6.3.20 UNIT 65 - ELECTRICAL DISTRIBUTION

6.3.20.1 INTRODUCTION

This section delineates the engineering required to establish the design basis for the electrical distribution system in the Crow Tribe of Indians, Synfuels Feasibility Study.

To meet this requirement the ensuing design philosophies and general system descriptions have been developed. A more complete and detailed explanation of the proposed system is illustrated in accompanying drawings and sketches.

In addition to establishing the electrical design basis, the results of this section have been used to support the capital cost estimate.

6.3.20.2 SUMMARY

This section of the final report evaluates and defines the electrical requirements of the Base Case and Power Self-Sufficiency Case. These reviews are based upon preliminary load listings and power generation figures furnished by Fluor's process engineering department. This section:

Establishes electrical design criteria
Defines an electrical operating philosophy
Addresses the phased construction approach
Supports the capital cost estimate

Coproduction and Shell Coal Case are assumed to be equivalent to the Base Case from an electrical standpoint. This assumption is based upon the facts that the total quantities of power generated onsite and base plant loads, in each of these three cases is within a narrow band. Table 6.3.20-1 displays these relationships.

6.3.20.2 (Continued)

TABLE 6.3.20-1

Case	Onsite Generation	Base Plant Load	Export Power
Base	3 machines 131.7 MW ea.	113.0 MW	282.1 MW
Power Self-Sufficiency	2 machines 88.7 MW ea.	88.7 MW	0
Coproduction	3 machines 106.0 MW ea.	109.5 MW	208.5 MW
Shell Coal	3 machines 141.1 MW ea.	121.1 MW	302.2 MW

The Power Self-Sufficiency Case is dramatically different. Power generation is drastically reduced from the quantities in the other three cases. This impacts the design of the main plant switchyard and utility interconnections. In addition, there is a reduction in the amount of base plant load. This variation eliminates the need for some of the capacity built into the Base Case distribution system. The capital cost estimate for the Self-Sufficiency Case considers these variations.

6.3.20.3 CRITERIA

The continuity of production in an industrial plant is only as reliable as its electrical power distribution system. This section outlines the design and performance objectives of the overall system.

General

The overall objective of the power distribution system is to provide maximum reliability, flexibility, and continuity of service and to meet these objectives with the lowest investment costs that satisfy system requirements.

6.3.20.3 (Continued)

Safety

Safety of life and preservation of property are two of the most important factors in the design of the electrical system. Safety to personnel involves no compromise. Codes, standards, and established practices are followed closely in the selection of all equipment.

Simplicity

Many total shutdowns have resulted from complicated systems. Industrial operators do not get emergency switching practice everyday. If they have complicated systems, experience proves they are apt to make mistakes in an emergency. Simple systems are easy to understand and easy to operate during both normal and emergency conditions.

Flexibility

Flexibility of the electrical system means the adaptability to development and expansion as well as to changes to meet varied requirements during the life of the plant. Considerations include plant voltages, equipment rating, space for additional equipment and capacity for increased load.

Service Reliability

High service reliability generally can be obtained in two ways. One is by providing duplicate channels to route power to any load. The other is by installing only the highest grade electrical equipment available and using the best installation methods. It can be added that service reliability can be increased through simplicity of design, a fact that was emphasized previously.

6.3.20.3 (Continued)

Selection of Equipment

The main fundamental in selecting equipment is to choose the best available. It costs no more in the end and pays dividends in service continuity and low maintenance.

Maintenance

The system design can aid in this problem by being configured in such a way as to provide alternate power channels to permit one to be taken out for maintenance without dropping essential loads. Use of drawout equipment wherever possible enable maintenance on circuit breaker elements to be done in a clean service ship. Spare elements are specified to replace the one being maintained.

6.3.20.4 EVALUATION

Electrical Power Transmission

A definition of the transmission system linking the synfuels plant with the regional utility network is beyond the scope of Fluor's statement of work. The proper method of determining the design criteria of the utility system is to perform a transmission planning study.

The Western Area Power Administration (WAPA) prepared a preliminary study for the proposed Crow 1000 MW coal fired generating plant tentatively located near Hardin, Montana. Studies of this kind base their recommendations upon the following information:

Plant power output
Generator size
Power flow

6.3.20.4 (Continued)

Stability

Proposed additions to the regional transmission system

The WAPA study indicates that a 230 kV system would be inadequate for a Crow plant above 950 MW. It recommends a 345 kV design. The study also shows the Crow power plant as a junction for three transmission lines connecting various other generating stations.

For the synfuels project study Fluor has assumed that the reduced order of magnitude of the generating plant in the Base Case and Alternate Cases will fit comfortably into a 230 kV design. It has also been assumed that two parallel lines would provide ample ties to the regional system. These assumptions are the basis for the design and layout of the switchyard.

For the Power Self-Sufficiency Case a small single tie to the utility system is provided to supply emergency power. Because this tie is on the order of magnitude of 35 MW, a 69 kV service is considered adequate. This arrangement will not need as much analysis as required in the other cases.

Montana Power Company

Montana Power Company of Butte, Montana is the electrical utility most likely to purchase Crow export power. In telephone conversations with a MPC representative it was indicated that the contractural arrangement and the rate schedules developed for the Crow synfuels project would be effected by transmission costs and would be compared to such costs for alternate, better placed projects on the Montana system.

It should be pointed out that the WAPA study stated "contractural arrangements and joint participation in new transmission may have a significant impact on the development of the actual Crow transmission scheme."

6.3.20.4 (Continued)

This same representative also stated that the service arrangement could be designed to accommodate reverse power flow. The Crow electrical design takes advantage of this capability and uses it for startup and emergency power. This eliminates the need and problems associated with installing, operating, and maintaining diesel engine or turbine driven emergency generators.

This type of service is normally provided for Montana Power's own generating plants, but has never been contracted out to a client. The impact of this arrangement upon the Agreement for Purchase of Power is not known at this time.

Big Horn County Electric Cooperative, Inc.

Big Horn County Electric of Lodge Grass, Montana will provide power for operation of the raw water supply pumping stations.

Electrical service to the pumping stations is more straight forward than the export, startup, emergency agreement with Montana Power. Each pumping station has been designed to be connected to a 69 kV transmission line.

The average charge for electrical power from the present schedule works out to be approximately two cents per kWh.

Base Case

Normal System

Electrical power for operation of the Crow synfuels plant is produced onsite in Unit 42, Power Generation. Three 1500 psig steam turbogenerators produce 131.7 MW each. These machines operate at 24 kV, 60 Hz with a 0.8 power factor (PF).

6.3.20.4 (Continued)

Plant generation capabilities total approximately 395 MW. Of this 113 MW are consumed within the plant itself. The remaining 282 MW is export via two parallel transmission lines and sold as a byproduct to the local utility, Montana Power.

The main switchyard functions as the connecting and switching point for the transmission lines, generation circuits and step-up and step-down transformers. It is located adjacent to Unit 42 and designed to operate at 230 kV.

The main switchyard is arranged in a break-and-a-half scheme. This scheme has three breakers in series between two main buses. Two circuits are connected between the three breakers. This pattern is repeated along the main buses so that one and a half breakers are used for each circuit.

Under normal operating conditions all breakers are closed and both buses are energized. A circuit is tripped by opening the two associated circuit breakers. Either bus may be taken out of service at any time with no loss of service. Breaker maintenance can be done with no loss of service, no relay changes and simple operation of the breaker disconnects.

Generators are connected by 24 kV isolated phase bus to step-up, captive transformers in the switchyard. Plant power is drawn through two 230-13.8/13.8 kV three winding transformers. This arrangement allows the main substation equipment to be broken down into two independent switchgear lineups. The ultimate benefit of this design is the decrease in the required duty of the switchgear in both short circuit and continuous current ratings. The result is a primary distribution system designed at 13.8 kV.

6.3.20.4 (Continued)

Without this splitting of the system the primary distribution voltage would be forced to the next higher standard voltage. As 15 kV equipment is the maximum rating of economical indoor metal-clad switchgear, the advantages over outdoor oil or gas insulated equipment would be lost. Indoor metal-clad switchgear is compact, easy to maintain, flexible, and presents a system that is simpler to operate.

Primary power is distributed at 13.8 kV to substations located adjacent to the units and close to the centers of the loads. Here it is stepped down to utilization voltages and delivered by short secondary feeders to points of use. Medium voltage 4.16 kV circuits power the larger electric drivers and supply small adjacent units. Low voltage 480 volt circuits distribute the bulk of the power to the large number of small consumers.

The electrical distribution system from the switchyard through to the loads is a classical secondary-selective design. The system utilizes two primary feeder circuits and two transformers to supply each load center. Duplicate paths of supply from the source to each secondary bus make it possible to provide power when a transformer or primary circuit is out of service due to failure, testing, maintenance, or expansion. No single problem on any circuit can interrupt service.

The secondary-selective scheme is achieved through the use of double ended substations. The tie breaker is normally open and the system operates as two parallel radial systems. The tie breakers are interlocked with the transformer breakers so that they cannot close unless one of the transformer breakers is open. This practice minimizes the short circuit duty imposed on low voltage circuits.

6.3.20.4 (Continued)

With the loss of one primary circuit each load center may be totally supplied by the complementary circuit. To allow for this condition all transformers have been sized so that the forced air cooling rating is of sufficient size to carry both loads.

Emergency System

An emergency system is provided for semi-critical loads to supply the necessary lighting and equipment to facilitate a safe and orderly plant or unit shutdown in case of a complete or partial failure of the normal electrical supply.

The emergency distribution system is independent of the normal system both in its derivation of an energy source and in its distribution systems. For reasons of plant operating security and electrical system stability most critical loads are normally powered from the emergency system and transferred to the normal system during an upset.

Power for the emergency system shall be drawn from the switchyard through a dedicated 40 MVA, 230-13.8 kV transformer. Reliable operation is derived from the:

Double bus, double breaker switchyard arrangement of the emergency equipment.
Three onsite steam turbines
Ability of local utility to reverse the normal export power flow to provide emergency and startup service.

The emergency system is tied to the loads through 600 volt automatic transfer switches and 5 kV switchgear type circuit breakers. Automatic transfer switches include a bypassing arrangement to allow servicing of the switch while the load is energized.

6.3.20.4 (Continued)

The aforementioned, multiple feeders, alternate energy sources and segregated systems assure a maximum degree of reliability and flexibility in the operation of the emergency system.

In addition to the emergency system an Uninterruptible Power Supply (UPS) is used to supply a continuous source of ac power to critical loads. During any interruption of the ac input to the UPS system a battery bank supplies dc power to an inverter without variation in inverter output voltage or frequency.

The main critical load supplied from the UPS system is the computer and its peripheral equipment. Other loads are dictated by process control requirements.

Phased Construction

The general plant electrical design has been laid out using a two phased construction approach. Every effort has been made to design a system which minimizes the expenses associated with the future expansion of the project during initial construction.

The design does make some allowances for the extension of the electrical system to service loads in the future segments of the plant.

Manholes in areas designated for future expansion have been sized and located as if both phases were to be built initially. Without this approach it would be impossible to cross existing ducts during the expansion.

The switchyard is configured in a fashion which will allow the addition of the future generation and the new distribution system designed for the future loads without shutting down generation and electrical export activities.

6.3.20.4 (Continued)

The electrical system for the plant expansion will originate in a mirror image of the existing switchyard as shown on Drawing 00-5-603A. A separate 13.8 kV primary distribution system will be dedicated to the new and expanded units.

Capital Cost Estimate

The capital cost estimate presents a total picture of the price tag for the entire synfuels project. The electrical portion of the estimate is composed of two distinct segments.

Due to the time restraints on this project, the electrical segment of the estimate is based upon a preliminary issue of the overall plot plan, not included in the report. Onsite power generation, base plant load, and the outside dimensions of the plot all remained substantially unchanged when the final information became available. Therefore, the capital cost estimate is assumed to represent the value of the electrical system for the plant arrangement submitted as part of this report. The first segment of the estimate evaluates the cost of the electrical systems within the boundaries of the individual areas and units. The cost of these items is included in the computer estimating program.

The second portion encompasses the interconnecting systems such as the primary distribution network and overall street lighting and grounding systems. The primary distribution system includes all equipment and wiring at and above the 480 volt switchgear level.

Because each of these systems is dependent upon the magnitude of the load and dimensions of the plot, they cannot be estimated by the computer. Therefore, these and similar systems were defined and manually estimated.

6.3.20.4 (Continued)

As previously stated a detailed evaluation was completed for the Base Case and assumed to be equivalent to the systems in Alternate Cases 2 and 3. The Power Self-Sufficiency was factored off the Base Case with allowances made for the variations in the switchyard design and reduction in overall plant load.

Almost all electrical drawings produced for this project have been used to support this portion of the estimate. The following are brief descriptions of each of these drawings and the systems they present. Appendix 6.3.20-1 List all electrical design drawings included in this section of the final report.

Area Classification 00-5-602

A preliminary definition of the extent and degree of hazard is presented in Drawing 00-5-602. Areas and process units are classified as to the type and degree of hazard as defined by the National Electrical Code (NEC) supplemented by recommendations in the American Petroleum Institute "Recommended Practices" RP 500A, RP 500B, RP 500C, and National Fire Protection Association Standard 70C, where applicable.

Each classifications refers to a different set of electrical installation guidelines in the NEC. The code defines the requirements for electrical equipment and wiring in these locations where fire or explosive hazard may exist due to flammable gases or vapors, flammable liquids, combustible dust or ignitable fiber or flyings.

Locations are classified depending on the properties of the flammable vapors, liquids, or gases or combustible dust or fibers which may be present, and the likelihood that a flammable or combustible concentration or quantity is present. During detailed engineering, area classification

6.3.20.4 (Continued)

drawings shall be produced for areas and process units as required and shall indicate the limits both horizontally and vertically of classified areas.

The area classification drawings are used by the estimators to determine the type and degree of hazard of the particular area. With this information the installation practices dictated by the NEC can be allowed for in the estimate.

One Line Diagrams 00-5-603A thru H

The one line diagrams show by means of graphical symbols and conventional nomenclature an overall distribution system arrangement. During detailed engineering the simplified diagrams included with this report will be upgraded to show the entire power distribution system from the incoming source to the ultimate motor loads and other electrical users. The drawings presented here are used solely to evaluate the primary distribution system. They define:

Major electrical equipment items
Switchyard design requirements
Interconnecting conduit and cabling
High voltage motors
Underground duct banks

Standard Drawings 00-4-605G and 00-4-605 LA thru LD

These Fluor standard grounding and lighting drawings, used with the plan drawings, provide the estimator with a model upon which to base pricing. Use of these drawings also allow electrical designers to more quickly

6.3.20.4 (Continued)

produce installation plans. The designer has only to reference the detail for each case. Fluor uses this approach extensively during detailed engineering.

Power Distribution System Layout 00-5-607A

The Power Distribution System Layout is an overall plant plot which include electrical substations, manholes, and duct banks. This drawing locates the substations and defines the routing of underground conduit systems.

Switchyard Plans 00-5-611A thru 611C and 00-4-611E

These sketches are preliminary switchyard arrangements for the Base Case and Power Self-Sufficiency Case. The layouts are based upon standard arrangements used by Fluor Power Services. The drawings are used for allocating space on the overall plot plan and for estimating major electrical equipment.

Grounding, Street, and Perimeter Lighting 00-5-612A

The grounding portion of this drawing defines the extent of the interconnecting system used to establish a single ground reference point within the plant. Overall area and security lighting is presented here as well.

The use of this drawing in conjunction with the Flour standard drawings previously listed provides the estimator with a tool that defines the extent of the grounding and lighting systems outside the boundaries of the individual unit.

6.3.20.4 (Continued)

Distributed Control System Layout 00-5-613A

The Distributed Control System Layout is an overall plot plan drawing which shows the routing and installation of the all conduit and hardware associated with the distributed control system data highway.

Fluor Standard Substation Layout 00-2-14A

Fluor Standard Substation Layout is included to give a more complete picture of what to anticipate in regards to the electrical system design. The drawing presents an equipment layout that Fluor has found through the course of past projects to offer the best compromise in coordinating all the systems included in the substation.

This design is an idealized arrangement and may not be adaptable to all installation. A final substation design will depend upon the particulars of each individual situation as well as client requirements.

Power, Lighting, and Grounding Plan; Raw H_2O Supply Pumping Stations 44-5-607A

This drawing has been developed to define and estimate all electrical equipment and systems associated with the Raw Water Supply Pumping Stations.

Power Self-Sufficiency Case

Onsite generation and the base plant load for the Self-Sufficiency Case are significantly different than the quantities developed in the Base Case. See Table 6.3.20-1 for a comparison.

6.3.20.4 (Continued)

The plant design in the Self-Sufficiency Case is capable only of supplying its own electrical energy requirements. No design consideration are included for the plant to be a net electricity exporter.

One hundred percent redundancy in the power generation plant assures an adequate degree of on-time energy production. A standby utility service increases overall system security.

With the elimination of export power the 230 kV switchyard design level dictated by the utility connection in the other cases is no longer applicable. Design considerations in the Power Self-Sufficiency Case indicate that a 69 kV level is adequate.

The revised plant design considerations also indicate that the breaker-and-a-half scheme used in the other cases exceeds acceptable engineering practices. A double bus, single breaker scheme has been evaluated and found to be an acceptable approach.

This scheme uses two main buses and each circuit includes two bus selector disconnect switches. A bus tie connects to the two main buses and when closed allows transfer of a feeder from one bus to the other without deenergizing the feeder circuit.

Generation and base plant power supplies are connected to the switchyard in a manner which is substantially the same as in the Base Case.

The capital cost estimate of the Power Self-Sufficiency Case does make allowance for the reduction in generation and base plant load as well as the reconfiguration of the switchyard.

6.3.20.5 CONCLUSION

The drawings and writings included in this section of the final report provides a preliminary design and description of the electrical system for the synfuels plant.

The engineering approach to the design of the electrical system follows established industry standards and proven Fluor practices.

The electrical system is economically designed for reliable service and safety to personnel and equipment, ease of maintenance and operation, minimum power losses, mechanical protection of equipment, interchangeability of equipment and addition of future loads. Additionally, the electrical layout takes into consideration the total size of the installation, generation capacity, utility service, and load density.

Special attention has been given to those items which have a large influence on the overall cost and selection of system voltages. These items include switchgear, fault duty, feeder circuits and circuit arrangement. Sectionalization and segregation have also been considered as important factors in ensuring reliability. This approach is designed to limit a failure to small portions of the system.

The basis engineering philosophy is to distribute power at the most economical distribution voltage level to areas of concentrated electrical load. The distribution voltage shall be transformed to a lower utilization voltage and delivered to the utilization equipment via relatively short secondary feeders.

Voltage insulation levels, interrupting capacities, circuit protection, continuous current capacities and mechanical strengths shall be selected and coordinated in accordance with calculations, and the recommendations of the Institute of Electrical and Electronic Engineers (IEEE), the National

6.3.20.5 (Continued)

Electrical Manufacturers Association (NEMA), the National Standards Institute (ANSI), and the Insulated Cable Engineers Association (ICEA). Necessary calculations will be made to ensure all equipment is suitable for the duty required and the application.

