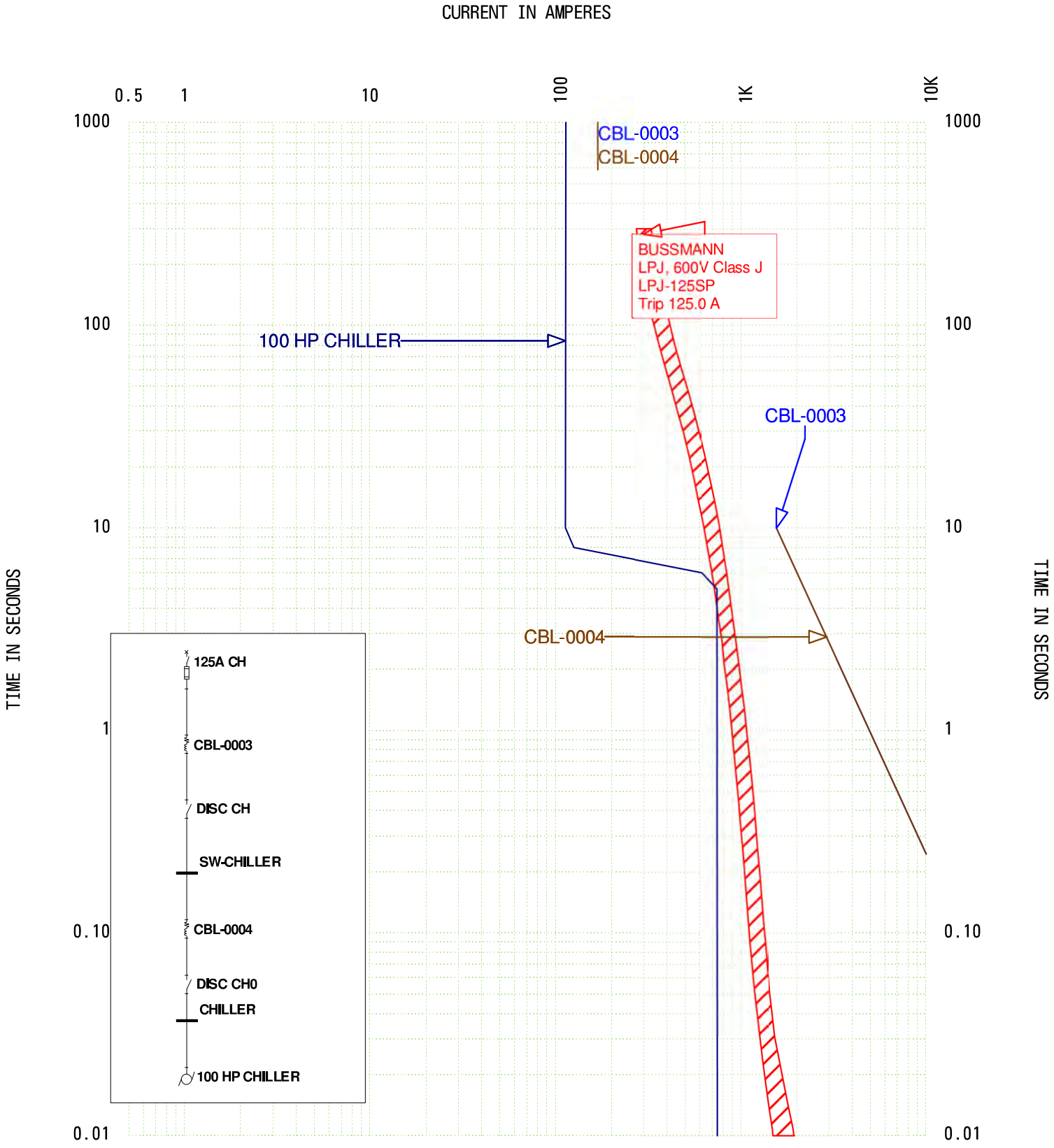
Current Scale x 1

Reference Voltage: 480

SKM Systems Analysis, Inc.



TCC Name: PUMPS 1-4	Current Scale x 1	Reference Voltage: 480
Oneline: PUMPS 1-4		
June 21, 2025 1:34 PM		SKM Systems Analysis, Inc.

