I. BACKGROUND

In 2012 TKDA provided a design to upgrade the electrical distribution system for the West Building at the Riverland Community College Austin Campus (RCC). Much of the building’s electrical distribution system was at the end of life for its normal life, and Austin Utility requested converting the building electrical service from a 13,800 volt “primary” to a 480 volt “secondary.” The Owner’s original 13,800 volt cable, switchgear, and transformers had not been replaced or updated since the building was originally constructed. In addition, one of the existing transformers had been tested and was identified with dangerously high internal explosive gas levels and had to be replaced on an emergency basis. Therefore, the majority of the building electrical distribution system equipment was scheduled for replacement. The design enhancements replaced the aged system with updated wiring and distribution equipment reducing the potential for future failures. The design included changing the building electrical service from primary to secondary voltage levels in coordination with the local utility engineers. This change eliminated the need for the Owner to maintain the more dangerous 13,800 volt medium voltage equipment and simplifying future maintenance requirements.

Following the completion of that work, the Owner asked TKDA to review the condition of the East Building electrical distribution system and provide guidance for upgrading that equipment. The following paragraphs summarize TKDA’s assessment of the existing electrical distribution system for the East Building and the recommendations for improvements.

II. SYSTEM OVERVIEW

The East Building was originally constructed in 1965. The building was fed from an Austin Utility 13,800 volt primary feeder originating from the pole line routed along Fourteenth Street. The 13,800 volt (medium voltage: MV) service lateral enters the building in the basement of the Theater. The Theater electrical room contains a medium voltage switch that originally distributed the 13,800 volt primary feeder to a set of single phase transformers in the adjacent electrical vault and to a similar set of transformers in the Gym electrical room vault. The Gym transformers were replaced in 1993 during a major expansion to the building. The work for this Project included the removal of the Gym transformers and the installation of a new medium voltage fused switch lineup in the Gym electrical vault. The new medium voltage switch lineup distributed power to three new pad-mounted transformers located outside the building. One of the transformers feeds the original Gym switchboard MDC-2. The second transformer feeds motor control center MCC-C in the Boiler plant. The third transformer feeds a switchboard MDC-3 located in the Library electrical room. The MDC-3 switchboard replaced the original MDC-1B switchboard for that area.
The Theater 208 volt main switchboard MDC-1 feeds switchboard MDC-1A located in the northeast electrical room of the Central Classroom area. Both switchboards are original to the building. The Theater distribution system equipment provides power to loads in the Theater and Classroom areas. The Gym 208 volt main switchboard MDC-2 feeds switchboard MDC-2A, which is located in the southwest electrical room of the Central Classroom area. Both of these switchboards are also original to the building. The “newer” 208 volt Library main switchboard MDC-3 serves loads in the Library area. The 480 volt Boiler Plant main motor control center MCC-C was installed in 1992. The MCC also provides power to the original boiler plant panelboard MDC-2B through an 112.5KVA, 480-208Y/120 volt transformer. MCC-C and MDC-2B panelboard supplies power to the plant boiler, chiller, and associated equipment.

The East Building has a small 35KW diesel generator used for emergency loads. The generator and automatic transfer switch (ATS) were upgraded in 1992. The generator is rated for 208Y/120 volt and is located in a separate building outside in the south courtyard. The generator has an integral diesel fuel base tank. The generator is connected to distribution panelboard EMDC through the ATS. Both the distribution panelboard and the ATS are located in the Theater basement electrical room. The life safety distribution system feeders are routed from panelboard EMDC to panelboards EMA-1, EMA-2, EMC-1, EME-1, and EM, which are located in the Central Classroom B169 stairwell, the Central Classroom B134 stairwell, the Gym C110 hallway, the Theater basement electrical room, and the Library A135A electrical room, respectively.

III. BUILDING LOAD ANALYSIS

Review of four years of Utility billing records for the East Building revealed a minimum electrical demand of 246KW, an average demand of 315KW, and a maximum demand of 472KW. The electrical demands found on the monthly Utility billing records were assembled in the “Four Year Utility KW Demand Graph.” This graph clearly shows a historic trend of higher electrical demands during the cooling season and lesser demands in the winter. The electrical demands were in the range of 250KW to 275KW for the winter months and approximately 350KW to 450KW during the summer months. Therefore, a new building service should be sized in the range of 500KVA to 750KVA at a minimum. This range is based on the assumption of a 0.85 power factor and the NEC required 125% adjustment when sizing equipment from 12 months of measured data. The provided Utility billing records for the East Building do not indicate any measured or estimated power factor.