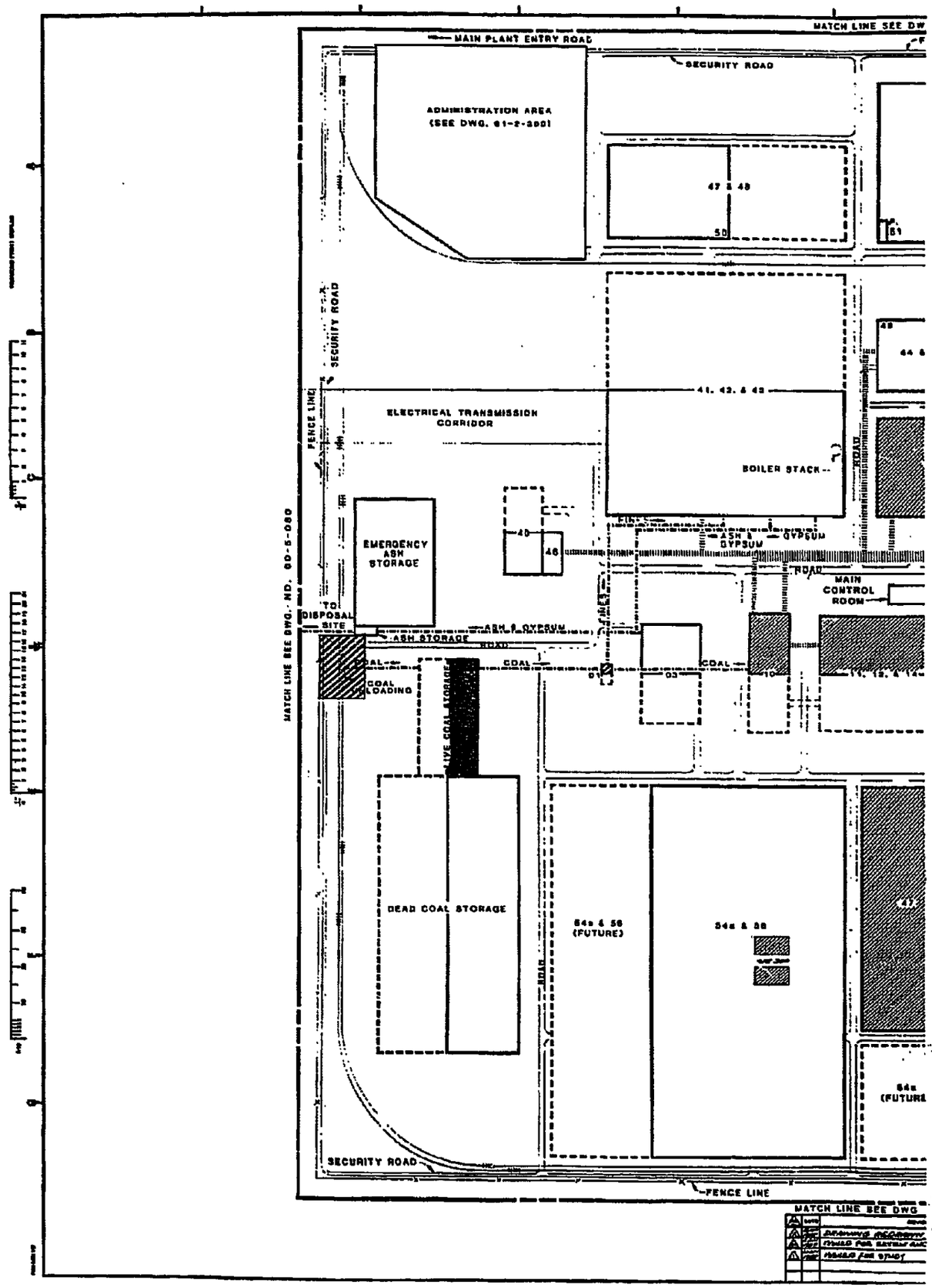
APPENDIX 6.3.20-1

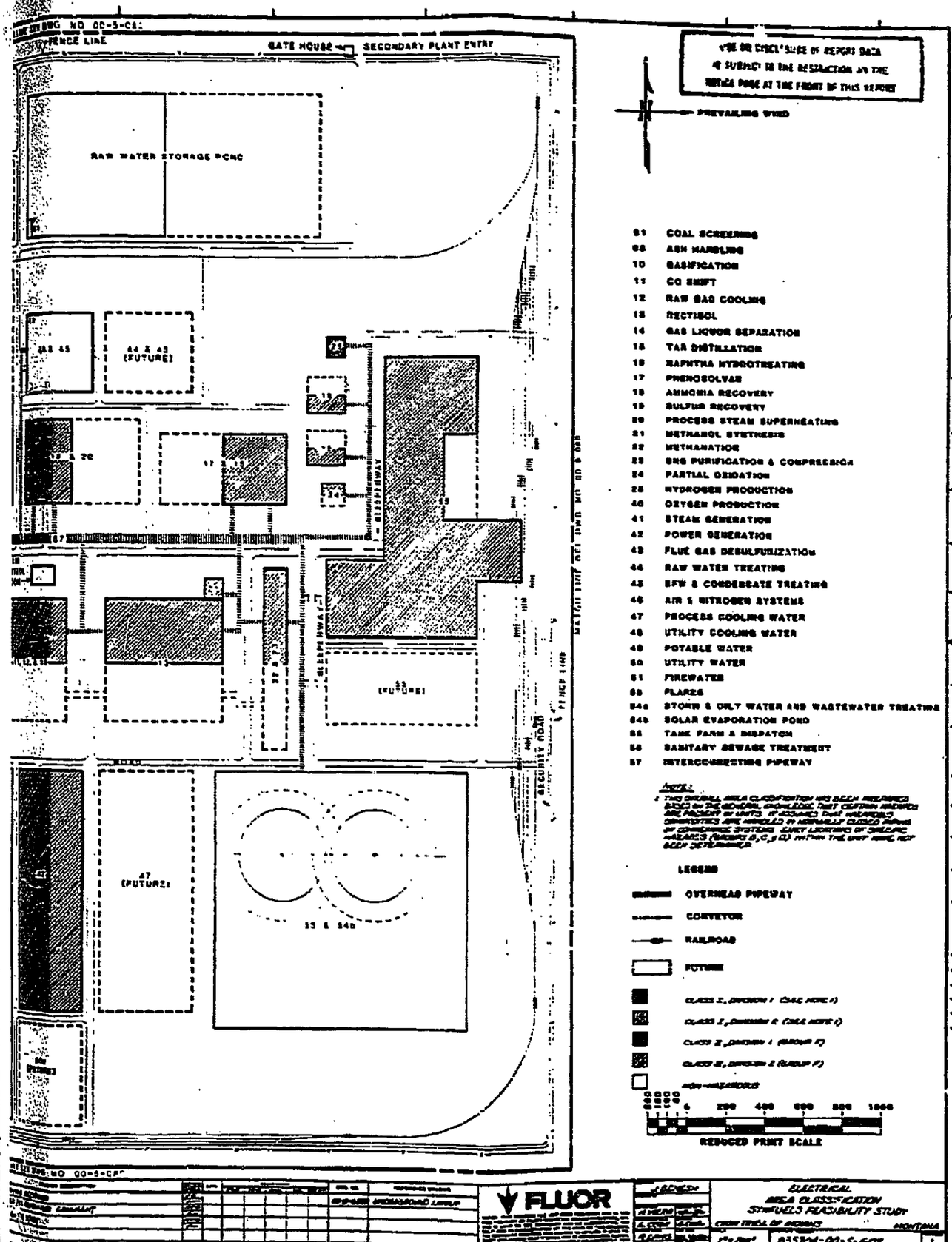
ELECTRICAL DESIGN DRAWINGS

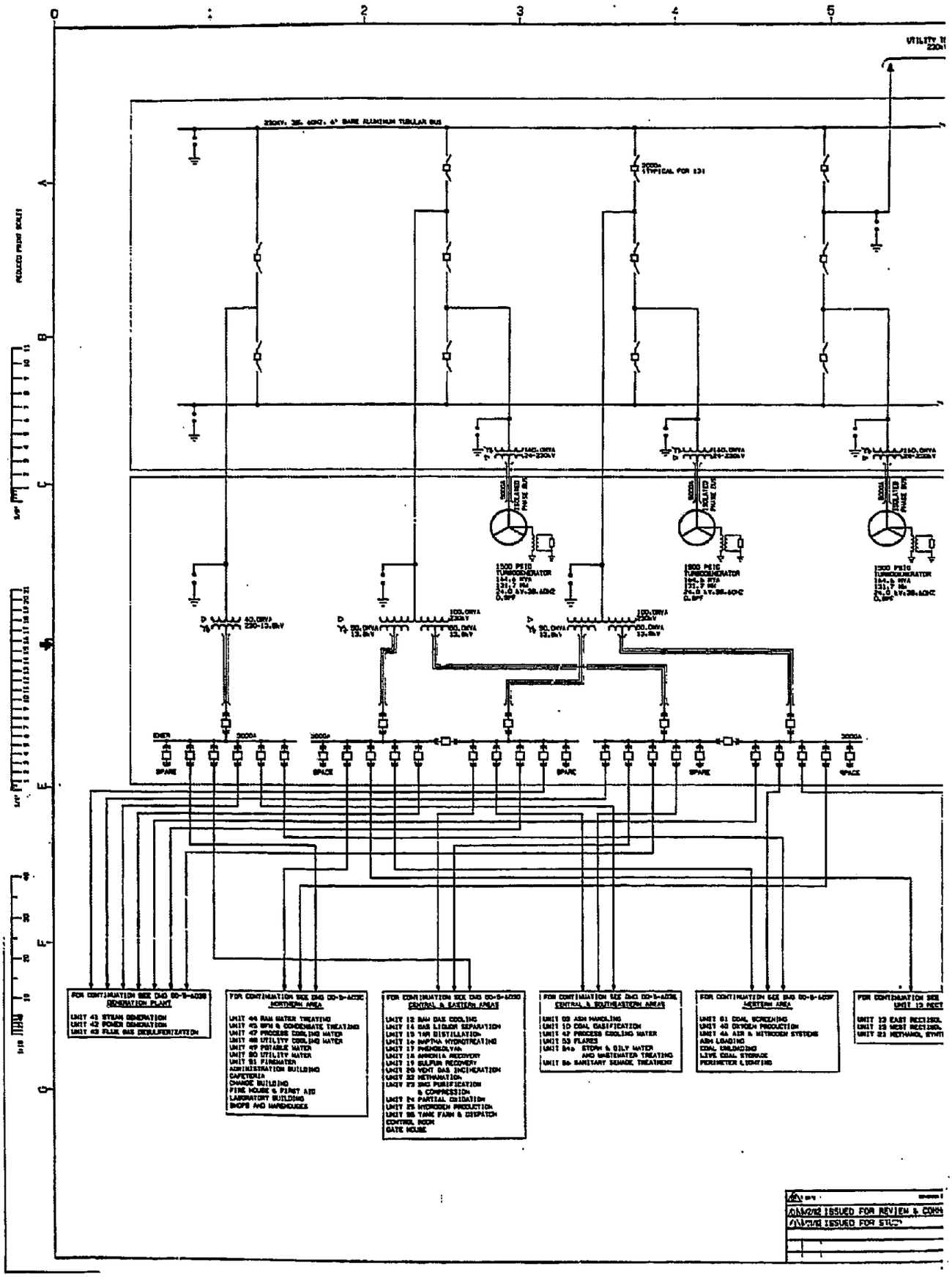
DRAWINGS	TITLE	REVISIONS
835704-00-5-602	Area Classification	1
835704-00-5-603A	Utility & Distribution System Base Case	1
835704-00-5-603B	Power Distribution, Generation Plant	1
835704-00-5-603C	Power Distribution, Northern Area	1
835704-00-5-603D	Power Distribution, Central & Eastern Areas	1
835704-00-5-603E	Power Distribution, Central & South Eastern Area	1
835704-00-5-603F	Power Distribution, Western Area	1
835704-00-5-603G	Power Distribution, Unit 13 Rectisol	1
835704-00-5-603H	Utility & Distribution System Alternate 1	1
835704-00-4-605G	Standards Grounding	
835704-00-4-605LA	Standards Lighting	1
835704-00-4-605LB	Standards Lighting	1
835704-00-4-605LC	Standards Lighting	1
835704-00-4-605LD	Standards Lighting	1
835704-00-5-607A	Power Distribution System Layout	1
835704-00-5-611A	Switchyard Plan	1
835704-00-4-611B	Switchyard Plan	1
835704-00-4-611C	Switchyard Plan	1
835704-00-4-611E	Switchyard Plan (Alternate 1)	1

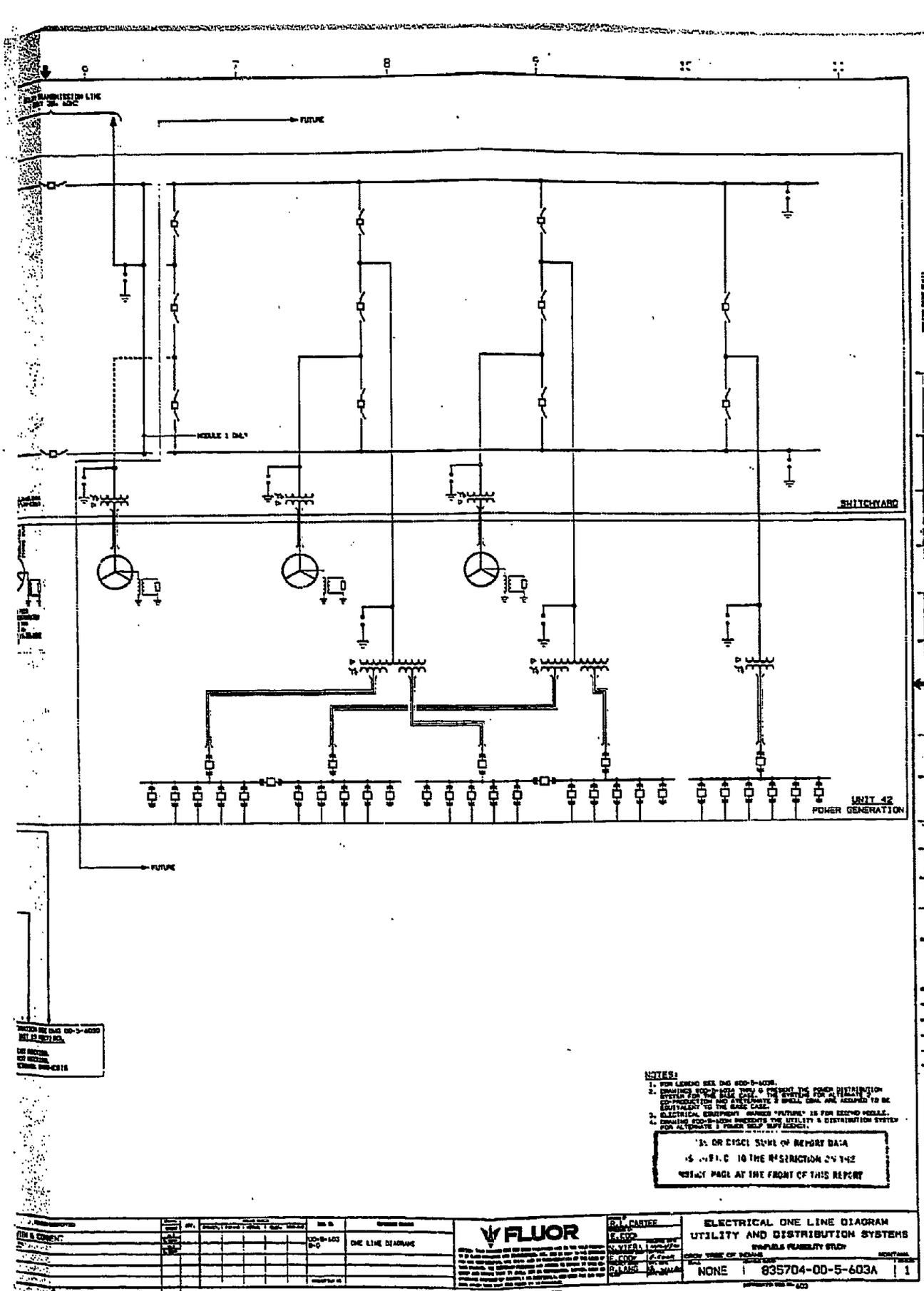
APPENDIX 6.3.20-1 (Continued)

DRAWINGS	TITLE	REVISIONS
835704-00-5-612A	Grounding, Street, and Perimeter Lighting	1
835704-00-5-613A	Distributed Control System Layout	1
835704-00-2-14A	Fluor Standard Substation Layout	1
835704-44-5-607A	Power Lighting and Ground Plan Raw H_2O Supply Pumping Stations	1


MATCH LINE SEE DW
MAIN PLANT ENTRY ROAD
SECURITY ROAD
ADMINISTRATION AREA
(SEE DWG. 61-2-350)
47 & 48
50
51
SECURITY ROAD
41, 42, & 43
ELECTRICAL TRANSMISSION
CORRIDOR
FENCE LINE
BOILER STACK
ROAD
EMERGENCY
ASH
STORAGE
40
46
ASH & GYPSUM
GYPSUM
ROAD
MAIN
CONTROL
ROOM
TO
DISPOSAL
SITE
ASH STORAGE
ASH & GYPSUM
ROAD
COAL
COAL
COAL
COAL
LOADING
03
10
LIVE COAL STORAGE
DEAD COAL STORAGE
54a & 58
(FUTURE)
54a & 58
ROAD
SECURITY ROAD
FENCE LINE
MATCH LINE SEE DWG. NO. 60-5-060
MATCH LINE SEE DWG


FENCE LINE
GATE HOUSE
SECONDARY PLANT ENTRY
RAW WATER STORAGE POND
44 & 45
44 & 45 (FUTURE)
47 (FUTURE)
33 & 34b
(FUTURE)
PREVAILING WIND
61 COAL SCREENING
62 ASH HANDLING
10 GASIFICATION
11 CO SHIFT
12 RAW GAS COOLING
13 RECTISOL
14 GAS LIQUOR SEPARATION
15 TAR DISTILLATION
16 NAPHTHA HYDROTREATING
17 PHENOSOLVAN
18 AMMONIA RECOVERY
19 SULFUR RECOVERY
20 PROCESS STEAM SUPERHEATING
21 METHANOL SYNTHESIS
22 METHANATION
23 GAS PURIFICATION & COMPRESSION
24 PARTIAL OXIDATION
25 HYDROGEN PRODUCTION
40 OXYGEN PRODUCTION
41 STEAM GENERATION
42 POWER GENERATION
43 FLUE GAS DESULFURIZATION
44 RAW WATER TREATING
45 BFW & CONDENSATE TREATING
46 AIR & NITROGEN SYSTEMS
47 PROCESS COOLING WATER
48 UTILITY COOLING WATER
49 POTABLE WATER
50 UTILITY WATER
51 FIREWATER
53 FLARES
54a STORM & OILY WATER AND WASTEWATER TREATING
54b SOLAR EVAPORATION POND
55 TANK FARM & DISPATCH
56 SANITARY SEWAGE TREATMENT
57 INTERCONNECTING PIPEWAY
NOTE:
LEGEND
OVERHEAD PIPEWAY
CONVEYOR
RAILROAD
FUTURE
0 200 400 600 800 1000
REDUCED PRINT SCALE
FLUOR
ELECTRICAL AREA CLASSIFICATION
SYNFUELS FEASIBILITY STUDY
1"=80'
B35704-00-5-602
1