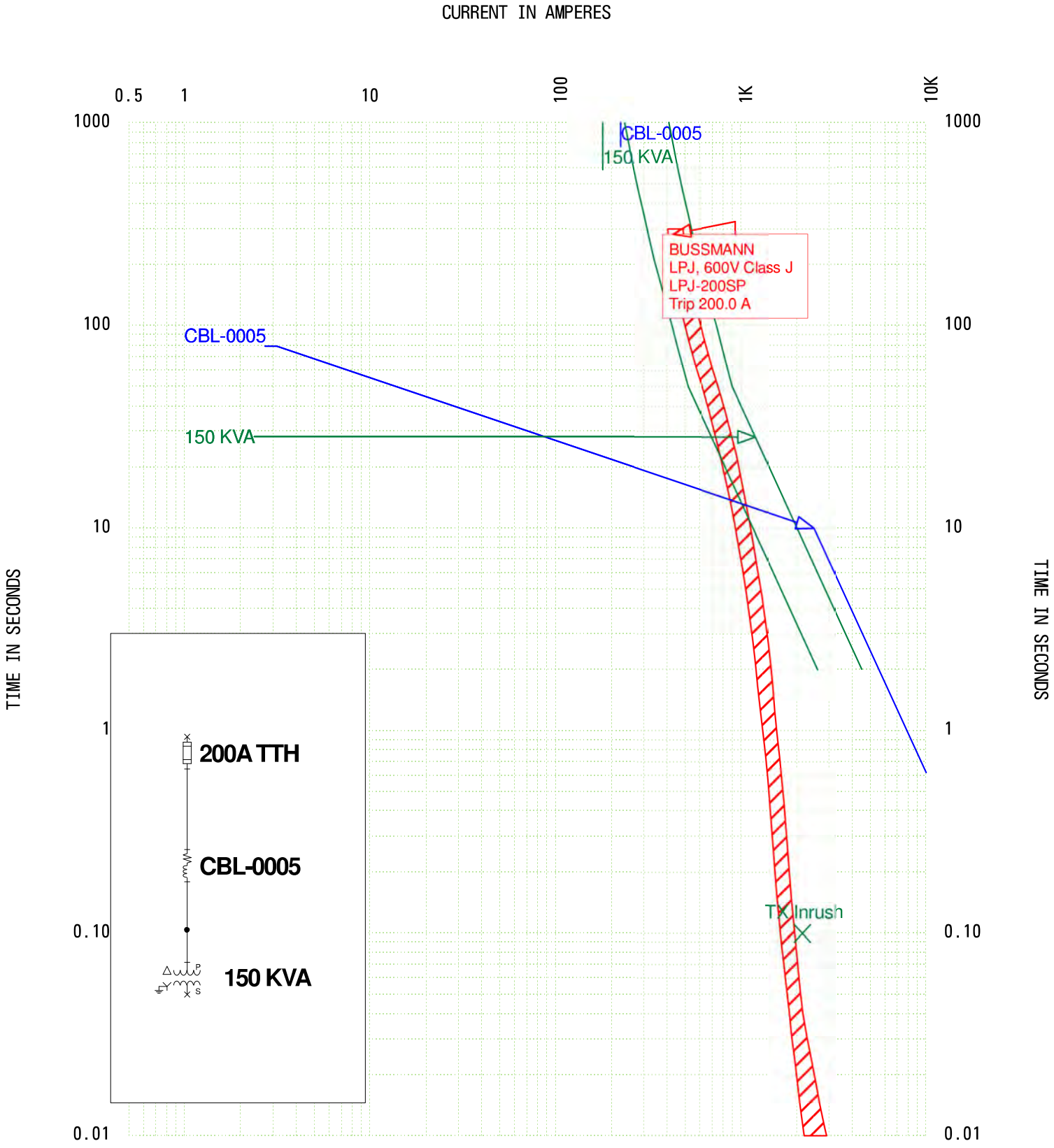


TCC Name: CHILLER
Oneline: CHILLER
June 21, 2025 1:35 PM

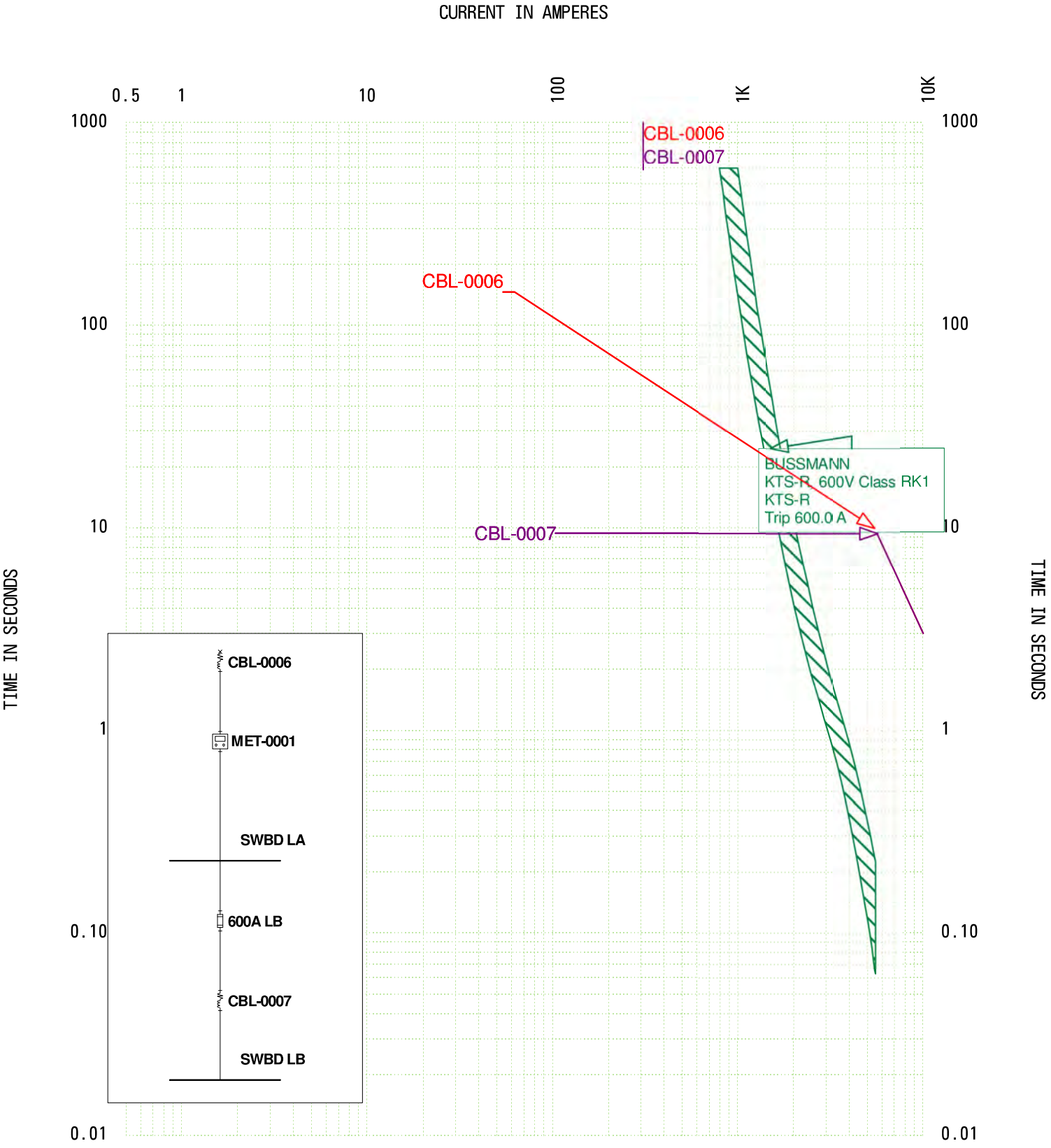
Current Scale x 1

Reference Voltage: 480

SKM Systems Analysis, Inc.



TCC Name: XFMR TTH	Current Scale x 1	Reference Voltage: 480
Oneline: XFMR TTH		
June 21, 2025 11:47 AM		SKM Systems Analysis, Inc.