IV. CONDITIONS ASSESSMENT AND RECOMMENDED SYSTEM UPGRADES

UTILITY SERVICE. The Utility service lateral serving the East Building originates at the 13,800 volt riser pole on Fourteenth Street and is routed underground to a MV load break cabinet located outside the Theater. The lateral continues into the building to the Owner’s MV Main Switchgear. The Austin Utility equipment and cabling are aged and in need of replacement. TKDA contacted Tom Tylutki at Austin Utility and discussed changing the East Building services to 480 volt, similar to the change that was done at the West Building. Austin Utility is willing to provide two services to the East Building as part of any replacements of their MV equipment and/or cabling. TKDA agrees with this proposed approach and will incorporate the necessary changes to their planning to accommodate this direction, if the Upgrade Project is approved by RCC and MNSCU.
BUILDING MV EQUIPMENT. The RCC owned 13,800 volt electrical distribution system equipment is comprised of two MV switchgear lineups, a set of three grouped single phase MV transformers, three MV pad mount transformers, and the associated MV cabling. The Main MV Switchgear lineup, which is located in the Theater electrical room, was installed in 1965 with the original building construction. The Theater switchgear has two MV feeder switches. The feeder switches have blank covers so that they cannot be inspected without opening the respective switch, causing disruption to operations. One MV feeder switch provides power to the three, single phase, pole-type transformers in the adjacent Theater electrical vault. The Theater equipment is well over 45 years old. The other Theater MV feeder switch serves the switchgear lineup located in the Gym electrical vault.

The Theater MV switch lineup is located in a clean, dry electrical room and has not experienced any serious problems. The Theater three single phase transformers are located in the adjacent electrical vault that has exposure to the outside environment through an open grate cover. The transformers also have exposed, energized, MV parts, which could easily be accidentally contacted by a worker. The
transformers do not have oil test ports; consequently, a technician must de-energize the transformers to take a sample of the insulting oil to test for problems. The Theater transformers are as old as the West Building transformer that failed the insulating oil test in 2012. The Theater transformers have dust fibers and some accumulated dirt on the insulators. The combined moisture and dirt on the transformer insulators can combine to undermine the insulating features of the insulators. This degraded insulator condition can lead to a flashover of the higher voltage corona. A flashover occurs when a corona or the electric field that surrounds all open 13,800V connections follows the surface of the degraded insulator to ground causing a path for a major electrical fault.

Theater Transformer Live Parts and Dust

Gym Switchgear View Window

The Gym switchgear lineup has three feeder distribution switches. The switchgear was installed in 1993 during the building upgrades to the Gym and Library areas. Thus that Gym equipment is approximately 25 years of age. The Gym switchgear has glass in each feeder switch section door. This permits the ability to verify each switch position and to inspect the internal components without opening any switches. The three Gym MV switches serve feeders that are routed to three separate pad-mounted transformers located outside the East Building. The transformers provide power to the Gym 208 volt switchboard MDC-2, the Library 208 volt switchboard MDC-3, and the Boiler plant 480 volt motor control center MCC-C. In 2009 an insulator failure occurred in the Gym 13,800 volt switchgear, which caused an outage to the East Building. It is believed that the failure was likely due to outside air with higher moisture content entering the Gym electrical vault from the open grating into the Gym electrical vault, similar to the description above. Since that event, the Gym switchgear insulators were replaced, the Gym electrical vault access grate has been blocked, and a dehumidifier is available for the equipment during wet weather.

Typical electrical equipment is expected to have a nominal useful life between 30 to 40 years, depending on the loading, operation, abuse/care, upkeep, and installation environment of the equipment. It has been noted that much of the medium voltage equipment is older and has had some problems. Therefore, TKDA is recommending that the RCC owned 13,800 volt primary electrical distribution system be removed and the building electrical distribution system be replaced with a 480/208 volt secondary distribution system. This conversion will permit the aged RCC equipment to be replaced and will shift...
the responsibility of the MV equipment monitoring and maintenance to the Utility. MV equipment requires more attention and is more susceptible to failure if not properly tested and maintained. Unless maintenance workers regularly work on MV equipment the knowledge of the operating characteristics and safety procedures can be forgotten. In addition a mistake with MV equipment is more likely to lead to fatalities or to significant damage due to the inherent nature of the higher voltages and large energy levels. MV equipment is a necessity for a large campus with multiple buildings and is therefore not necessary at the Austin Campus today.