0
2
3
4
5
A
B
C
D
E
F
G
230kV, 3Ø, 60HZ, 6" BARE ALUMINUM TUBULAR BUS
3000A TYPICAL FOR 131
1500 PSIG TURBOGENERATOR
3000A ISOLATED PHASE BUS
3000A
SPARE
SPACE
FOR CONTINUATION SEE DWG 00-B-A038
GENERATION PLANT
UNIT 41 STEAM GENERATION
UNIT 42 POWER GENERATION
UNIT 43 FLUE GAS DESULFERIZATION
FOR CONTINUATION SEE DWG 00-B-A038
NORTHERN AREA
UNIT 44 RAW WATER TREATING
UNIT 45 BFW & CONDENSATE TREATING
UNIT 47 PROCESS COOLING WATER
UNIT 48 UTILITY COOLING WATER
UNIT 49 POTABLE WATER
UNIT 50 UTILITY WATER
UNIT 51 FIREWATER
ADMINISTRATION BUILDING
CAFETERIA
CHANGE BUILDING
FIRE HOUSE & FIRST AID
LABORATORY BUILDING
SHOPS AND WAREHOUSES
FOR CONTINUATION SEE DWG 00-B-A038
CENTRAL & EASTERN AREAS
UNIT 12 RAW GAS COOLING
UNIT 14 GAS LIQUOR SEPARATION
UNIT 15 TAR DISTILLATION
UNIT 16 NAPTHA HYDROTREATING
UNIT 17 PHENOSOLVAN
UNIT 18 AMMONIA RECOVERY
UNIT 19 SULFUR RECOVERY
UNIT 20 VENT GAS INCINERATION
UNIT 22 METHANATION
UNIT 23 SNG PURIFICATION & COMPRESSION
UNIT 24 PARTIAL OXIDATION
UNIT 25 HYDROGEN PRODUCTION
UNIT 26 TANK FARM & DISPATCH
CONTROL ROOM
GATE HOUSE
FOR CONTINUATION SEE DWG 00-B-A038
CENTRAL & SOUTHEASTERN AREAS
UNIT 09 ASH HANDLING
UNIT 10 COAL GASIFICATION
UNIT 42 PROCESS COOLING WATER
UNIT 53 FLARES
UNIT 54b STORM & OILY WATER AND WASTEWATER TREATING
UNIT 56 SANITARY SEWAGE TREATMENT
FOR CONTINUATION SEE DWG 00-B-A038
WESTERN AREA
UNIT 01 COAL SCREENING
UNIT 02 OXYGEN PRODUCTION
UNIT 04 AIR & NITROGEN SYSTEMS
ASH LOADING
COAL UNLOADING
LIVE COAL STORAGE
PERIMETER & LIGHTING
ISSUED FOR REVIEW & COMM
ISSUED FOR STUDY



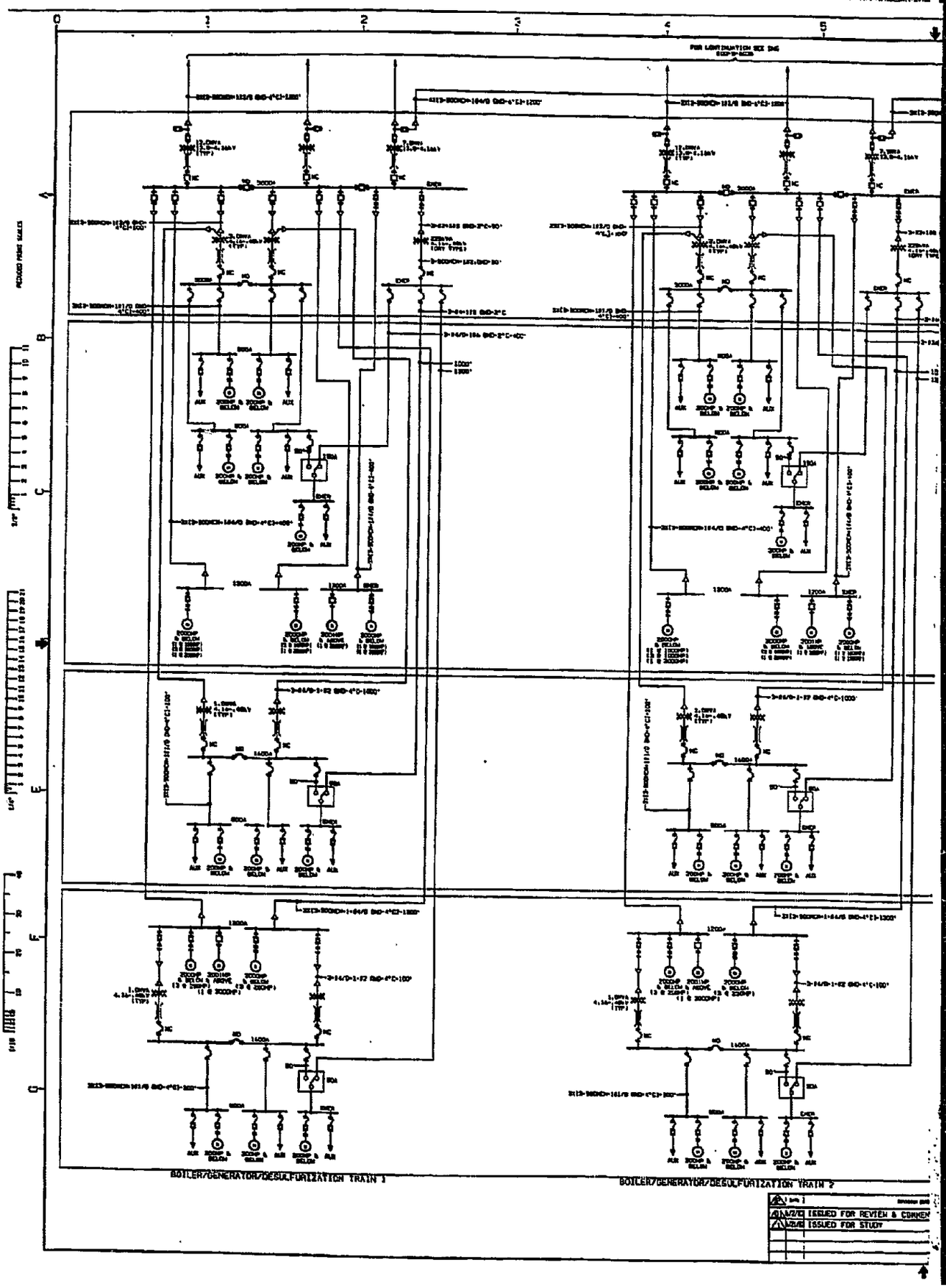
NOTES:
1. FOR LEGEND SEE DWG 800-P-600B.
2. DRAWING 800-P-600A DOES NOT SHOW THE POWER DISTRIBUTION SYSTEM FOR THE BASE CASE. THE SYSTEM FOR ALTERNATE 2 CO-PRODUCTION AND ALTERNATE 3 SMALL COAL ARE ASSUMED TO BE EQUIVALENT TO THE BASE CASE.
3. ELECTRICAL EQUIPMENT SHOWN "FUTURE" IS FOR SECOND MODULE.
4. DRAWING 800-P-600A PRESENTS THE UTILITY & DISTRIBUTION SYSTEM FOR ALTERNATE 1 POWER SELF SUFFICIENCY.

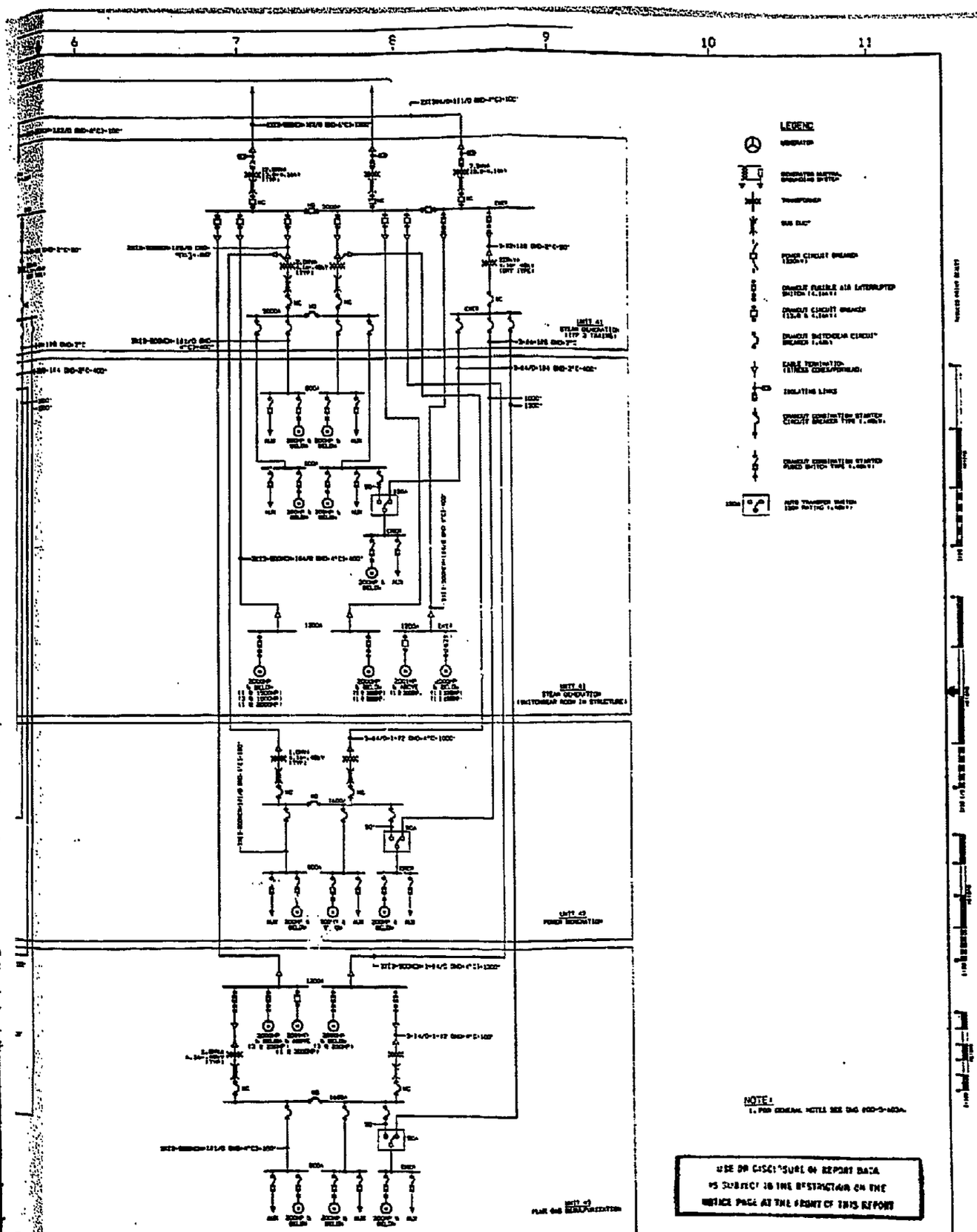
FLUOR

ELECTRICAL ONE LINE DIAGRAM
UTILITY AND DISTRIBUTION SYSTEMS
SYNFUELS FEASIBILITY STUDY

NONE	835704-00-5-603A	1

ONE LINE DIAGRAM


BOILER/GENERATOR/DESULFURIZATION TRAIN 1
BOILER/GENERATOR/DESULFURIZATION TRAIN 2
ISSUED FOR REVIEW & COMMEN
ISSUED FOR STUDY

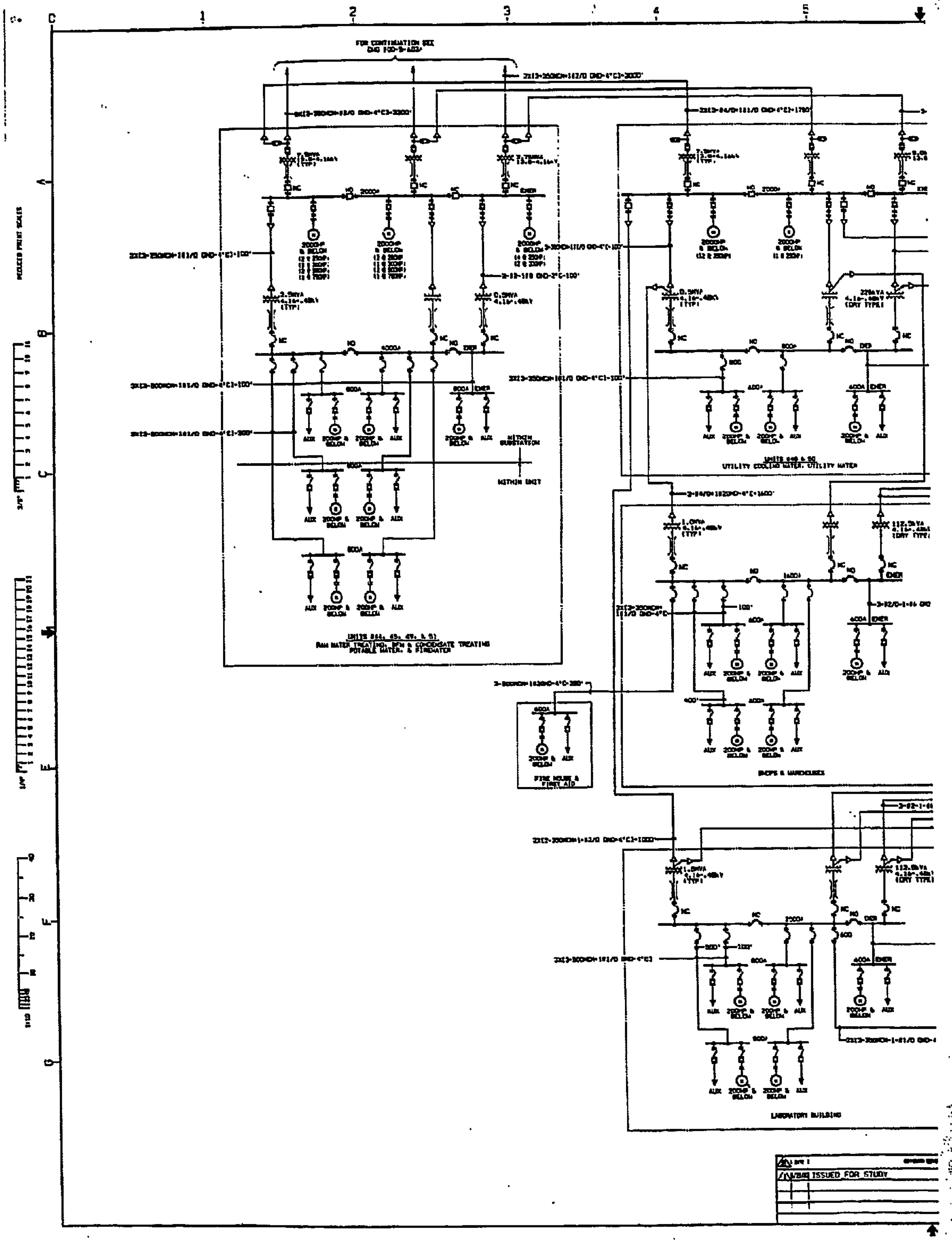


BOILER/GENERATOR/DESULFURIZATION Train 2

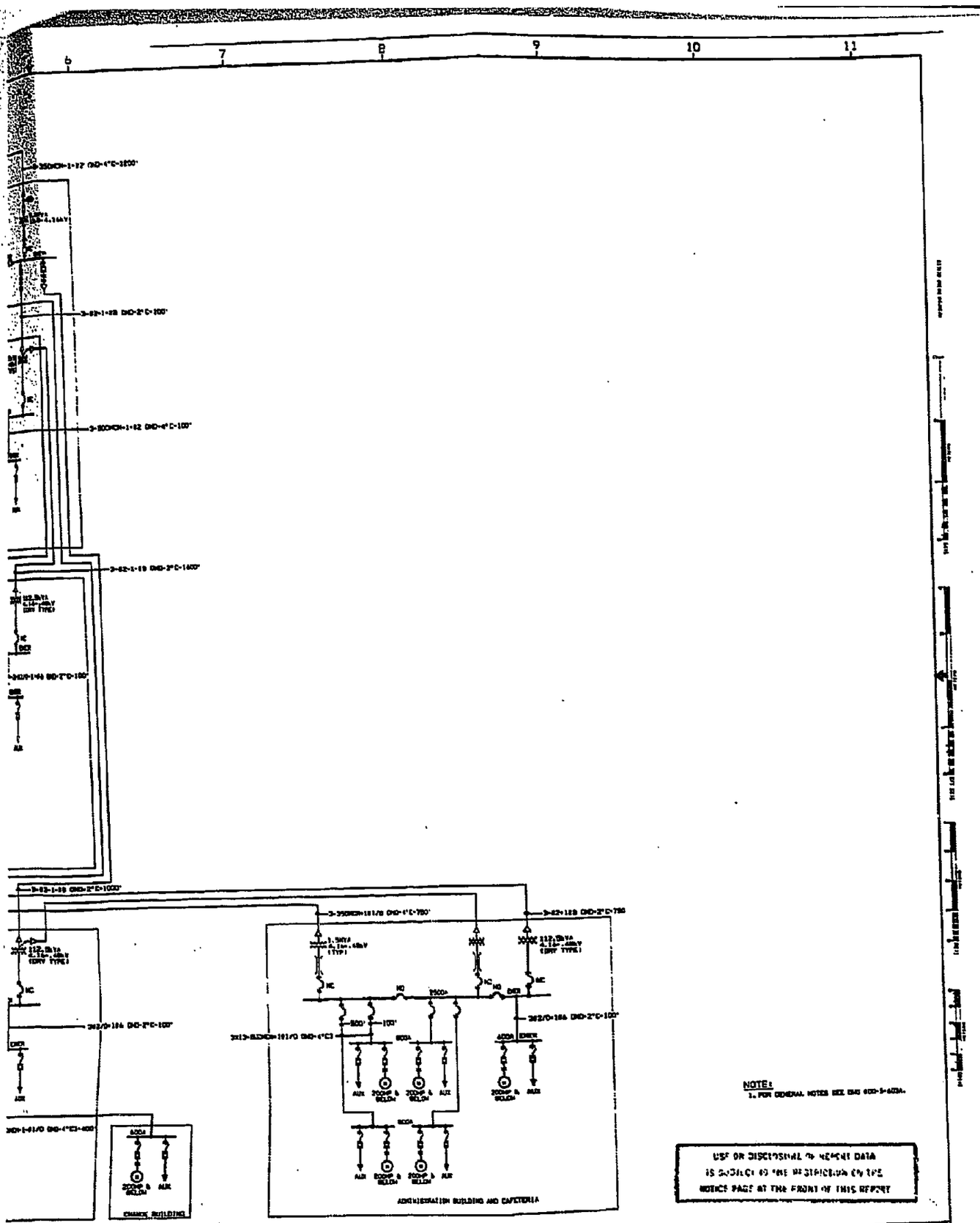
FLUOR

ELECTRICAL ONE LINE DIAGRAM
POWER DISTRIBUTION-GENERATION PLANT
SIMPLIFIED FEASIBILITY STUDY

NONE	835704-00-5-6038	1



WITHIN SUBSTATION
WITHIN UNIT
UNITS 44A, 45, 49, & 51
RAW WATER TREATING, BFW & CONDENSATE TREATING
POTABLE WATER, & FIREWATER
UTILITY COOLING WATER, UTILITY WATER
SHOPS & WAREHOUSES
FIRE HOUSE & FIRST AID
LABORATORY BUILDING
ISSUED FOR STUDY