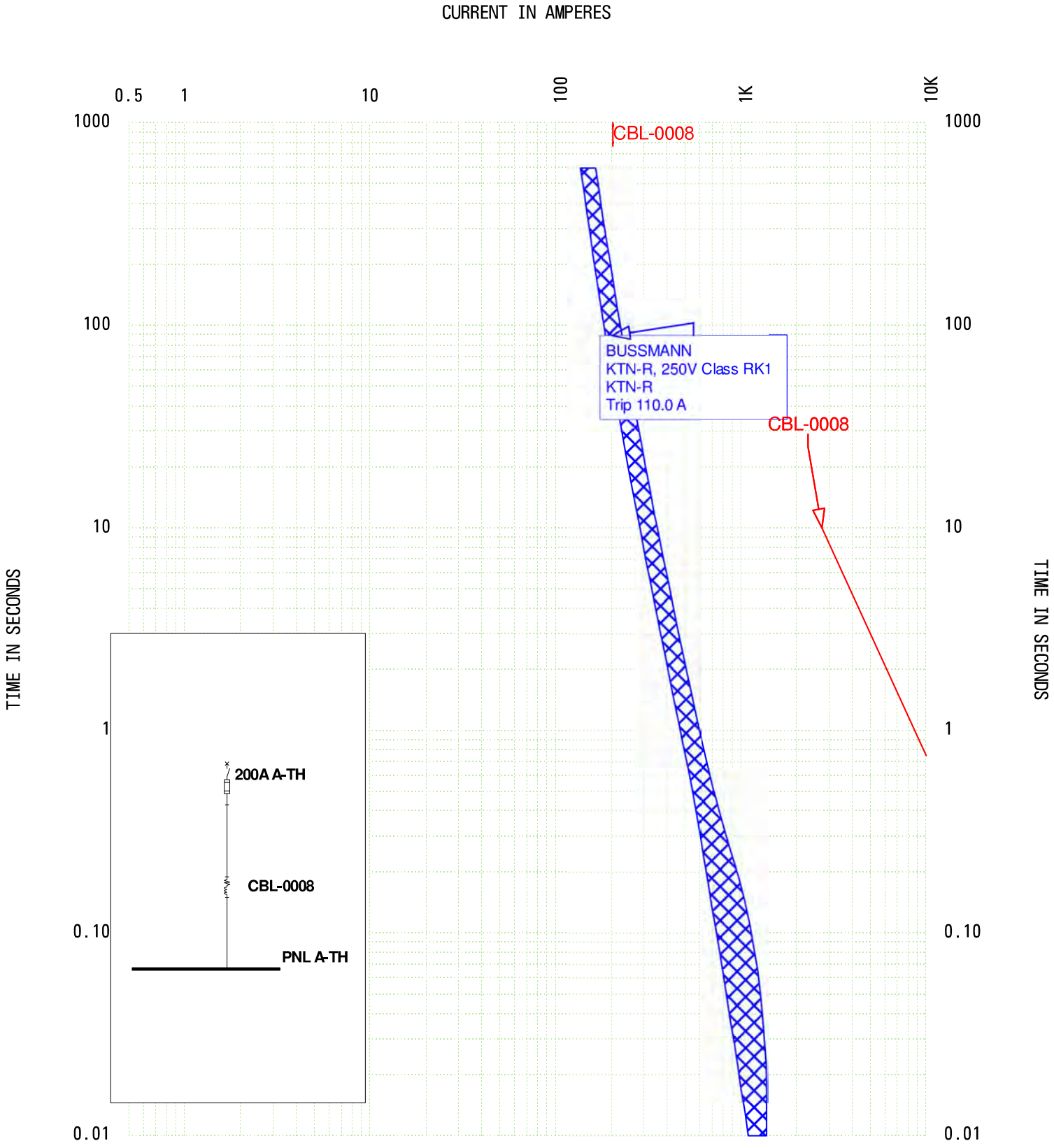


TCC Name: SWBD LA & LB
Oneline: SWBD LA & LB
June 21, 2025 11:46 AM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