The MV cable interconnecting the equipment would have similar ages to the respective MV equipment. XLP insulated MV cables have a typical life expectancy of approximately 25 to 30 years. Cable life is also impacted by the loading and location of the cable. Some of the aged MV cabling is routed underground, which can lead to “treeing” and premature cable failure. The cable could be tested, but the test itself could damage a marginal cable during the procedure; therefore, cable testing is not planned at this time. It is recommended that the cable be removed by the Owner and “replaced” by the Utility as part of their supplied upgrade of the East Building service to secondary voltage. If the Upgrade Project recommendations are not approved and the cable cannot be removed or replaced by the Owner, then the Owner should schedule the MV cable for VLF or other non-destructive cable testing to determine any cable segments that are in imminent danger of failure.

Therefore, TKDA’s proposed plan is for Austin Utility is to provide a secondary 208 volt service for the Theater electrical distribution equipment and a secondary 480 volt service for the Boiler Plant equipment. The recommended configuration would include two 480 volt feeders routed from the Boiler Plant to two new 480 volt to 208 volt transformers mounted outside the Gym and Library electrical rooms to refeed their services. See proposed work descriptions below for more information on the low voltage (208 volt and 480 volt) electrical distribution equipment changes. The Gym switchgear feeders and associated pad mount transformers would be removed as the 480 volt Boiler Plant and the 208 volt Library electrical distribution equipment upgrades are completed. Then once the 208 volt Gym switchboard is replaced and loads transferred to the new equipment, the Gym and Theater MV switchgear, and associated MV feeders would be removed.

THEATER ELECTRICAL ROOMS

The 208 volt main switchboard in the Theater electrical room was installed with the original building, and the equipment has exceeded its normal useful life. There is some evidence of both generalized and local corrosion on some equipment in the electrical room. The localized rusting was noted on some unused conduits. Typically, the localized corrosion is indicated by concentrated rust deposits and/or pitting on the surface of the metal. Ultimately localized corrosion will lead to complete erosion of the affected metal. This corrosive condition usually is the result of moisture or other corrosive agents in an adverse environment. In this case, moist air probably migrated into the electrical room from the adjacent transformer vault that is open to the outside atmosphere through an open grate at the end of the room. The generalized corrosion observed on some of the cabinet surfaces is mostly superficial and usually does not result in more severe damage. The water that occasionally discharges from the tubing near the main switchboard is splashing off the floor onto the cabinet. The source of the water should be stopped and/or controlled away from the electrical equipment. (See the switchboard tubing/corrosion photo in the Appendix.)
TKDA is proposing that a new 208 volt switchboard be installed to replace the existing 208 volt Theater main switchboard. Power would come from a new Utility provided pad mount transformer mounted outside the Theater building. This would permit the removal of the Owner’s three existing single phase transformers mounted in the electrical vault. The new switchboard would then be pre-installed in the space vacated by the removal of the transformers. A temporary 208 volt power source (either temporary remote building power or a generator) may be required to back up the existing Theater service equipment until the new service equipment is operational and the existing loads are transferred to the new source. Once the equipment is installed, the open grate for the vault should be blanked off to eliminate the source of moist air into the electrical vault from the outside. The new equipment will not require the same level of ventilation as the original equipment because the Owner’s heat generating transformers will be removed from the electrical vault. (See the Theater electrical vault open grate photos in the Appendix.) The recommendations for the Emergency Generator panelboard EMDC located in the Theater electrical room will be discussed later in this summary report. The construction sequence planning and other details for the Theater electrical distribution equipment will be determined during the final design for the system.