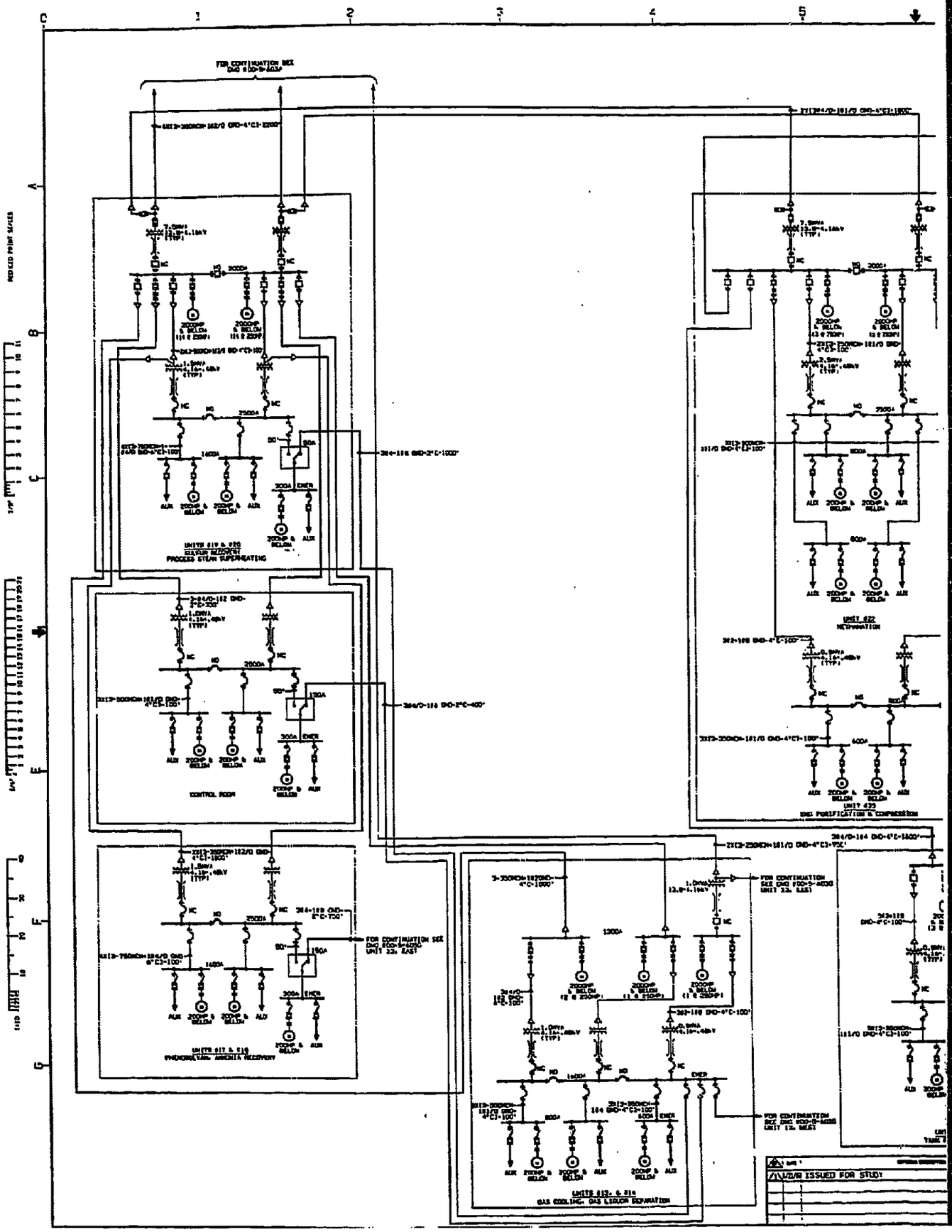
USE OR DISCLOSURE OF PROPRIETARY DATA IS SUBJECT TO THE RESTRICTIONS ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

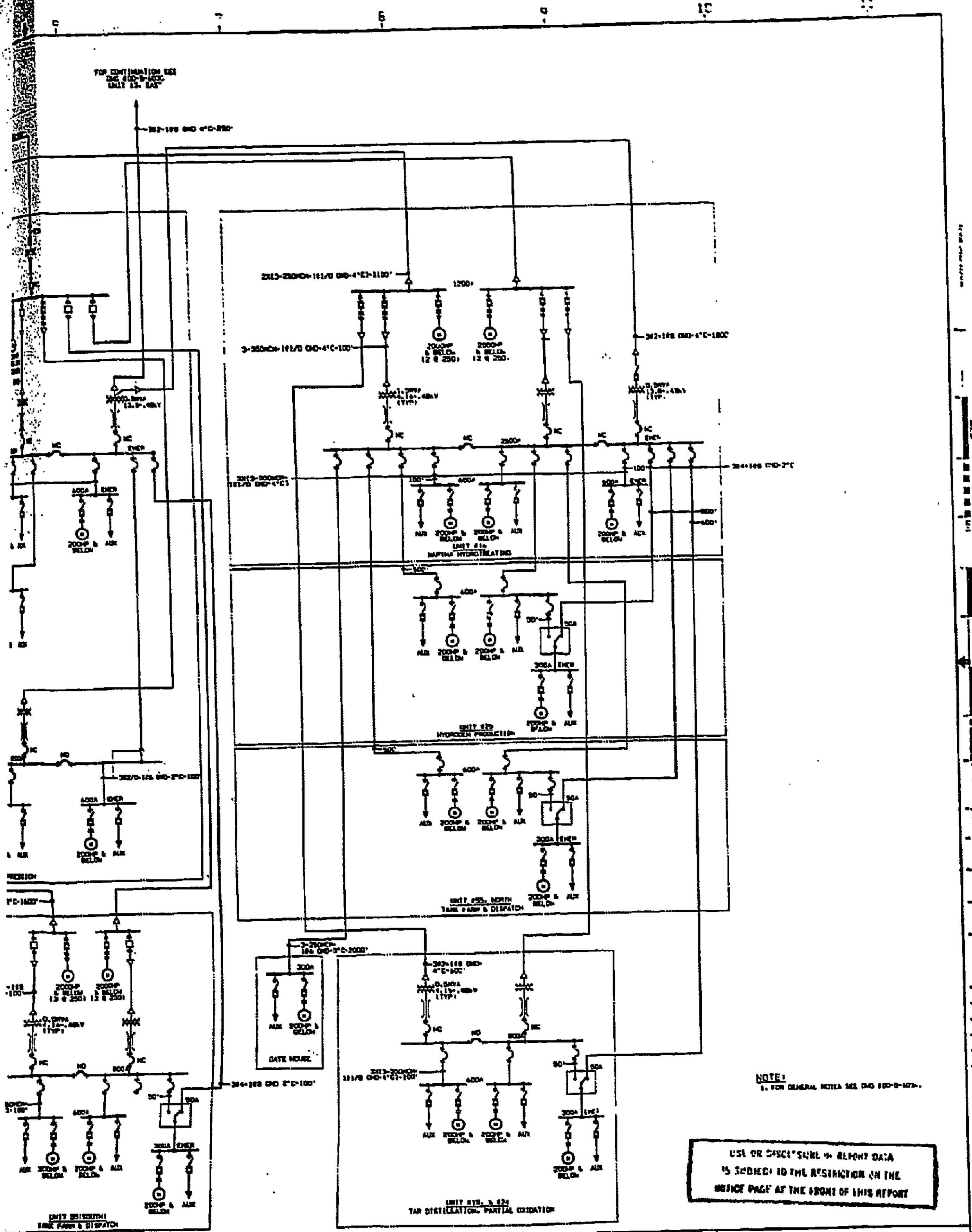
FLUOR

ELECTRICAL ONE LINE DIAGRAM
POWER DISTRIBUTION-NORTHERN AREA
SYNFUELS FEASIBILITY STUDY
CROW TRIBE OF INDIANS MONTANA

NONE | 835704-00-S-603C | 1

ONE LINE DIAGRAMS


REVISED PER NOTES
ISSUED FOR STUDY



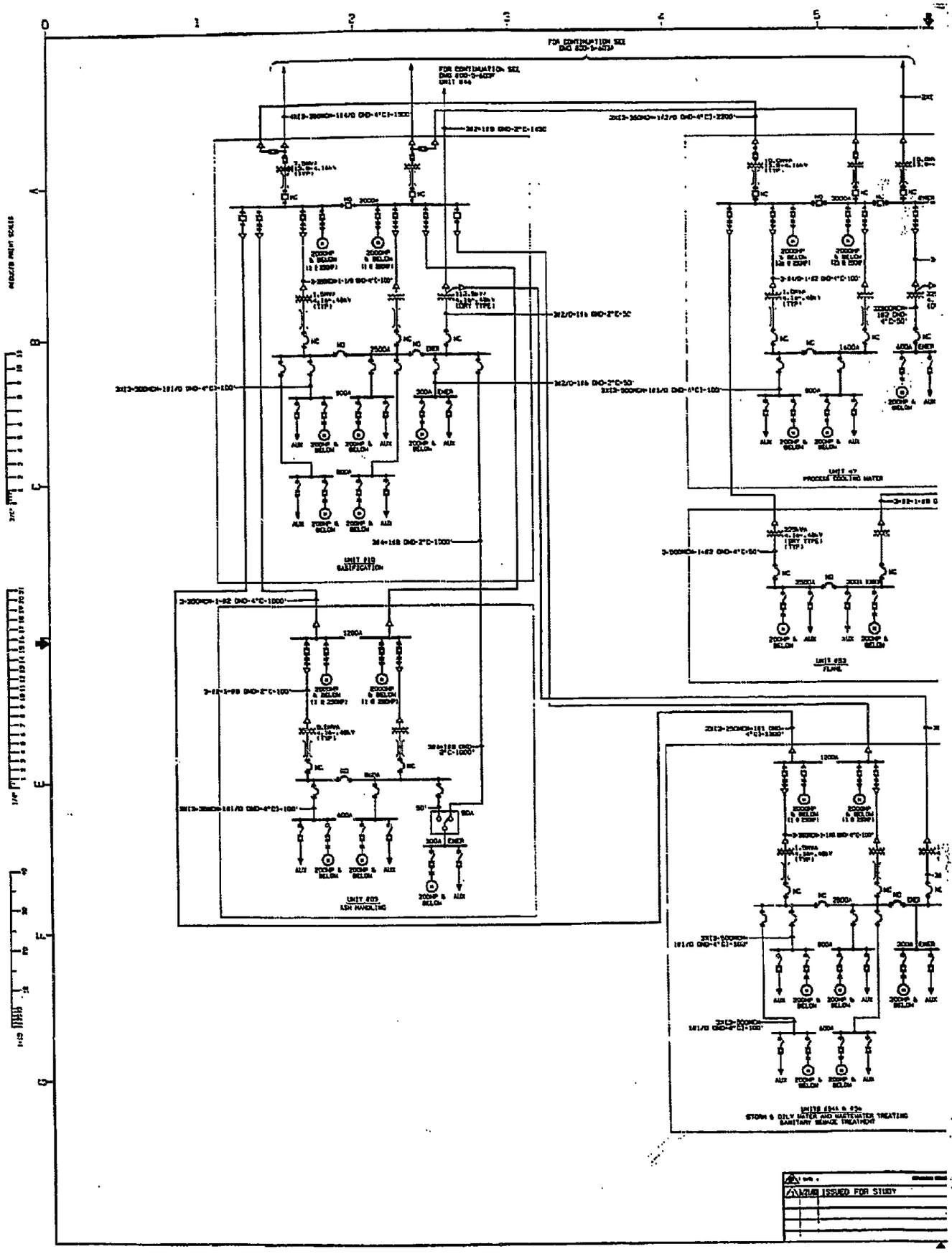
USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

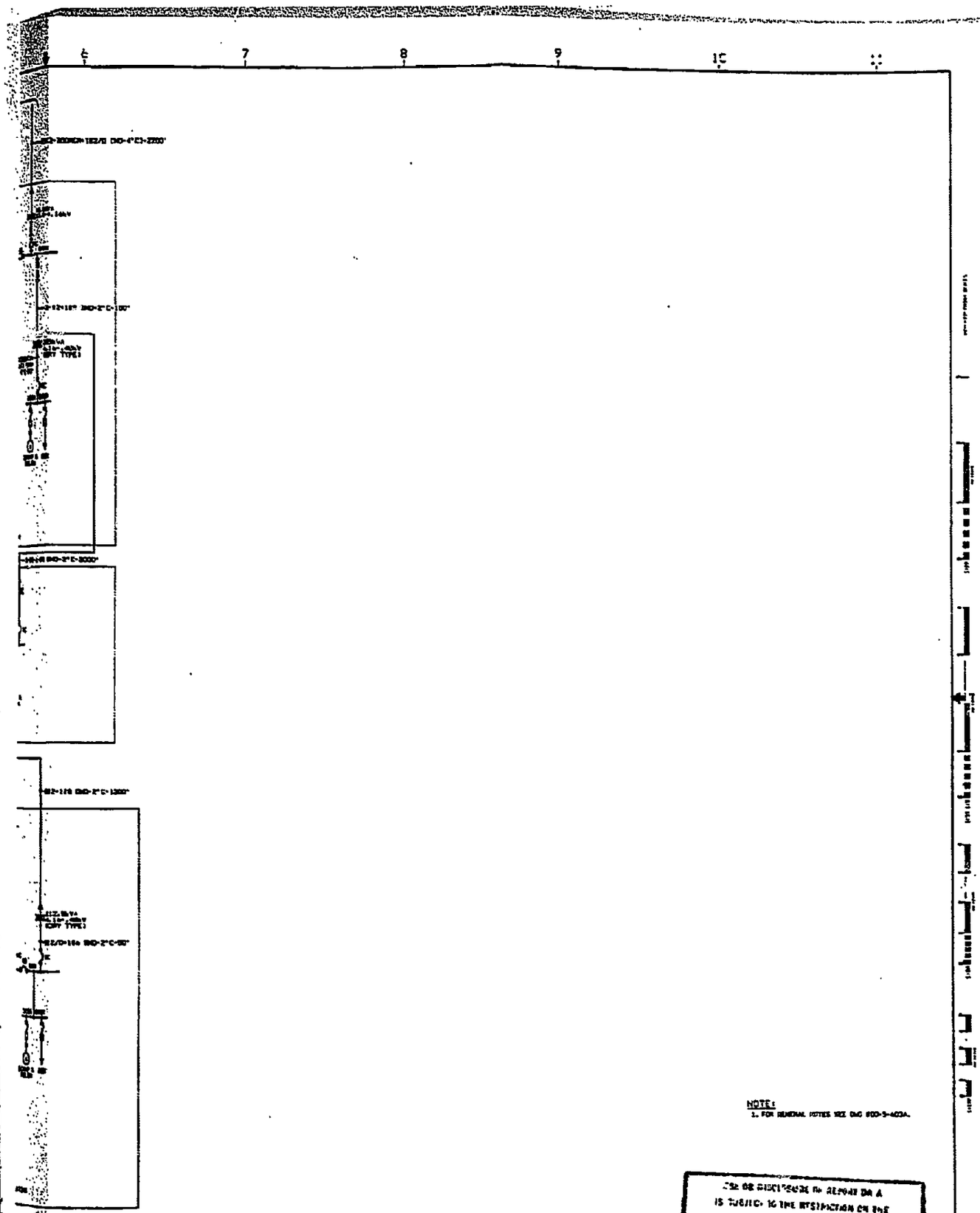
FLUOR

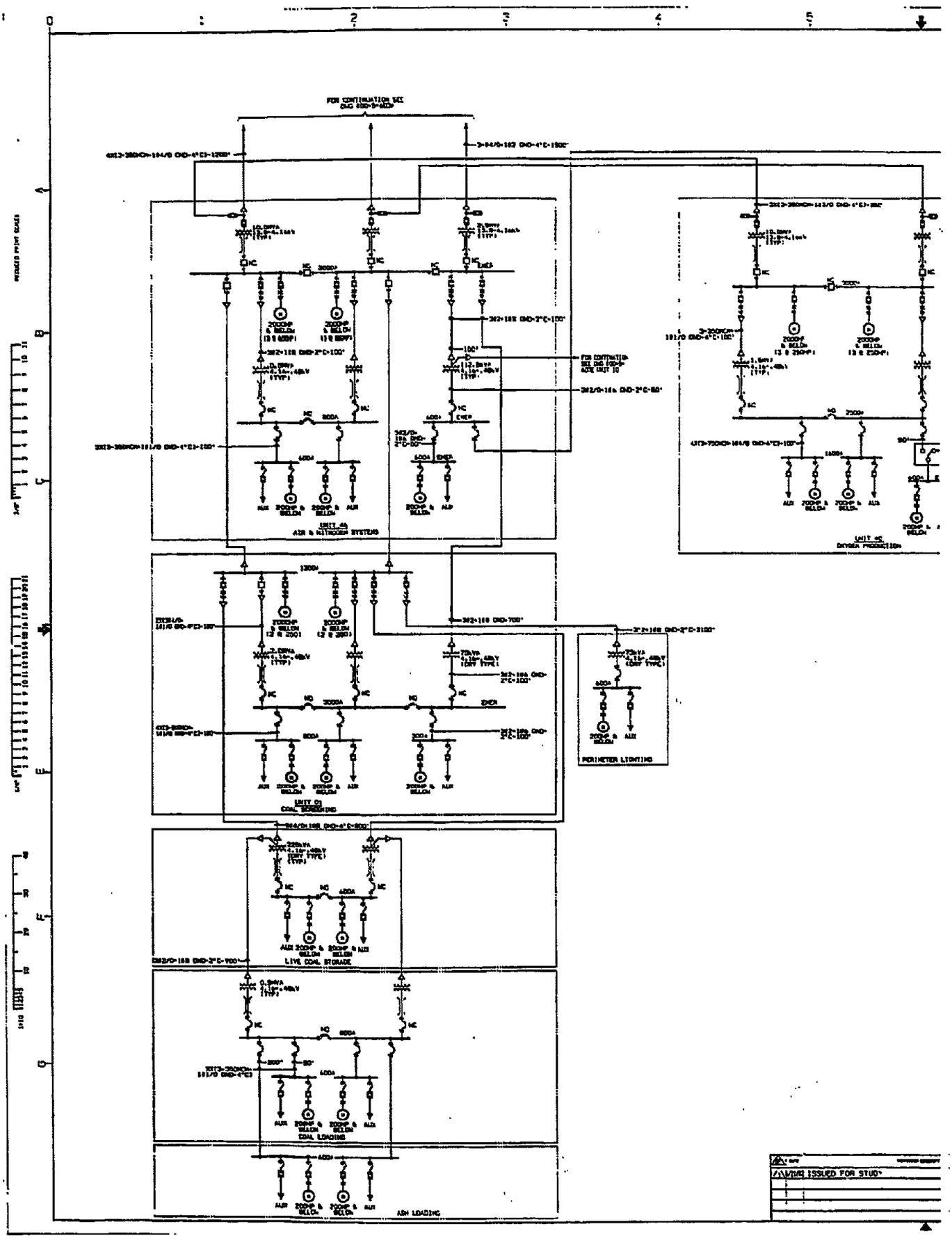
R.L. CARTEE
E. COOK
V. VIERA
E. COOK
R. LANG