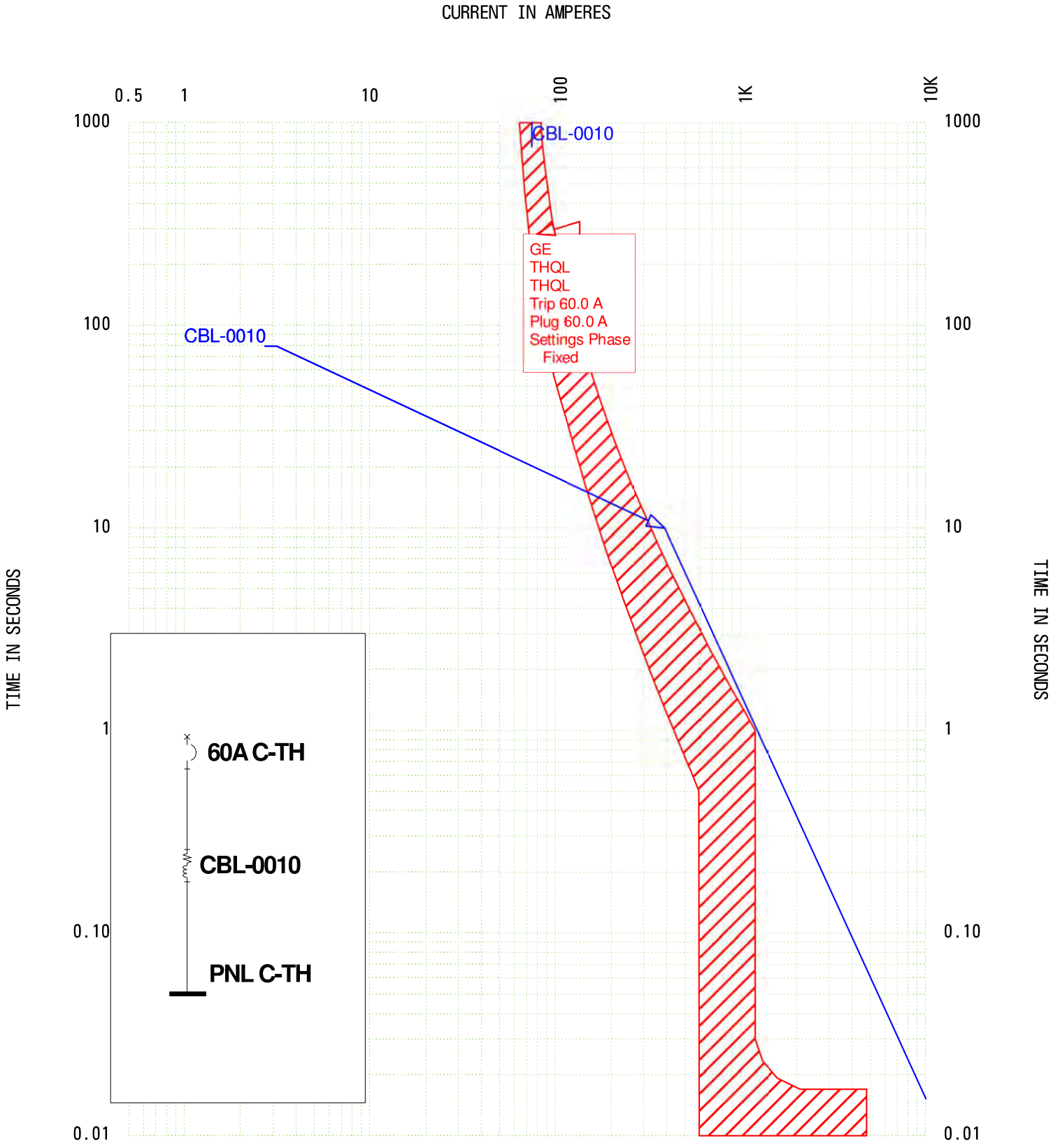


TCC Name: PNL A-TH
Oneline: PNL A-TH
June 21, 2025 1:39 PM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