TKDA is also proposing that the Theater main switchboard ground system be investigated during the final design for construction documents. There were no readily observable grounding connections to the main switchboard other than the ground connections to the single phase transformer tanks. See the “General Miscellaneous” section of this report for discussions on general recommendations for grounding service equipment. In addition see the panelboard section for the recommended general approach for replacing the branch circuit panelboards associated with the Theater electrical distribution system. These general recommendations will be applicable as typical for all of the East Building service and transformer ground system installations and panelboard replacements.
BOILER PLANT

The Boiler Plant service is comprised of a 480 volt motor control center MCC-C. The MCC was installed in 1993. It does not have the required main disconnect switch with overcurrent protection, any indication of an approved UL rating as service equipment, ground fault protection, or proper work clearance in front of the equipment. The MCC main disconnect is only a molded case switch; it does not have the necessary integral overload, short circuit, or ground fault protection. There also was no obvious conduit or conductor providing the required service grounding electrode for either the pad mount transformer or MCC-C. These deficiencies should be verified and improved in any future upgrades to the building service. The 208 volt MDC-2B panelboard, which is fed from MCC-C, was installed with the original building and is clearly beyond its normal useful life.

Therefore, TKDA is proposing that MCC-C be replaced and relocated in an open area in the Boiler plant due to the age of the equipment, the installation deficiencies, and the preference to pre-install the new MCC in a new, open area. The pre-installation of MCC-C will help to reduce the duration of any outage(s) required during the MCC replacement and transfer of associated loads. TKDA also suggests that the new Boiler Plant service equipment be sized to re-feed the equipment upgrades to the Gym switchboard MDC-2, the Library MDC-3 switchboard, and Central Classroom panelboard MDC-2A. TKDA believes that the Boiler Plant will provide more potential open space opportunities than the Gym electrical room area. Also replacing the “end of line” Boiler plant service equipment first and then using the Boiler Plant service to feed the Gym and Library switchboards will be a less disruptive construction sequence.

In addition, the tunnel leaks should be investigated and repairs planned as part of the Boiler plant electrical upgrades. Currently, the existing 13,800 volt feeder from the Gym MV switchgear to the Boiler Plant MCC-C pad mount transformer is routed through the tunnel. The tunnel concrete ceiling and walls have small cracks and sprawling. There were puddles of water on the floor and evidence of some stains on electrical conduits, pull boxes, and associated electrical equipment from water dripping from the cracks. This leaking and corrosion should be corrected to protect the future electrical conduits for the proposed new feeders to the Gym, Library, and Central Classroom distribution equipment routed through the tunnel.

LIBRARY ELECTRICAL ROOM

The existing Library electrical room switchboard MDC-3 was installed in 1992 during a major addition to the Library. The Library electrical equipment is in relatively good shape. The 208 volt main fused switchboard does not appear to meet the working clearance requirements set forth by the National Electrical Code. The NEC requires 42 inches for work clearance between electrical distribution equipment “live parts” and an opposite grounded surface and/or equipment. However, the distance between the electrical room concrete wall (which is considered a grounded surface) and the Library electrical switchboard cover was 38 inches. TKDA would suggest that the Electrical Inspector be asked to review the installation to confirm the adequacy of the current clearance or to permit a continued exemption.
TKDA is suggesting that the existing Library switchboard remain and the service lateral replaced from the new 480-208Y/120 volt transformer described earlier. Since it may be impractical to pre-install the transformer and service lateral, the outage for the demolition and replacement of the equipment could require an extensive outage to complete. Therefore, TKDA expects that the design should include provision for a temporary power source or standby generator to maintain building operations while completing the construction changes.

GYM ELECTRICAL ROOMS

The Gym 208 volt switchboard was installed with the original East Building distribution equipment. As with the other original building equipment, this switchboard is recommended for replacement. The grounding electrode conductor for the switchboard connects to a local copper pipe, which may not meet the NEC requirements for service and/or transformer grounding. This potential deficiency needs to be investigated and corrected during the final design prior to construction. The existing Gym 208 volt switchboard and electrical rooms have been modified, so that some of the original bus duct has remained and cable tray installed. These raceways obstruct the area where the new switchboard could be pre-installed. The proposed switchboard location would also require the removal of the Gym MV switchgear in order to open up clear workspace in front of the new switchboard and to permit removal of the blocked ventilation grate. This grate would need to be removed to permit an access path to bring the new switchboard into the vault. The Gym service modifications should be completed after the Boiler Plant and Library switchboard upgrades, because the Gym transformer would be the only remaining load on the Gym MV switchgear. Due to the complexity of the proposed Gym distribution equipment upgrades, the final design for this area should include the provision of a temporary local power source or a portable generator.

Once the upgrade work is completed, the blocked access grate should be restored and sealed to minimize the intrusion of outside moisture, but maintained for future access. During previous Project site trips, there was evidence of intrusion of water leaks from outside. If this problem still exists, then the cause should be verified, investigated, and a plan developed to correct the source of any identified leaking during final design and construction.