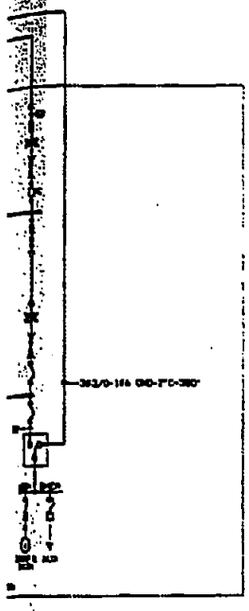
ELECTRICAL ONE LINE DIAGRAM
POWER DISTRIBUTION-CENTRAL & EASTERN AREAS

NONE 1 835704-00-5-603D 1


FOR CONTINUATION SEE
FOR CONTINUATION SEE
UNIT 819
GASIFICATION
UNIT 47
PROCESS COOLING WATER
UNIT 853
FLARE
UNIT 809
ASH HANDLING
UNITS 8944 & 834
STORM & OILY WATER AND WASTEWATER TREATING
SANITARY SEWAGE TREATMENT
ISSUED FOR STUDY


6
7
8
9
10
NOTE:
1. FOR GENERAL NOTES SEE DWG 800-S-603A.
ONE LINE DIAGRAM
FLUOR
ELECTRICAL ONE LINE DIAGRAM
POWER DISTRIBUTION-CENTRAL & SOUTH EASTERN AREA
SIMPLUS FEASIBILITY STUDY
NONE
835704-00-5-603E
1

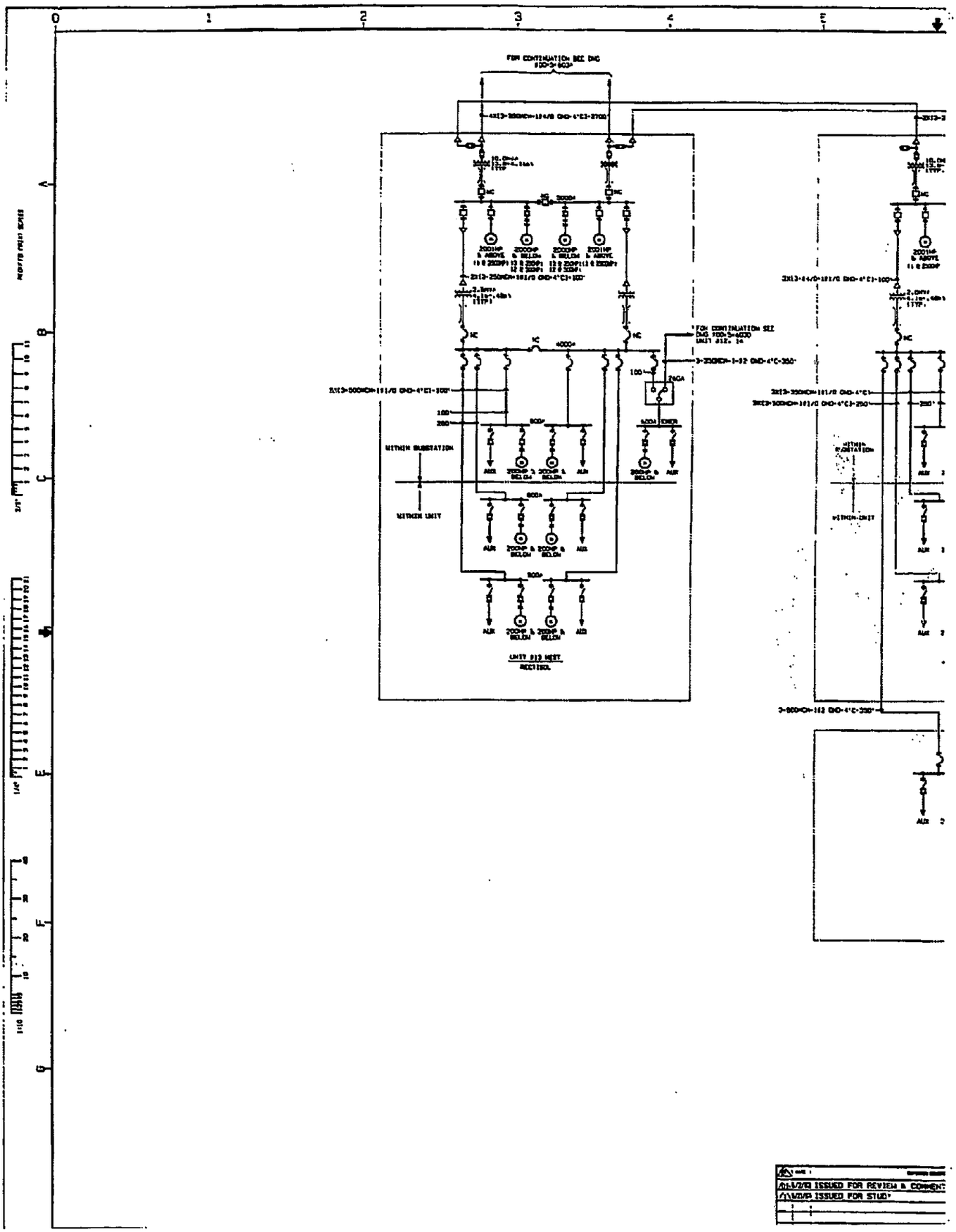

FOR CONTINUATION SEE DWG 830-9-602
UNIT 4A AIR & NITROGEN SYSTEMS
UNIT 4C OXYGEN PRODUCTION
UNIT 01 COAL SCREENING
PERIMETER LIGHTING
LIVE COAL STORAGE
COAL LOADING
ASH LOADING
ISSUED FOR STUDY



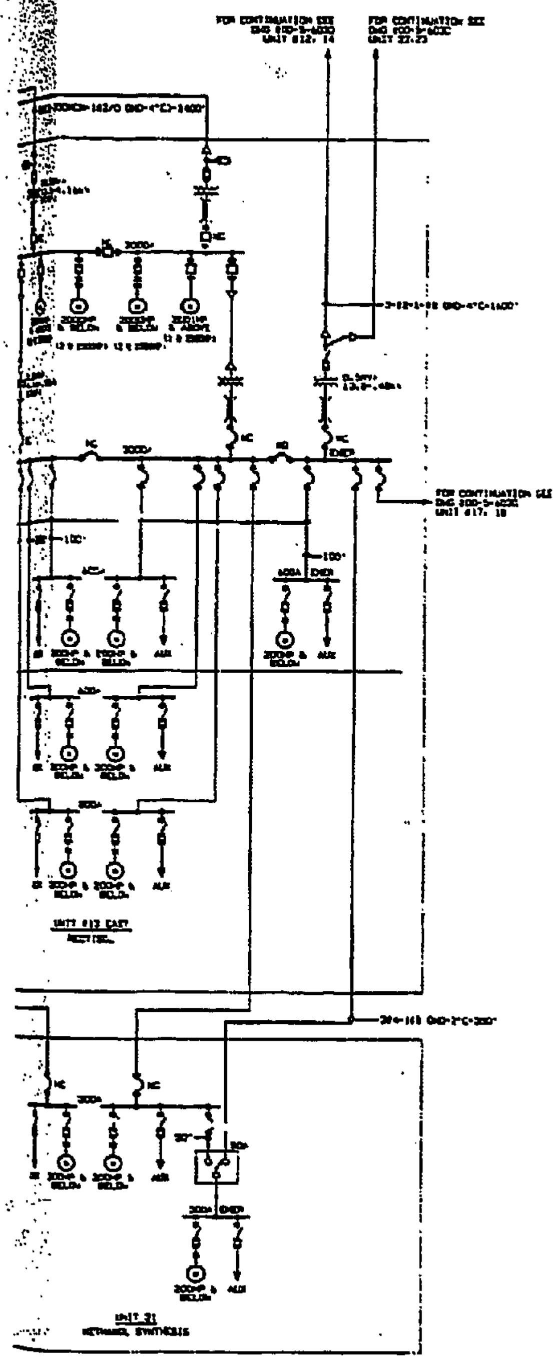
NOTE:
1. FOR GENERAL NOTES SEE DWG 800-S-M20A.

USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE REVERSE PAGE AT THE FRONT OF THIS REPORT

ONE LINE DIAGRAM	FLUOR	ELECTRICAL ONE LINE DIAGRAM POWER DISTRIBUTION - WESTERN AREA SHIFFLETT FEASIBILITY STUDY	
		NONE	835704-00-5-603F | 1



01-11/01	ISSUED FOR REVIEW & COMMENT
11/01/02	ISSUED FOR STUDY



NOTE:
1. FOR GENERAL NOTES SEE DWG [illegible]

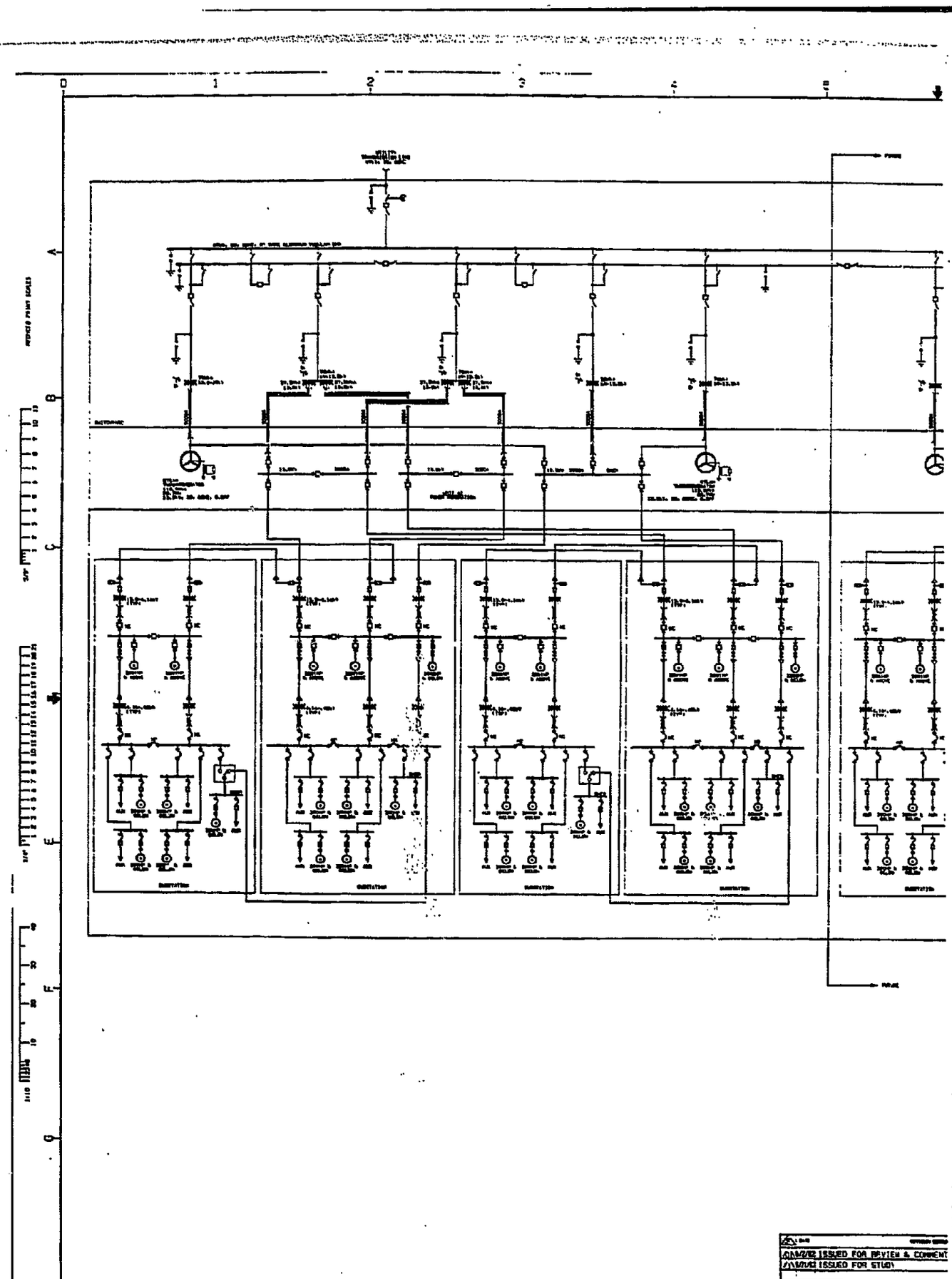
[illegible] OR DISCLOSURE OF REPORT DATA IS [illegible] TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

FLUOR

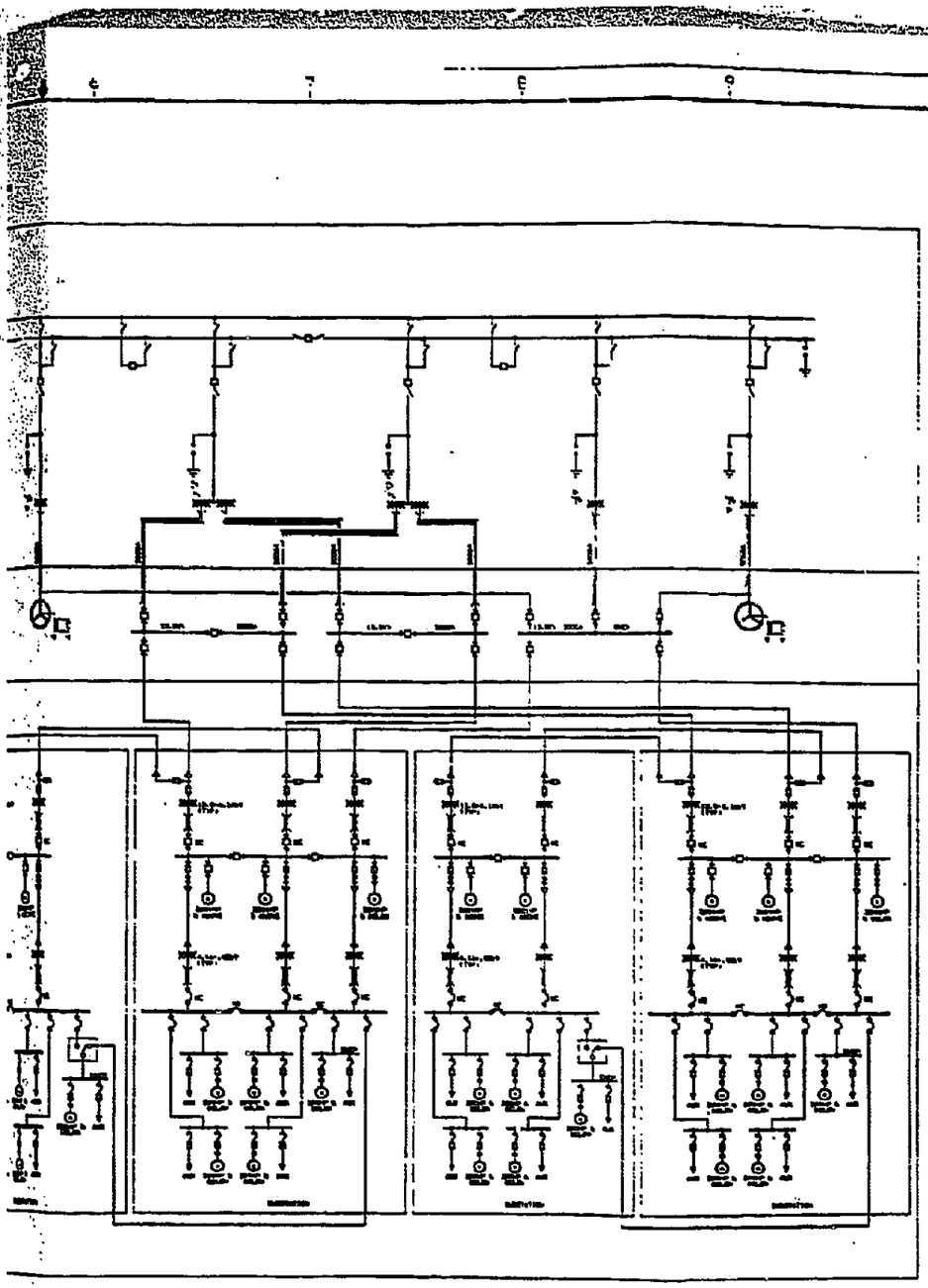
C. L. CARTER
E. COO
V. VIERA
E. COO
P. LAND

ELECTRICAL ONE LINE DIAGRAM
POWER DISTRIBUTION-UNIT 13 RECTISOL

NONE | 835704-00-5-6030 | 1



03/02/02	ISSUED FOR REVIEW & COMMENT
01/07/02	ISSUED FOR STUDY



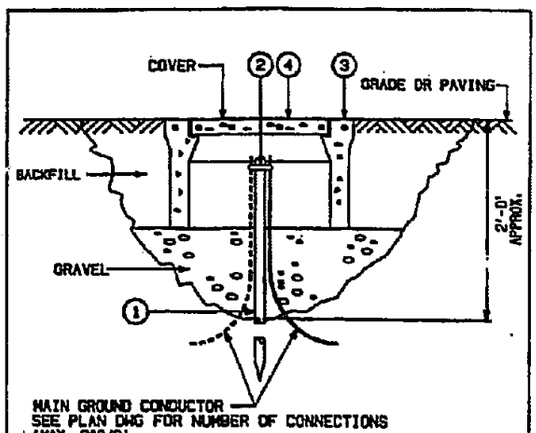
NOTE:
1. FOR GENERAL NOTES SEE DWG [illegible]

USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

FLUOR

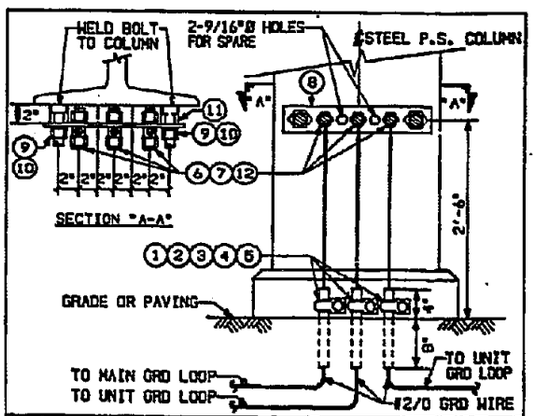
ELECTRICAL ONE LINE DIAGRAM
UTILITY & DISTRIBUTION SYSTEMS - ALTERNATE 1
SNAPDRAGON FEASIBILITY STUDY

NONE : 835704-00-5-603H | 1



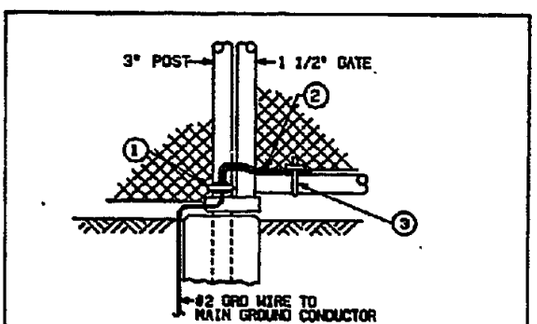
ITEM	DESCRIPTION	QTY	ITEM CODE NO.
1	GROUND ROD, 3/4" X 10'-0"	1	67501001-00900
2	CONNECTOR, ROD	1	62784001-00200
3	CONCRETE BOX	1	60790000-00100
4	BOX COVER (CONCRETE)	1	60790000-00200