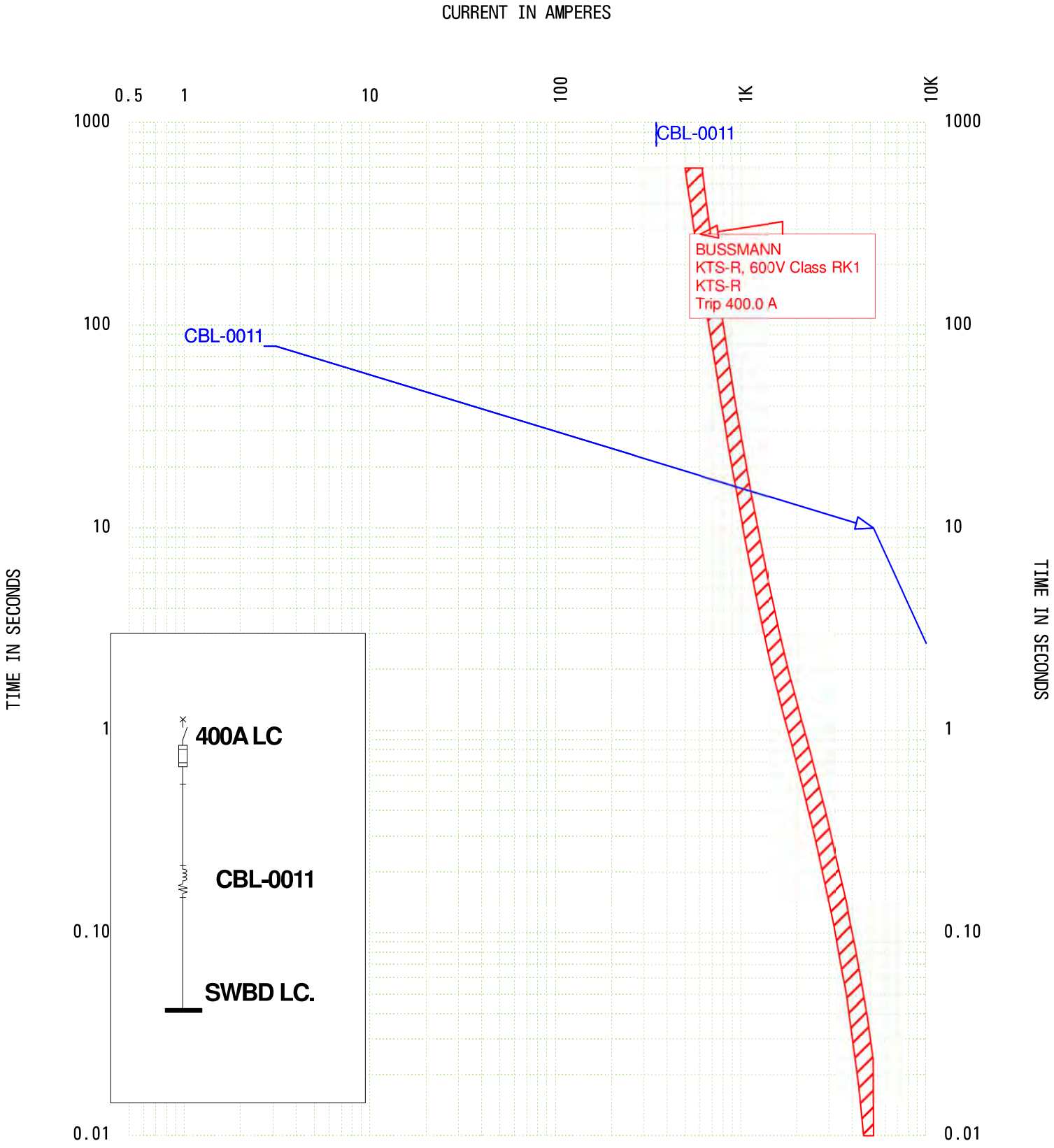


TCC Name: PNL C-TH
Oneline: PNL C-TH
June 21, 2025 1:40 PM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