CENTRAL CLASSROOM M/E ROOMS

Both Central Classroom panelboards MDC-1A and MDC-2A are original to the building and past their normal useful life. They should be replaced with the proposed Boiler Plant and Gym equipment upgrade projects above. As noted earlier, MDC-2A would be re-fed from the new Boiler Plant service instead of the Gym switchboard. This change should permit the Gym switchboard to be reduced in size, which will facilitate its location in the Gym electrical vault in the space vacated by the Gym transformers that were removed in 1994. Panelboard MDC-1A would be re-fed from the new replacement Theater switchboard.

The original MDC-1A and MDC-2A switchboards were floor mounted, but may need to be specified as wall mounted units. Replacement switchboards the same size as the original distribution equipment may not fit through the “narrow” stairs and angled doors leading to the Central Classroom area electrical rooms. There also may not be enough open space to pre-install the replacement panelboards; therefore, a temporary power source should be planned to maintain operations for the longer required outage.
LIFE SAFETY GENERATOR SYSTEM

The East Building emergency generator is a small 35 KW Katolight diesel fueled model. The generator base tank has a 200-gallon capacity and will operate for approximately 40 hours when operating at full load with 75% tank level and a 3.5G/HR consumption rate. The generator appears to be newer and properly maintained. There is evidence of some liquid leaking below the generator, but it appears to be from spilled diesel fuel during refueling. The generator should be inspected, serviced, and tested by a factory authorized technician during the final design period to determine if any improvements or additional corrective actions would be recommended. In addition the maintenance records for the generator should be reviewed. The appropriateness of the branch circuits assigned to the Emergency Generator Distribution System for Life Safety purposes were not reviewed for this report, but should be verified during the final design.

The emergency generator panelboard EMDC mounted in the Theater electrical room should be replaced. It has no interior cover and is beyond its normal useful life. This distribution panelboard could be relocated with Theater 208 volt switchboard MDC-1 in the adjacent transformer vault to permit pre-installation. The five panelboards that distribute the emergency power from panelboard EMDC are located throughout the building. These panelboards should be investigated and scheduled for replacement as recommended in the “General Miscellaneous” discussion below in the Panelboard Status and Replacement section.

V. GENERAL MISCELLANEOUS

The following information represents additional topics related to the general assessments and recommendations noted above.

EQUIPMENT RATING REDUCTION ANALYSIS. TKDA is recommending that the loading on the Theater, Gym, Library, Boiler Plant, and Central Classroom switchboards be measured for a period of 30 days. The results of the data logging should be seasonally adjusted and evaluated to determine if any of the replacement switchboards or feeders can be reduced as part of any future Project. This task could be completed early in the final design process. As noted in the Building Load Analysis section above, the maximum building demand was 472KW, which equates to 1541 amp at 208 volt and 667 amp at 480 volt. The Library switchboard is rated for 1600 amp, the Theater and Gym switchboards are rated for 1200 amp, and the Central Classroom switchboards are rated for 800 amp and 1000 amp at 208 volt. The Boiler Plant MCC is rated for 1200 amp at 480 volt. The sum of these existing distribution equipment ratings is clearly larger than the peak demand for the whole building; therefore, the proposed replacement distribution equipment could be individually reduced in size once the measurements are collected and evaluated.

FINAL DESIGN BUILDING UPGRADE ALTERNATES. TKDA will work with the Utility to consider placing the second Utility service at the Gym instead of the originally proposed placement at the Boiler plant. There are benefits and detriments to both locations. For example, placing the second service at the Gym will reduce the feeder lengths since the Gym is more centrally located than the Boiler plant; however, the Gym location will reduce the available space for pre-installation. TKDA will also discuss the possibility of a third Utility service at the Gym, which would leave the Theater and Boiler plant services as proposed. Either of these two alternative solutions will likely require some analysis, design work, and determination of construction costs by the Utility.
PANELBOARD STATUS AND REPLACEMENT. There are approximately 32 panelboards in the West Building. The majority of the panelboards were installed as a part of the original installation of the building electrical distribution system, so many of the panelboards are near the end of their normal useful life. The panelboards were not investigated as part of this assessment; however, it is suggested that the panelboards should be cleaned, inspected, and tested once the major equipment is replaced and operational for the proposed Upgrade Project. The follow-up testing and maintenance work would help to identify deficiencies of individual panelboards and could be used to prioritize the replacement of specific panelboards. A typical panelboard problem would involve a loose or damaged lug, the inability of a circuit breaker to properly reclose after being opened, or the failure of a circuit breaker to trip under fault conditions. Therefore, the testing should include an Infrared Scan of the panelboard looking for loose connections or overloaded circuits. Then each circuit breaker should be opened and closed a couple of times to “re-lubricate” the internal circuit breaker switch mechanism and to check for smooth switching operation. If there is not a clean “snap” in both directions, then the circuit breaker should be replaced. Corrective measures would also include testing the tripping of the breaker under overload and fault conditions and tightening all lugs.