ASSEMBLY G-001
GROUND ROD
(CONCRETE COVER)



ITEM	DESCRIPTION	QTY	ITEM CODE NO.
1	ANCHOR, CONCRETE, 1/4"-20	3	60030200-00100
2	BOLT, MACH, 1/4"-20X3/4", GALV.	3	60146001-00800
3	LOCKWASHER, 1/4"	3	69803101-00200
4	CLAMP, CONDUIT, 1", ONE HOLE W/CLAMP BACK GALV.	3	62201001-00300
5	CONDUIT, 1", PVC	3'-0"	62744000-00300
6	CONNECTOR, SERVIT POST, 1/2"-13 LONG STUD, #2/0 AWG	3	62780701-00700
7	LOCKWASHER, 1/2", SILICON BRONZE	3	69803201-00400
8	BAR, FLAT COPPER, 1/4"X2"	1'-2"	60100504-03100
9	BOLT, MACH, 1/2"-13X3", W/NUT	2	60146001-03000
10	LOCKWASHER, 1/2"	2	69803101-00500
11	COUPLING, CONDUIT, 1 1/4", RSG	2	60143101-00400
12	NUT, HEX, 3/8"-16, SILICON BRONZE	3	65520101-00200

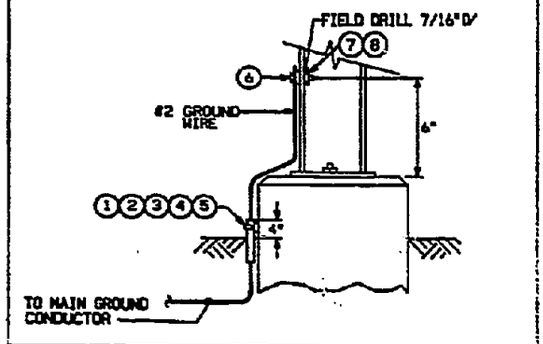
ASSEMBLY G-012
GROUNDING TEST BAR



ITEM	DESCRIPTION	QTY	ITEM CODE NO.
1	CONNECTOR, GROUND, 3" POST, #2 AWG	1	62782502-00700
2	BRAID, COPPER, FLEXIBLE, 12" LONG	1	62785000-00100
3	CONNECTOR, GROUND, FOR COPPER BRAID, 1 1/2" POST	1	62784501-00300

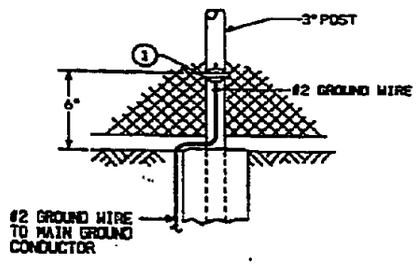
ASSEMBLY G-502
FENCE GATE GROUNDING

MARK	REVISION DESCRIPTION	DRAWN CHECK	APP'D
2	ISSUED FOR REVIEW & COMMENT		
1	ISSUED FOR STUDY		



ITEM	DESCRIPTION	QTY	ITEM CODE NO
1	ANCHOR, CONCRETE, 1/4"-20	1	60030200-00100
2	BOLT, MACH. 1/4"-20X3/4", GALV.	1	60146001-00800
3	LOCKWASHER, 1/4", GALV.	1	69803101-00200
4	CLAMP, CONDUIT, 1", ONE HOLE W/CLAMP BACK, GALV.	1	62201001-00300
5	CONDUIT, 1", PVC	11'-0"	62744000-00300
6	CONNECTOR, SERVIT POST, 3/8"-16 LONG STUD, #2AWG	1	62780501-00500
7	LOCKWASHER, 3/8", SILICON BRONZE	1	69803201-00300
8	NUT, HEX, 3/8"-16, SILICON BRONZE	1	65520101-00200

ASSEMBLY G-4C;
STEEL COLUMN GROUNDING



ITEM	DESCRIPTION	QTY	ITEM CODE NO.
1	CONNECTOR, GROUND, 3" POST, #2 AWG	1	62782502-00700

ASSEMBLY G-501
FENCE GROUNDING

FLUOR

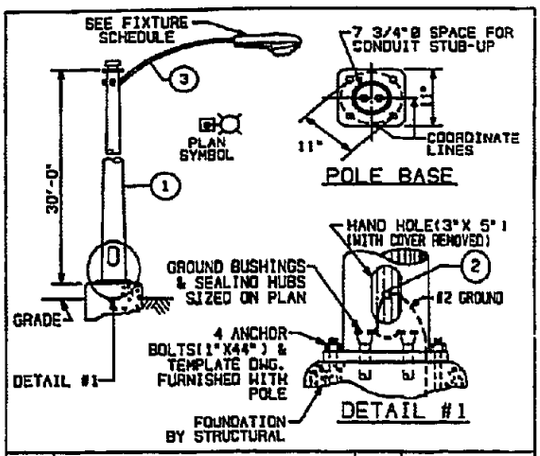
M. VIERA

ELECTRICAL
STANDARDS GROUNDING
SYNFUELS FEASIBILITY STUDY

CROW TRIBE OF INDIANS MONTANA

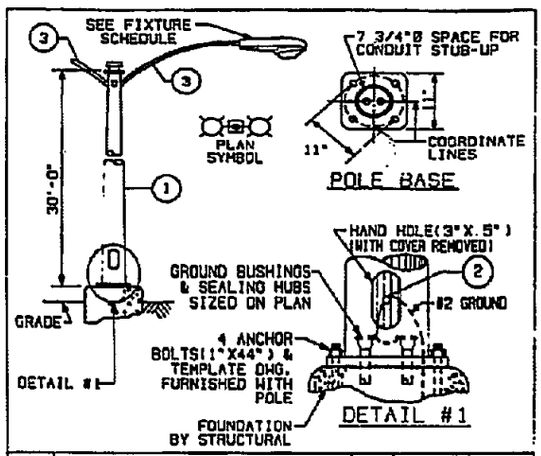
NONE | 835704-00-4-605G | 1

6654 DISTRIBUTION CODE NO.



ITEM	DESCRIPTION	QTY	ITEM CODE NO.
1	POLE, ROUND TAPERED STEEL, 30 FT. WITH 2"TENON & CAP W/4 SIMPLEX BASES	1	65910000-00300
2	CONNECTOR, GROUNDING TYPE, 2 AWG	1	62780501-00500
3	POLE ARM, STEEL, SINGLE, 4 FT. W/SIMPLEX FITTING	1	65910070-00200

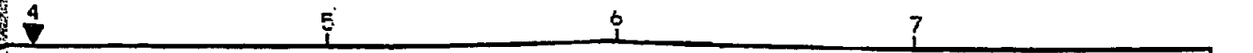
ASSEMBLY #L421
STREETLIGHT MOUNT (SINGLE FIXTURE)



ITEM	DESCRIPTION	QTY	ITEM CODE NO.
1	POLE, ROUND TAPERED STEEL, 30 FT. WITH 2"TENON & CAP W/4 SIMPLEX BASES	1	65910000-00300
2	CONNECTOR, GROUNDING TYPE, 2 AWG	1	62780501-00500
3	POLE ARM, STEEL, SINGLE, 4 FT. W/SIMPLEX FITTING	2	65910070-00200

ASSEMBLY #L422
STREETLIGHT MOUNT (DOUBLE FIXTURE)

	DATE	REVISION DESCRIPTION	DRAWN / CHECK	APP.
2	02	ISSUED FOR REVIEW & COMMENT		
1	02	ISSUED FOR STUDY		



USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

FLUOR

DESIGN FILE: 835704LAD.405

ELECTRICAL
STANDARDS LIGHTING
SYNFUELS FEASIBILITY STUDY
CROW TRIBE OF INDIANS MONTANA

NONE | 835704-00-4-605LA | 1

DISTRIBUTION CODE NO.

INCANDESCENT

PENDANT MOUNT- WEATHER RESISTANT; CLASS I, DIV 2; CLASS II, DIV 2; CLASS III.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	1	64643004 00200	120V., VAPORTIGHT, W/GLOBE AND DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. VDA250RD	150W. A21. I.F.
	2	64643004 00500	120V., VAPORTIGHT, W/GLOBE AND DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. VDA220RD	200W. A23. I.F.
	3	64643004 00800	120V., VAPORTIGHT, W/GLOBE AND DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. VDA230RD	300W. PS30. I.F.
	4	64643000 00200	120V., VAPORTIGHT, WITH GLOBE ONLY 3/4" HUB. CROUSE-HINDS NO. VDA250	150W. A21. I.F.
	5	64643000 00500	120V., VAPORTIGHT, WITH GLOBE ONLY 3/4" HUB. CROUSE-HINDS NO. VDA220	200W A23. I.F.
	6	64643008 00200	120V., VAPORTIGHT, W/GLOBE AND 30° ANGLE REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. VDA250RA	150W. A21. I.F.

INCANDESCENT

STANCHION MOUNT- WEATHER RESISTANT; CLASS I, DIV 2; CLASS II, DIV 2; CLASS III.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	7	64646504 00100	120V., VAPORTIGHT, W/GLOBE AND 30° ANGLE REFLECTOR, 1 1/4"HUB FOR STANCHION MOUNT. CROUSE-HINDS NO. VXHA450RA	150W. A21. I.F.

INCANDESCENT

PENDANT MOUNT- FACTORY SEALED; CLASS I, GROUPS C & D; CLASS II, GROUPS E,F,& G.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	8	64649002 00400	120V. EXPLOSION-PROOF, WITH GLOBE/GUARD & DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. EVA2101	150W. A21. I.F.
	9	64649002 00450	120V. EXPLOSION-PROOF, WITH GLOBE/GUARD & DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. EVA2101	200W. A23. I.F.
	10	64649002 00700	120V. EXPLOSION-PROOF, WITH GLOBE/GUARD & DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. EVA2151(SEE NOTE 1)	300W. PS25. I.F.

INCANDESCENT

PENDANT MOUNT- FACTORY SEALED, CLASS I, GROUPS A,B,C,& D.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	11	64649016 00100	120V, EXPLOSION-PROOF, WITH GLOBE/GUARD & DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. EVA2951	150W. A21. I.F.
	12	64649016 00150	120V, EXPLOSION-PROOF, WITH GLOBE/GUARD & DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. EVA2951	200W. A23. I.F.
	13	64649016 00200	120V, EXPLOSION-PROOF, WITH GLOBE/GUARD & DOME REFLECTOR, 3/4" HUB. CROUSE-HINDS NO. EVA2921	300W. PS30. I.F.

INCANDESCENT

WALL MOUNT- WEATHERPROOF

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	14	64642000 00100	120V., COMMERCIAL, WALL BRACKET, ALUMINUM LUMINARE. HOLOPANE NO. 415	150W. A21. I.F.
	15	64642020 00100	120V., COMMERCIAL, WALL MOUNTED, WIDE SPREAD LUMINARE. HOLOPANE NO. 400	150W. A21. I.F.

INCANDESCENT

SURFACE MOUNT

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	16	64642050 00100	120V., COMMERCIAL, PREWIRED UNIT OPAL DRUM TYPE, 12-60W. LAMPS), HALO NO. H2710	120W. A19. I.F.

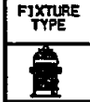
INCANDESCENT

RECESSED

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	17	64655000 00100	120V., COMMERCIAL, PREWIRED UNIT WITH "ABALITE" LENS AND EGGSHELL TRIM. HALO NO. H9-90	40W R16 I.F.

INCANDESCENT

TOWER AND OBSTRUCTION LIGHTS

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	
	18	64565050 00100	120V, RED BEACON, PER FAA 44A. W/2-WIRE CABLE, 700W. LAMP. TYPE PCB-12, 700W. LAMP, 300MM CROUSE-HINDS NO. 41257F	700W. 700PS 40P
	19	64545000 00100	120V. OBSTRUCTION MARKER LIGHT SINGLE FIXTURE PER FAA L-810. 1" BOTTOM HUB, TYPE EOL, 116W LAMP CROUSE-HINDS NO. 44505A	116W. 116A21 /TS
	20	64545000 00300	120V. OBSTRUCTION MARKER LIGHT DOUBLE FIXTURE PER FAA L-810. 1" BOTTOM HUB, TYPE EOL, 2-116W. LAMP CROUSE-HINDS NO. 44507A	232W. 2-116A 21/TS

NO.	DATE	REVISION DESCRIPTION	DRAWN	APP.
2	5/9/80	ISSUED FOR REVIEW & COMMENT		
1	4/8/80	ISSUED FOR STUDY		

FLUORESCENT

CEILING OR PENDANT MOUNT

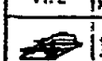
FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	100	64580010 00100	120V..COMMERCIAL.STRIPLIGHT. 1-TUBE. 48" R.S..H.P.F. BENJAMIN NO. S-14-4	52W. F40CW
	101	64580020 00100	120V..INDUSTRIAL. 2-TUBE. 48" R.S..H.P.F.. BENJAMIN NO. FL-1024-4U	94W. F40CW
	102	64580020 00300	120V..INDUSTRIAL. 3-TUBE. 48" R.S..H.P.F.. BENJAMIN NO. FL-1034-4U	144W. F40CW
	103			
	104	64580030 00100	120V..COMMERCIAL. 1-TUBE. 48" R.S..H.P.F. BENJAMIN NO. CH-2214-4	52W. F40CW
	105	64580040 00100	120V..COMMERCIAL 1'X 4' UNIT 2-TUBE. 48" R.S..H.P.F.. BENJAMIN NO.CH-2224-4	96W. F40CW
	106	64580040 00500	120V..COMMERCIAL 2'X 4' UNIT 2-TUBE. 48" R.S..H.P.F.. BENJAMIN NO. CH-7224-4	96W. F40CW
	107	64580040 00900	120V..COMMERCIAL 2'X 4' UNIT 4-TUBE. 48" R.S..H.P.F.. BENJAMIN NO. CH-7244-4	192W. F40CW

RECEPTACLES

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER
	500	66500700 00200	125V.AC OR DC.15A.DUPLEX. GROUNDED.2 POLE.3 WIRE.IVORY STRAIGHT BLADE. HUBBELL NO. 5262-I
	501	66515480 00100	125V.AC OR DC.20A..SINGLE GROUNDED.2 POLE.3 WIRE.BLACK. TWIST LOCK HUBBELL NO. 2310
	502	66520960 00200	125/250V..50A..STRAIGHT BLADE. SINGLE.3 POLE.4 WIRE.GROUNDED. BLACK PORCLAIN. HUBBELL NO. 9450
	503	66523510 00200	125/250V..20A..EXPLOSION-PROOF FACTORY SEALED.CLASS I.GROUPS C&D. 3 POLE.2 WIRE.THRU FEED 3/4" HUBS CROUSE-HINDS NO. CPS 152-211
	504	66523710 00100	480Y..POWER RECEPTACLE.60A.EXPL. PROOF, FACTORY SEALED.STYLE 2.CLASS I.DIV 2. GROUP C&D.4 POLE.3 WIRE.1 1/4"HUB. CROUSE-HINDS #DR442 W/CES42 BACK BOX.
	505		
	506		
	507		

FLUORESCENT

RECESSED

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	108	64595000 00100	120V..COMMERCIAL 2'X 2'UNIT. 2-TUBE R.S..H.P.F.. BENJAMIN NO. AS-7224-2	92W F40CW/ U/3
	109	64595000 00300	120V..COMMERCIAL 2'X 4'UNIT. 2-TUBE R.S..H.P.F.. BENJAMIN NO. AS-7224-4	92W F40CW
	110	64595000 00500	120V..COMMERCIAL 2'X 4'UNIT. 3-TUBE R.S..H.P.F.. BENJAMIN NO. AS-7234-4	140W F40CW
	111	64595000 00700	120V..COMMERCIAL 2'X 4'UNIT. 4-TUBE R.S..H.P.F.. BENJAMIN NO. AS-7244-4	184W F40CW
	112	64595100 00100	120V..COMMERCIAL 2'X 4'UNIT. WITH HOLOPHANE CONTROLENS. 2-TUBE R.S..H.P.F.. BENJAMIN NO. AS-8524-4	92W F40CW
	113	64595100 00300	120V..COMMERCIAL 2'X 4'UNIT. WITH HOLOPHANE CONTROLENS 3-TUBE R.S..H.P.F.. BENJAMIN NO. AS-8534-4	140W F40CW
	114	64595100 00500	120V..COMMERCIAL 2'X 4'UNIT. WITH HOLOPHANE CONTROLENS. 4-TUBE R.S..H.P.F.. BENJAMIN NO. AS-8544-4	184W F40CW

SWITCHES

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER
	508	67952100 00200	120/277V..20A.. SINGLE POLE.TOGGLE. IVORY HANDLE. HUBBELL NO. 1221-I
	509	67952100 00800	120/277V..20A.. 3-WAY TOGGLE. IVORY HANDLE. HUBBELL NO. 1223-I
	510	67955010 00500	120/277V..20A..TUMBLER. EXPLOSION-PROOF.CLASS I.GROUP C&D. 1 POLE.FRONT OPERATED.THRU FEED.3/4"HUBS CROUSE-HINDS NO. EPSC2129

NOTES:

1- FIXTURE NO.10 WITH 300W..PS25 LAMP SUITABLE FOR CLASS I, GROUP C DIV. WITH OR WITHOUT REFLECTOR.