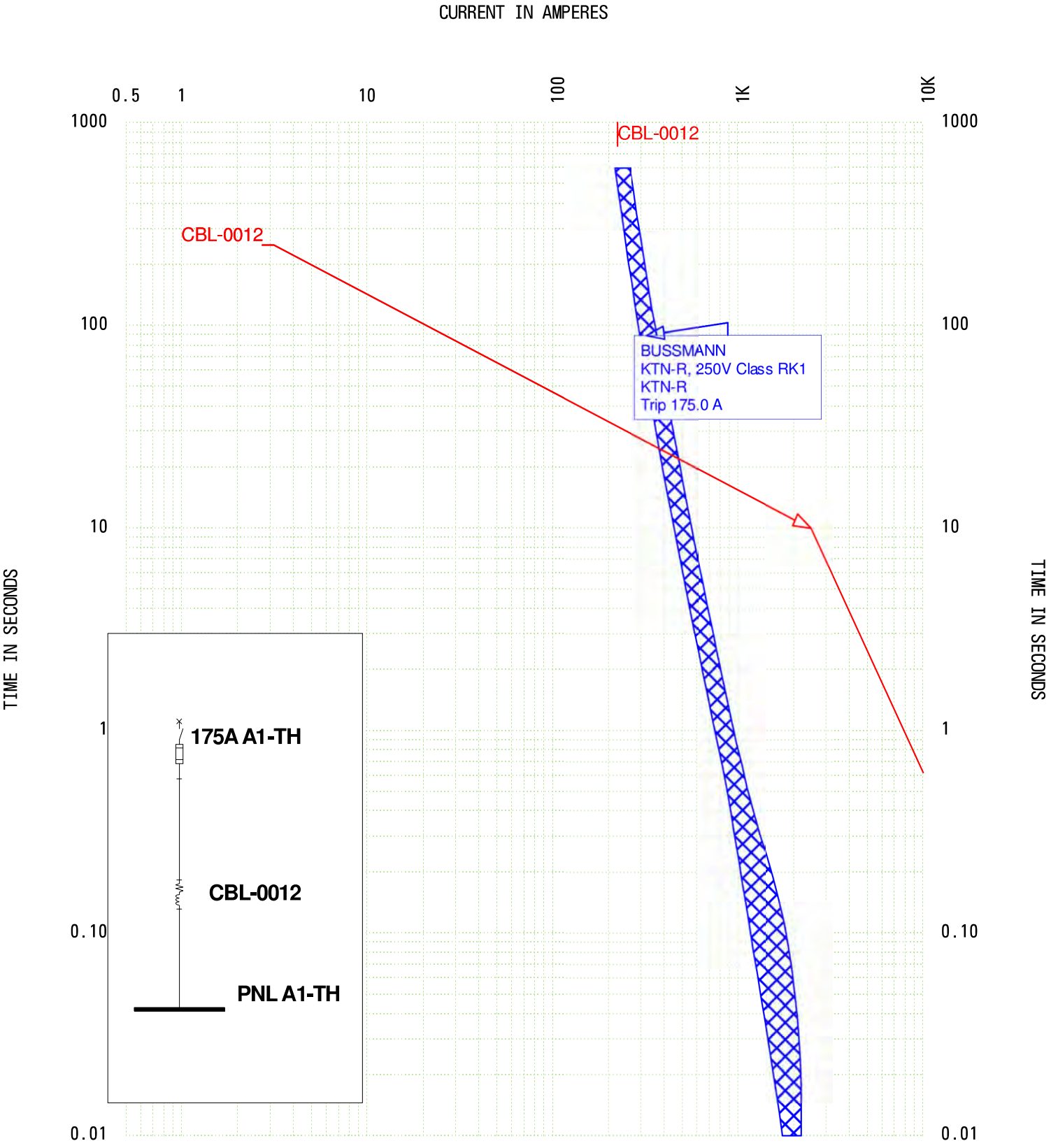


TCC Name: SWBD LC
Oneline: SWBD LC
June 21, 2025 1:47 PM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