If the panelboard appears damaged or has a significant number of failed breakers, then it might be more economical to replace the unit as a whole depending on the installation. For example, if the panelboard is surface mount, then the cabinet, interior busing section, breakers, and cover would be replaced. However, if the panelboard is flush mount, then only the cover, interior busing section, and breakers would be replaced.

EQUIPMENT NUMBERING AND NAMEPLATES. It is recommended that the numbering for the distribution system equipment be consistent and/or corrected between the drawings and equipment nameplates. There are some inconsistencies between documentation. For example, the emergency panelboard located in the Theater electrical room has been referenced by several designations including “EM1, EE-1, and EME-1.” In addition many of the building room numbers have been changed since the equipment numbering was established on the earlier Project drawings and panelboard nameplates. The proposed design plans and equipment nameplates for the new electrical distribution equipment should reflect new, coordinated, consistent naming conventions using the current room numbers and equipment locations. The new names should be incorporated into the Project design documents. New engraved plastic nameplates with lettering and background colors reflecting the rating, function, and power source of the equipment should also be provided. For example, the equipment nameplates would be configured as follows.

- 208 volt equipment nameplates would be white lettering on a blue background.
- 480 volt equipment nameplates would be white lettering on an orange background.
- Generator fed equipment nameplates would be white lettering on a red background.
- All nameplates would contain the equipment name on line one and the power source on line two.
GROUNDING INVESTIGATION. As noted earlier the grounding for each of the main switchboards was questionable; therefore, it is recommended that a triad ground be installed outside the Theater, Gym, Library, and Boiler Plant switchboards during the electrical distribution system upgrades. Documents would be provided to identify which switchboard neutrals should and should not be bonded with the final documents.

SURGE PROTECTION. It is recommended that the Theater, Gym, Library, and Boiler Plant switchboards be provided with a 250kA Surge Protective Device (SPD) during the Upgrade Project. The SPD should be seven mode and provided with a circuit breaker for disconnection.

ARC FLASH. The Owner should have a Power and Protective Device Coordination analysis performed for both the West and East Buildings once the new electrical distribution equipment for the East Building is selected. This analysis would be used to determine the available fault current and incident energy at each switchboard, motor control center, and panelboard in compliance with NFPA 70E, OSHA, and National Electrical Code requirements.

VI. ESTIMATE OF PROBABLE COSTS

The following schedule summarizes the estimate of probable costs for the basic proposed construction costs for budgeting purposes: Some tasks were identified for investigation and planning only.

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APPENDIX

A. FOUR YEAR UTILITY KW DEM GRAPH

See the following spreadsheet contains four years of KW demand records for the East building.
B. BUILDING ONELINE

Preliminary oneline of the East Building existing electrical distribution system
C. BUILDING ELECTRICAL DISTRIBUTION PLAN

Preliminary plan drawings of the East Building existing electrical distribution system equipment locations
CONSTRUCTION DOCUMENTS
EAST BUILDING
ELECTRICAL EVALUATION

RIVERLAND COMMUNITY COLLEGE
444 Cedar Street, Suite 1530
Saint Paul, MN 55101
651.292.4400

PARTIAL ELECTRICAL TUNNEL PLANS

Scale: 1/4" = 1'-0"

E1.4

GYM ELECTRICAL ROOM
1

SOUTH CLASSROOM
2

NORTH CLASSROOM
3

MAIN ELECTRICAL ROOM
4
D. SUPPLEMENTARY PHOTOS

A-1 Theater Electrical Vault Grate from Outside

A-2 Theater Electrical Vault Grate from Inside

A-3 Theater EMDC Missing Interior Cover

A-4 Theater MDC-1 Tubing and Splash Corrosion