FLUOR

DE VIERA

ELECTRICAL STANDARDS LIGHTING SYNFUELS FEASIBILITY STUDY

CROW TRIBE OF INDIANS MONTANA

NONE | 835704-00-4-605LB | 1

1 2 3

MERCURY VAPOR
PENDANT MOUNT- CLASS I, DIV 2; CLASS II, DIV 2; CLASS III

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	200	64673000 00100	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2A100GP/120	132W. H38JA-100/DX
	201	64673000 00300	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 175W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2A175GP/120	228W. H39KC 175/DX
	202	64673000 00500	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 250W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2A250GP/120	312W. H37KC 250/DX

MERCURY VAPOR
PENDANT MOUNT-FACTORY SEALED- CLASS I, GROUPS C & D. CLASS II, GROUPS E,F,& G.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	212	64675000 00100	120V. CONSTANT WATTAGE H.P.F BALLAST. 1" HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NO. EVMA83101/120	132W. H38JA-100/DX
	213	64675000 00200	120V. CONSTANT WATTAGE H.P.F BALLAST. 1" HUB. 175W. LAMP W/GLOBE AND GUARD. CROUSE HINDS NO. EVMA83171/120	228W. H39KC-175/DX
	214	64675000 00300	120V. CONSTANT WATTAGE H.P.F BALLAST. 1" HUB. 250W. LAMP W/ GLOBE AND GUARD. CROUSE HINDS NO. EVMA83251/120	312W. H37KC-250/DX

MERCURY VAPOR
CEILING MOUNT- CLASS I, DIV 2; CLASS II, DIV 2; CLASS III

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	203	64673002 00100	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2C100GP/120	132W. H38JA-100/DX
	204	64673002 00300	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 175W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2C175GP/120	228W. H39KC 175/DX
	205	64673002 00500	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 250W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2C250GP/120	312W. H37KC 250/DX

MERCURY VAPOR
PENDANT MOUNT- CLASS II, DIV 1, GROUPS E,F& G

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	215	64674000 00100	120V. CONSTANT WATTAGE H.P.F. BALLAST. 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NO. DMVC2A100GP/120	132W. H38JA-100/DX
	216	64674000 00300	120V. CONSTANT WATTAGE H.P.F. BALLAST. 3/4" HUB. 175W. LAMP W/GLOBE AND GUARD. CROUSE HINDS NO. DMVC2A175GP/120	228W. H39KC-175/DX

MERCURY VAPOR
WALL MOUNT-THROUGHFEED- CLASS I, DIV 2; CLASS II, DIV 2; CLASS III

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	206	64673004 00100	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2TH100GP/120	132W. H38JA-100/DX
	207	64673004 00300	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 175W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2TH175GP/120	228W. H39KC 175/DX
	208	64673004 00500	120V., CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB. 250W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVC2TH250GP/120	312W. H37KC 250/DX

MERCURY VAPOR
CEILING MOUNT- CLASS II, DIV 1, GROUPS E,F& G

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	217	64674002 00100	120V. CONSTANT WATTAGE H.P.F BALLAST. 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NO. DMVC2C100GP/120	132W. H38JA-100/DX
	218	64674002 00300	120V. CONSTANT WATTAGE H.P.F BALLAST. 3/4" HUB. 175W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NO. DMVC2C175GP/120	228W. H39KC-175/DX

MERCURY VAPOR
STANCHION MOUNT -CLASS I, DIV 2; CLASS II, DIV 2; CLASS III

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	209	64673006 00100	120V., CONSTANT WATTAGE H.P.F. BALLAST, 1 1/4" HUB. 100W. LAMP W/GLOBE AND GUARD CROUSE HINDS NO. VMVCJ100GP/120	132W. H38JA-100/DX
	210	64673006 00200	120V., CONSTANT WATTAGE H.P.F. BALLAST, 1 1/4" HUB. 175W. LAMP W/GLOBE AND GUARD CROUSE-HINDS NO. VMVCJ175GP/120	228W. H37KC-175/DX
	211	64673006 00300	120V., CONSTANT WATTAGE H.P.F. BALLAST, 1 1/4" HUB. 250W. LAMP W/GLOBE AND GUARD CROUSE HINDS NO. VMVCJ250GP/120	312W. H37KC-250/DX

MERCURY VAPOR
WALL MOUNT-THROUGH FEED -CLASS II, DIV 1, GROUPS E,F& G

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	219	64674004 00100	120V. CONSTANT WATTAGE H.P.F BALLAST. 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NO. DMVC2TH100GP/120	132W. H38JA-100/DX
	220	64674004 00300	120V. CONSTANT WATTAGE H.P.F BALLAST. 3/4" HUB. 175W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NO. DMVC2TH175GP/120	228W. H39KC-175/DX

MERCURY VAPOR
STANCHION MOUNT CLASS II, DIV.1, GROUPS E,F,G

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	221	64674006 00100	120V. CONSTANT WATTAGE H.P.F BALLAST. 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NO. DMVCJ100GP/120	132W H38JA-100/DX
	222	64674006 00200	120V. CONSTANT WATTAGE H.P.F BALLAST. 3/4" HUB. 175W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NO. DMVCJ175GP/120	228W H39KC-175/DX

REV	DATE	REVISION DESCRIPTION
B		ISSUED FOR REVIEW & COMMENT
A		ISSUED FOR STUDY

5 6 7

MERCURY VAPOR

LOW BAY-PENDANT MOUNT NON-HAZARDOUS-INDOOR

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LMP TYPE
	250	64476200 00100	120V CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB, 175W LAMP MED. SPREAD TYPE REFLECTOR CROUSE-HINDS # LBMC2A175W/120	229-H39KC-175/DX
	251	64476200 00300	120V CONSTANT WATTAGE H.P.F. BALLAST, 3/4" HUB, 250W LAMP MED. SPREAD TYPE REFLECTOR CROUSE-HINDS # LBMC2A250W/120	310-H37KC-250/DX

MERCURY VAPOR

HIGH BAY-PENDANT MOUNT NON-HAZARDOUS-INDOOR (MTG.HEIGHT 20' & ABOVE)

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LMP TYPE
	252	64476100 01400	SINGLE 400W LAMP WITH 480V CONSTANT WATTAGE BALLAST & SPREAD TYPE REFLECTOR APPLETON NO.B-H21AM-480	450-H33GL-400/DX
	253	64476200 00500	TWIN 400W LAMPS WITH 480V, CONSTANT WATTAGE BALLAST & SPREAD TYPE REFLECTOR APPLETON NO.B-H22AM-480	2x450-H33GL-400/DX
	254	64476300 00900	SINGLE 400W LAMP WITH EMERG. LTG. FEATURE & 480V. CONSTANT WATTAGE BALLAST & SPREAD TYPE REFLECTOR.APPLETON # B-H21AM-480E	450-H33GL-400/DX
	255	64476250 00500	TWIN 400W LAMP WITH EMERG. LTG. FEATURE & 480V CONSTANT WATTAGE BALLAST & SPREAD TYPE REFLECTOR.APPLETON # B-H22AM-480E	2x450-H33GL-400/DX
	256	64476100 01500	SINGLE 1000W LAMP WITH 480V CONSTANT WATTAGE BALLAST & SPREAD TYPE REFLECTOR APPLETON NO.B-H61AM-480	1100-H36GV-1000/DX
	257	64476300 01000	SINGLE 1000W LAMP WITH EMERG. LTG. FEATURE, 480V CONSTANT WATTAGE BALLAST & SPREAD TYPE REFLECTOR.APPLETON # B-H61AM-480E	1100-H36GV-1000/DX

MERCURY VAPOR

FLOODLIGHT

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LMP TYPE
	258	64715200 00500	AREA FLOODLIGHT, 400W LAMP WITH 480V H.P.F. BALLAST & 2" SLIPFITTER. CROUSE-HINDS NO. BALP-44C48	445-H33GL-400/DX
	259	64715200 01000	AREA FLOODLIGHT, 1000W LAMP WITH 480V H.P.F. BALLAST & 2" SLIPFITTER CROUSE-HINDS NO. BALP-10HC48	1100-H36GV-1000/DX
	260 NOTE #1	64715000 01200	AREA FLOODLIGHT, 400W LAMP WITH 480V H.P.F. BALLAST TRUNNION AND 2" SLIPFITTER CROUSE-HINDS # 479184	445-H33GL-400/DX
	261	64715100 07500	AREA FLOODLIGHT,1000W LAMP WITH 480V H.P.F. BALLAST AND 2" SLIPFITTER CROUSE-HINDS NO. MY-10HC48	1100-H36GV-1000/DX

MERCURY VAPOR

STREET LIGHTING

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LMP TYPE
	262	64731000 00500	TYPE III DISTRIBUTION, 480V H.P.F. BALLAST,175W LAMP WESTINGHOUSE OV-15 NUMBER 91G-CLSE-30A	229-H39KC-175/DX
	263	64731010 00500	TYPE III DISTRIBUTION,480V H.P.F. BALLAST,400W LAMP WESTINGHOUSE OV-25 NUMBER 922-CPAE-30A	450-H33GL-400/DX

REFLECTORS

FOR FIXTURE TYPES 212, 213, 214, 311 THRU 315

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER
	A	64698600 02000	REFLECTOR, DOME TYPE FIBERGLASS REINFORCED POLYESTER CROUSE-HINDS NO.RD 73
	B	64698600 01000	REFLECTOR, 30° ANGLE TYPE FIBERGLASS REINFORCED POLYESTER CROUSE-HINDS NO.RA 73
	C	64698500 00600	REFLECTOR, HIGH BAY TYPE CORROSION RESISTANT ALUMINUM CROUSE-HINDS NO. ET 3912

REFLECTORS

FOR FIXTURE TYPES 200 THRU 211, 215 THRU 222, 300 THRU 310, 316 THRU 326

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER
	D	64698600 00700	REFLECTOR, DOME TYPE FIBERGLASS REINFORCED POLYESTER CROUSE-HINDS NO.RD 70
	E	64698600 01700	REFLECTOR, 30° ANGLE TYPE FIBERGLASS REINFORCED POLYESTER CROUSE-HINDS NO.RA 70

NOTES:

1. FIXTURE #260 USE 2" PIPE SLIPFITTER C-H #ML108C ITEM CODE NUMBER 64738450-00100

FLUOR

H. VIERA

ELECTRICAL STANDARDS LIGHTING SYNFUELS FEASIBILITY STUDY

CROW TRIBE OF INDIANS MONTANA

NONE | 835704-00-E-605LC | 1

HIGH PRESSURE SODIUM

PENDANT MOUNT- CLASS I.DIVISION 2:CLASS II. DIVISION 2:CLASS III

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	300	64613000 00100	120V..H.P.F. BALLAST, 3/4"HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVS2A070GP/120	96W. LU70 /BU
	301	64613000 00300	120V..H.P.F. BALLAST, 3/4"HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMPER VMVS2A100GP/120	124W. LU100 /BU
	302	64613000 00500	120V..H.P.F. BALLAST, 3/4"HUB. 150W. LUCALOX LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVS2A150GP/120-LX	198W. LU150 /BU

HIGH PRESSURE SODIUM

PENDANT MOUNT-FACTORY SEALED- CLASS I:GROUPS C & D: CLASS II.GROUPS E.F & G.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	311	64615000 00100	120V..H.P.F. BALLAST.1" HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER EVMA43071/120	96W. LU70 /BU
	312	64615000 00200	120V..H.P.F. BALLAST.1" HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER EVMA43101/120	124W. LU100 /BU
	313	64615000 00300	120V..H.P.F. BALLAST.1" HUB. 150W. LUCALOX LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER EVMA43151/120-LX	198W. LU150 /BU

HIGH PRESSURE SODIUM

CEILING MOUNT- CLASS I.DIVISION 2:CLASS II. DIVISION 2:CLASS III

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	303	64613002 00100	120V..H.P.F. BALLAST, 3/4"HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVS2C070GP/120	96W. LU70 /BU
	304	64613002 00300	120V..H.P.F. BALLAST, 3/4"HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVS2C100GP/120	124W. LU100 /BU
	305	64613002 00500	120V..H.P.F. BALLAST, 3/4"HUB. 150W. LUCALOX LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVS2C150GP/120-LX	198W. LU150 /BU

HIGH PRESSURE SODIUM

STANCHION MOUNT-FACTORY SEALED - CLASS I.GROUPS C & D: CLASS II.GROUPS E.F & G.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	314	64615012 00100	120V..H.P.F.BALLAST.1 1/4"HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER EVMA44071/120	96W. LU70 /BU
	315	64615012 00200	120V..H.P.F.BALLAST.1 1/4"HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER EVM44101/120	124W. LU100 /BU

HIGH PRESSURE SODIUM

WALL MOUNT-THROUGH FEED - CLASS I.DIVISION 2:CLASS II. DIVISION 2:CLASS III

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	306	64613004 00100	120V..H.P.F. BALLAST, 3/4"HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVS2TW070GP/120	96W. LU70 /BU
	307	64613004 00300	120V..H.P.F. BALLAST, 3/4"HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVS2TW100GP/120	124W. LU100 /BU

HIGH PRESSURE SODIUM

PENDANT MOUNT- CLASS II.DIVISION 1.GROUPS E.F & G.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	316	64613500 00100	120V..H.P.F. BALLAST, 3/4"HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMVS2A070GP/120	96W. LU70 /BU
	317	64613500 00300	120V..H.P.F. BALLAST, 3/4"HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMVS2A100GP/120	124W. LU100 /BU
	318	64613500 00500	120V..H.P.F. BALLAST, 3/4"HUB. 150W. LUCALOX LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMVS2A150GP/120-LX	198W. LU150 /BU

HIGH PRESSURE SODIUM

STANCHION MOUNT- CLASSI.DIVISION 2:CLASS II. DIVISION 2:CLASS III

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	308	64613006 00100	120V..H.P.F.BALLAST.1 1/4"HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVSJ070GP/120	96W. LU70 /BU
	309	64613006 00200	120V..H.P.F.BALLAST.1 1/4"HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVSJ100GP/120	124W. LU100 /BU
	310	64613006 00300	120V..H.P.F.BALLAST.1 1/4"HUB. 150W. LUCALOX LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER VMVSJ150GP/120-LX	198W. LU150 /BU

HIGH PRESSURE SODIUM

CEILING MOUNT- CLASS II.DIVISION 1.GROUPS E.F & G.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	319	64613502 00100	120V..H.P.F. BALLAST. 3/4"HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMVS2CD070GP/120	96W. LU70 /BU
	320	64613502 00300	120V..H.P.F. BALLAST. 3/4"HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMVS2C100GP/120	124W. LU100 /BU
	321	64613502 00500	120V..H.P.F. BALLAST. 3/4"HUB. 150W. LUCALOX LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMVS2C150GP/120-LX	198W. LU150 /BU

NO.	DATE	DESCRIPTION	BY
2	9-20-96	ISSUED FOR REVIEW & COMMENT	
1	8-2-96	ISSUED FOR STUDY	

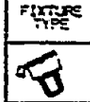
HIGH PRESSURE SODIUM

WALL MOUNT- THROUGH FEED- CLASS II, DIVISION 1, GROUPS E,F,G

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	322	64613504 00100	120V., H.P.F. BALLAST, 3/4" HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMYS21M070GP/12G	95w. HPS /SU
	323	64613504 00300	120V., H.P.F. BALLAST, 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMYS21M100GP/12G	124w. LU100 /SU
	324	64613504 00500	120V., H.P.F. BALLAST, 3/4" HUB. 150W. LUCALOX LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMYS21M150GP/12G-LX	188w. LU150 /SU

HIGH PRESSURE SODIUM

STANCHION MOUNT- CLASS II, DIVISION 1, GROUPS E,F & G.

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	325	64613508 00100	120V., H.P.F. BALLAST, 1 3/4" HUB. 70W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMYSJ07OGP/12G	95w. HPS /SU
	326	64613508 00200	120V., H.P.F. BALLAST, 1 3/4" HUB. 100W. LAMP W/GLOBE AND GUARD. CROUSE-HINDS NUMBER DMYSJ100GP/12G	124w. LU100 /SU

HIGH PRESSURE SODIUM

LOW BAY- NON-HAZARDOUS AREA. INDOOR

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	350	64616000 00200	120V., H.P.F. BALLAST, 3/4" HUB. 150W LAMP CROUSE-HINDS NUMBER LSML2A150L	188w. HPS /SU

HIGH PRESSURE SODIUM

HIGH BAY- NON-HAZARDOUS AREA. INDOOR

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	351	64616500 00500	SINGLE 275W. LAMP WITH 480V. BALLAST & SPREAD TYPE REFLECTOR. APPLETON NO. G-H61AH-48C	312w. HPS /SU
	352	64616500 01000	SINGLE 400W LAMP WITH 480V. BALLAST & SPREAD TYPE REFLECTOR. APPLETON NO. G-H71AL-48C	460w. HPS /SU

HIGH PRESSURE SODIUM

FLOODLIGHTING

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	353 NOTE #2	64702500 01500	AREA FLOODLIGHT, 250W., 480V., H.P.F. BALLAST, TRUNION, AND 2" SLIPFITTER CROUSE-HINDS NO. 48330	285w. LU250 /SU
	354 NOTE #2	64702500 02000	AREA FLOODLIGHT, 400W., 480V., H.P.F. BALLAST, TRUNION, AND 2" SLIPFITTER CROUSE-HINDS NO. 48335	480w. LU400 /SU
	355	64702600 00500	AREA FLOODLIGHT, 1000W., 480V. H.P.F. BALLAST & 2" SLIPFITTER CROUSE-HINDS NO. HA-1GLEC8	1152w. LU1000 /SU
	356	64708000 00500	AREA FLOODLIGHT, 250W., 480V. H.P.F. BALLAST & 2" SLIPFITTER CROUSE-HINDS NO. GALR-2LEC8	285w. LU250 /SU
	357	64708000 01000	AREA FLOODLIGHT, 400W., 480V. H.P.F. BALLAST & 2" SLIPFITTER CROUSE-HINDS NO. GALR-4LEC8	480w. LU400 /SU
	358	64708000 01500	AREA FLOODLIGHT, 1000W., 480V. H.P.F. BALLAST & 2" SLIPFITTER CROUSE-HINDS NO. GALR-1LEC8	1152w. LU1000 /SU

HIGH PRESSURE SODIUM

STREETLIGHTING

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	359	64725000 00500	TYPE III DISTRIBUTION, 480V. H.P.F. BALLAST, 400W. LAMP. TU-DOR TYPE GV-15, WESTINGHOUSE NUMBER TIG-SNGE-3CA	124w. LU100 /SU
	360	64725000 01000	TYPE III DISTRIBUTION, 480V. H.P.F. BALLAST, 250W. LAMP. TU-DOR TYPE GV-15, WESTINGHOUSE NUMBER TIG-SNGE-3EA	285w. LU250 /SU

METAL HALIDE

HIGH BAY- NON HAZARDOUS AREA. INDOORS

FIXTURE TYPE	FIXTURE TYPE NUMBER	ITEM CODE NUMBER	FIXTURE DESCRIPTION AND MANUFACTURER'S NUMBER	TOTAL WATTS & LAMP TYPE
	400	64681000 00900	SINGLE 400W. LAMP W/480V. H.P.F. BALLAST AND SPREAD TYPE REFLECTOR. 3/4" HUB. APPLETON NO. G-M71AH-48C	480W MV400 /SUH
	401	64681100 00500	TWIN 400W. LAMPS W/480V. H.P.F. BALLAST AND SPREAD TYPE REFLECTOR. 3/4" HUB. APPLETON NO. G-M72AH-48C	1008W MV400 /SUH
	402	64681000 01000	SINGLE 1000W. LAMP W/480V. H.P.F. BALLAST AND SPREAD TYPE REFLECTOR. 3/4" HUB. APPLETON NO. G-M81AH-48C	1152W MV1000 /SUH
	403	64681200 00900	SINGLE 400W. LAMP W/EMERG. LIGHT 480V. H.P.F. BALLAST AND SPREAD TYPE REFLECTOR APPLETON NO. G-M71AH-48OE	480W MV400 /SUH
	404	64681250 00500	TWIN 400W. LAMPS W/EMERG. LIGHT 480V. H.P.F. BALLAST AND SPREAD TYPE REFLECTOR APPLETON NO. G-M72AH-48OE	1008W MV400 /SUH
	405	64681200 01000	SINGLE 1000W. LAMP W/EMERG. LIGHT 480V. H.P.F. BALLAST AND SPREAD TYPE REFLECTOR APPLETON NO. G-M81AH-48OE	1152W MV1000 /SUH

NOTES:

1. SEE APPROPRIATE VENDOR CATALOGS FOR SUITABILITY OF LIGHTIN FIXTURES IN HAZARDOUS AREAS.
2. FIXTURES NUMBER 353 & 354 USE 2" PIPE SLIPFITTER C-H #HL1080. ITEM CODE NUMBER 64738450-00100.