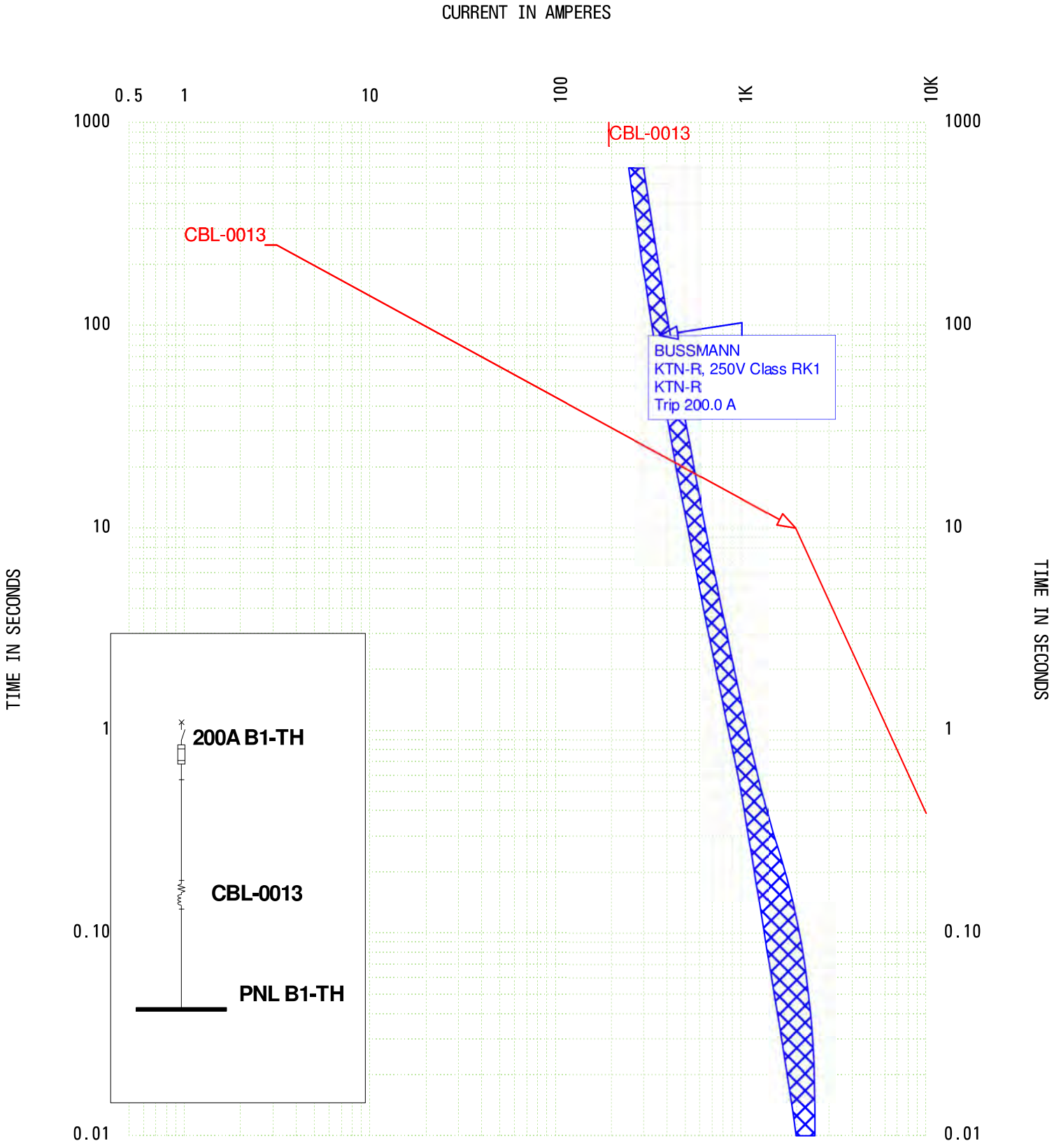


TCC Name: PNL A1-TH
Oneline: PNL A1-TH
June 21, 2025 1:55 PM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.



TCC Name: PNL B1-TH
Oneline: PNL B1-TH
June 21, 2025 1:44 PM

Current Scale x 1

Reference Voltage: 208

SKM Systems Analysis, Inc.

APPENDIX 5

WORK PERMIT SAMPLE

ENERGIZED ELECTRICAL WORK PERMIT

PART I: TO BE COMPLETED BY THE REQUESTER:

Job/Work Order Number: _____

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

PNL LA

(2) Description of work to be done:

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

Requester/Title _____ Date _____

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

Check When Complete

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

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

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

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

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

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

Electrically Qualified Person(s) _____ Date _____

Electrically Qualified Person(s) _____ Date _____

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

Maintenance/Engineering Manager _____ Manufacturing Manager _____

Safety Manager _____ Electrically Knowledgeable Person _____

General Manager _____ Date _____

APPENDIX 6

ARC FLASH LABELS

PPE TABLE

ARC FLASH LABELS

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

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	CHILLER

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	PNL B-TH

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	PNL A1-TH

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	PNL HA

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	SW-CHILLER

120 DEGREEZ MEP ENGINEERING
225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	SWBD LA

120 DEGREEZ MEP ENGINEERING
225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	SWBD HA

120 DEGREEZ MEP ENGINEERING
225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	SWBD LB

120 DEGREEZ MEP ENGINEERING
225 Broadway
Suite 350
San Diego, CA 92101
(310) 364-5228

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

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

Location:	XFMR TTH

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

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

Location:	PNL A-TH

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

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

Location:	PNL C-TH

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

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

Location:	PNL B1-TH

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	By:	AA/MP/RR

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

DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

Arc Flash Boundary
Incident Energy at

No Safe PPE

208 VAC

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

Location:	SWBD LC

120 DEGREEZ MEP ENGINEERING

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

Job#:	25-040	Prepared on:	06/23/25	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