USE OF DISCLOSURE OR REPORT DATA SUBJECT TO RESTRICTION ON THE SURFACE PAGE OF THIS REPORT

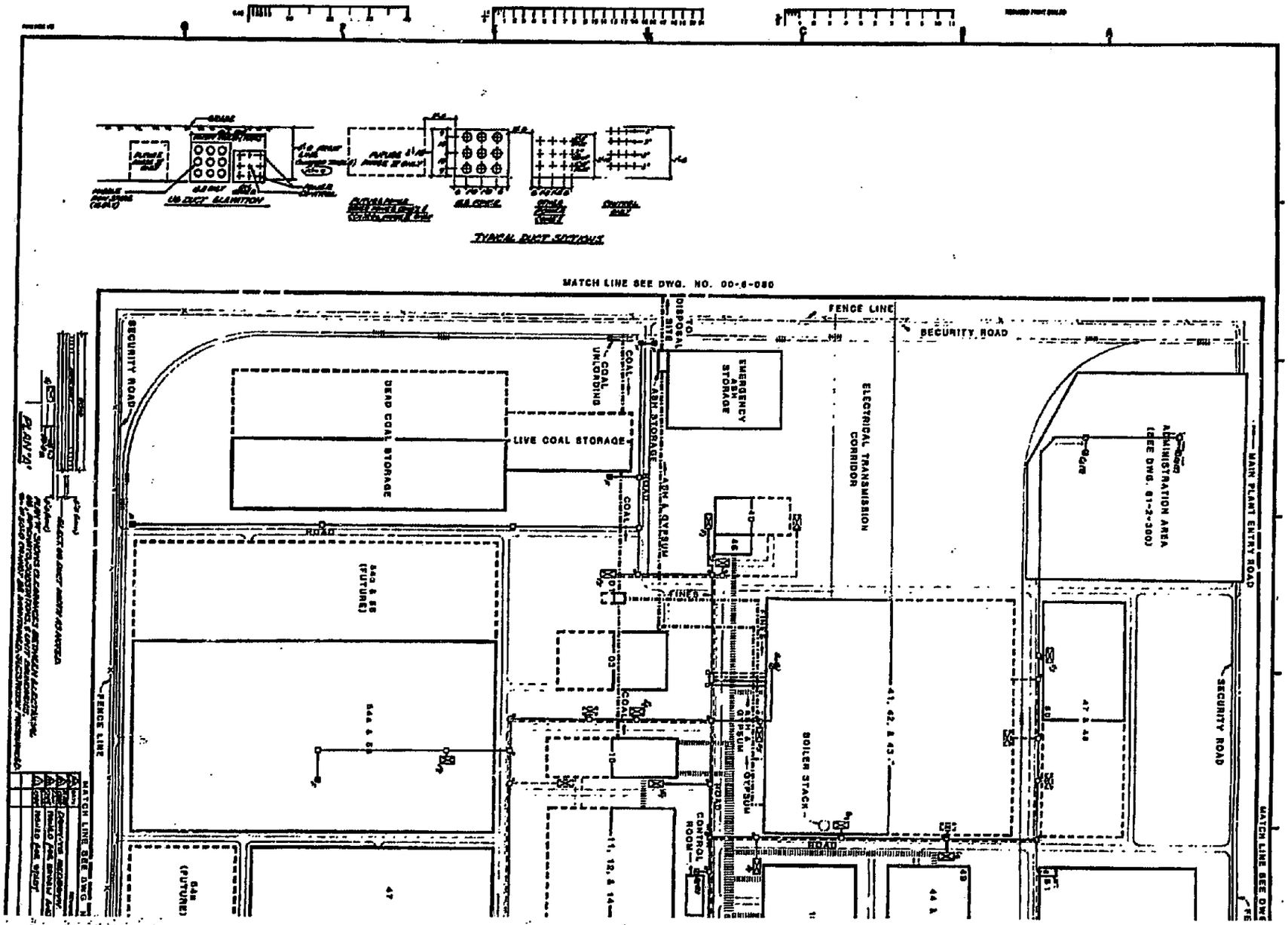
FLUOR

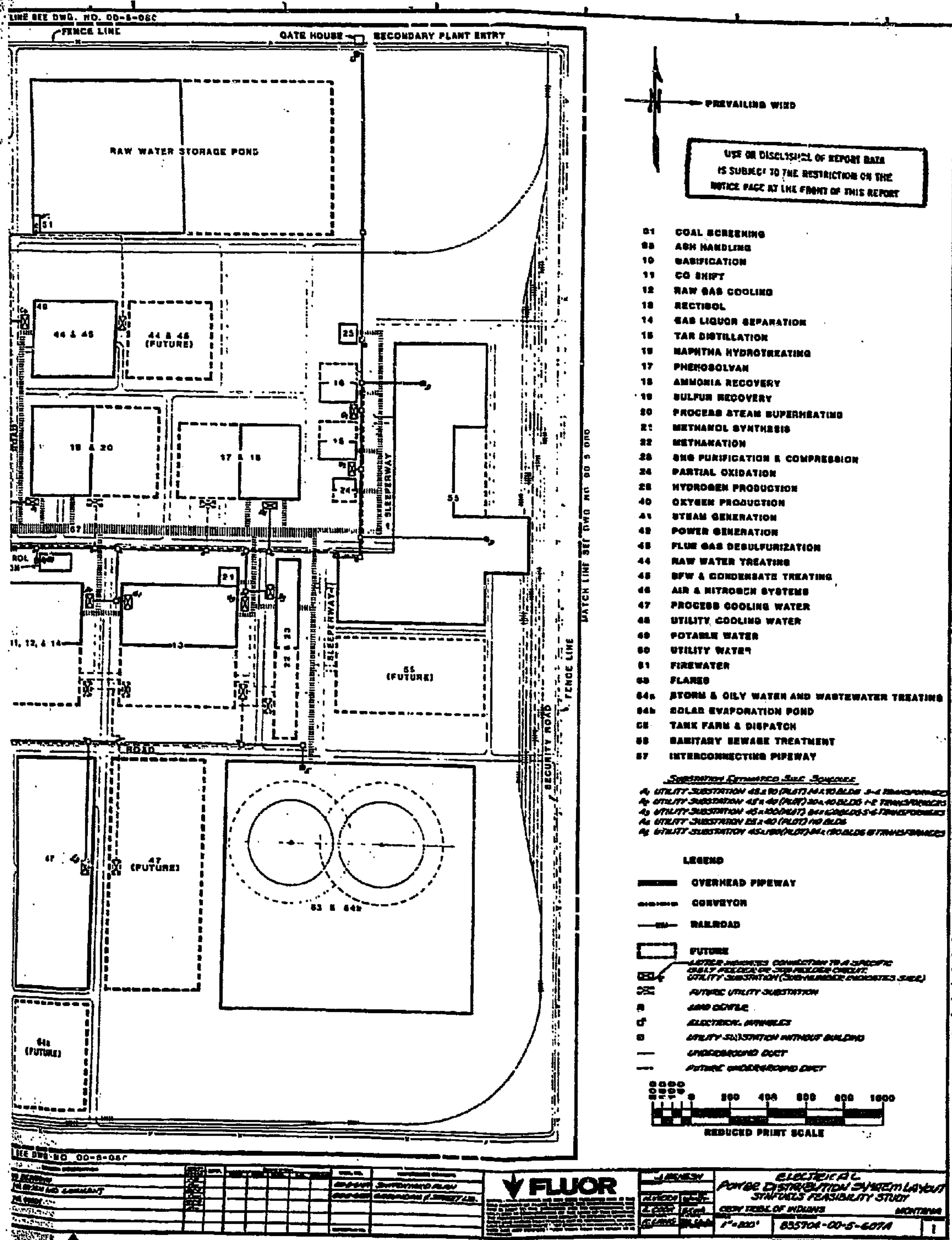
M.VIERA

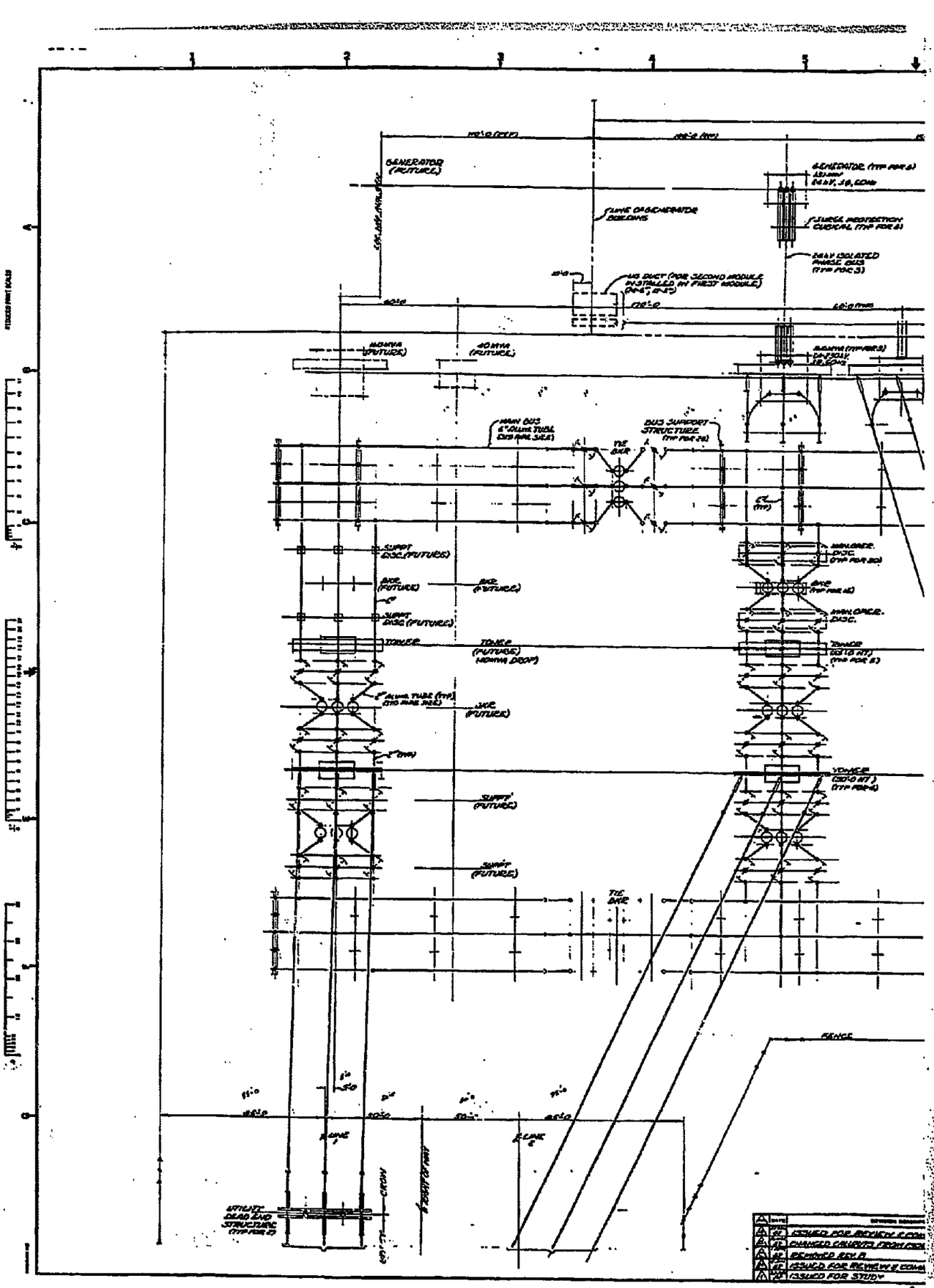
ELECTRICAL STANDARDS LIGHTING SYNFUELS FEASIBILITY STUDY

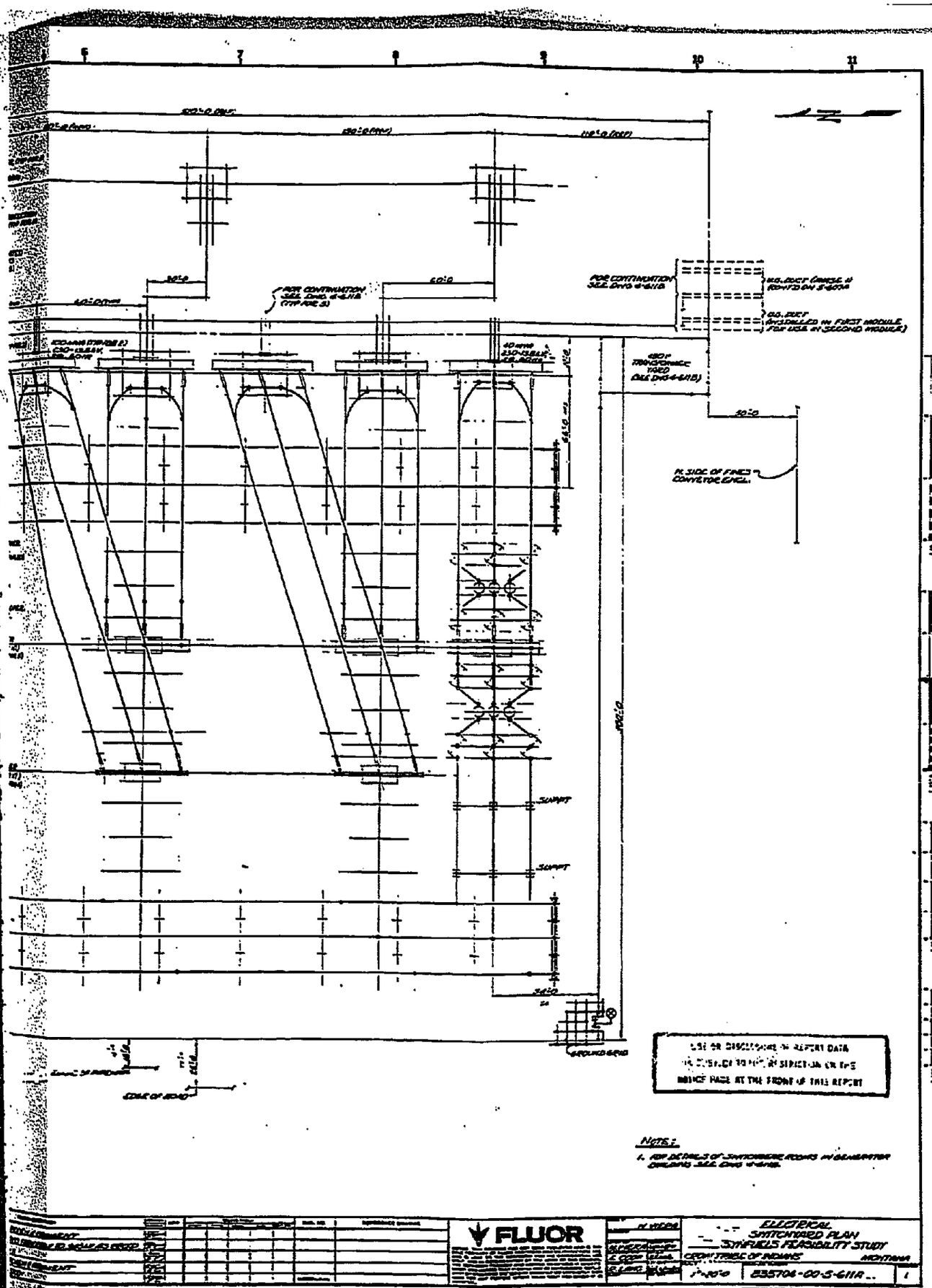
CROW TRIBE OF INDIANS MONTANA

NONE | 835704-00-E-605LD | 1


TYPICAL DUCT SECTIONS
MATCH LINE SEE DWG. NO. 00-6-080
FENCE LINE
SECURITY ROAD
COAL UNLOADING
TO DISPOSAL SITE
ASH STORAGE
EMERGENCY STORAGE
ELECTRICAL TRANSMISSION CORRIDOR
DEAD COAL STORAGE
LIVE COAL STORAGE
ADMINISTRATION AREA (SEE DWG. 81-2-300)
MAIN PLANT ENTRY ROAD
ROAD
FINES
GYPSUM
BOILER STACK
CONTROL ROOM
SECURITY ROAD
FENCE LINE
MATCH LINE SEE DWG.


FENCE LINE
GATE HOUSE
SECONDARY PLANT ENTRY
RAW WATER STORAGE POND
44 & 45
44 & 45 (FUTURE)
19 & 20
17 & 18
SLEEPERWAY
11, 12, & 14
22 & 23
55 (FUTURE)
47
47 (FUTURE)
53 & 54a
54a (FUTURE)
ROAD
SECURITY ROAD
FENCE LINE
PREVAILING WIND
USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT
01 COAL SCREENING
08 ASH HANDLING
10 GASIFICATION
11 CO SHIFT
12 RAW GAS COOLING
13 RECTISOL
14 GAS LIQUOR SEPARATION
15 TAR DISTILLATION
16 NAPHTHA HYDROTREATING
17 PHENOSOLVAN
18 AMMONIA RECOVERY
19 SULFUR RECOVERY
20 PROCESS STEAM SUPERHEATING
21 METHANOL SYNTHESIS
22 METHANATION
23 SNG PURIFICATION & COMPRESSION
24 PARTIAL OXIDATION
25 HYDROGEN PRODUCTION
40 OXYGEN PRODUCTION
41 STEAM GENERATION
42 POWER GENERATION
43 FLUE GAS DESULFURIZATION
44 RAW WATER TREATING
45 BFW & CONDENSATE TREATING
46 AIR & NITROGEN SYSTEMS
47 PROCESS COOLING WATER
48 UTILITY COOLING WATER
49 POTABLE WATER
50 UTILITY WATER
51 FIREWATER
53 FLARES
54a STORM & OILY WATER AND WASTEWATER TREATING
54b SOLAR EVAPORATION POND
CE TANK FARM & DISPATCH
56 SANITARY SEWAGE TREATMENT
57 INTERCONNECTING PIPEWAY
LEGEND
OVERHEAD PIPEWAY
CONVEYOR
RAILROAD
FUTURE
0 200 400 600 800 1000
REDUCED PRINT SCALE
FLUOR
ELECTRICAL POWER DISTRIBUTION SYSTEM LAYOUT
SYNFUELS FEASIBILITY STUDY
MONTANA
835704-00-5-607A


GENERATOR (FUTURE)
LINE OF GENERATOR BUILDING
GENERATOR (TYP FOR 3)
SURGE PROTECTION CUBICAL (TYP FOR 3)
MAIN ISOLATED PHASE BUS (TYP FOR 3)
MAIN BUS 6"ø ALUM TUBE
TIE BAR
BUS SUPPORT STRUCTURE (TYP FOR 24)
SUPPT DISC (FUTURE)
BUS (FUTURE)
TOWER (FUTURE) (40MVA DROP)
SUPPT (FUTURE)
TIE BAR
FENCE
UTILITY DEAD END STRUCTURE (TYP FOR 2)
CENTER OF TANK
ISSUED FOR REVIEW & COMM
CHANGED CABLES FROM CSA
REVISED REV A
ISSUED FOR REVIEW & COMM
ISSUED FOR STUDY



USE OF DISCONTINUITY REPORT DATA
IS SUBJECT TO THE RESTRICTIONS
NOTICE PAGE AT THE FRONT OF THIS REPORT

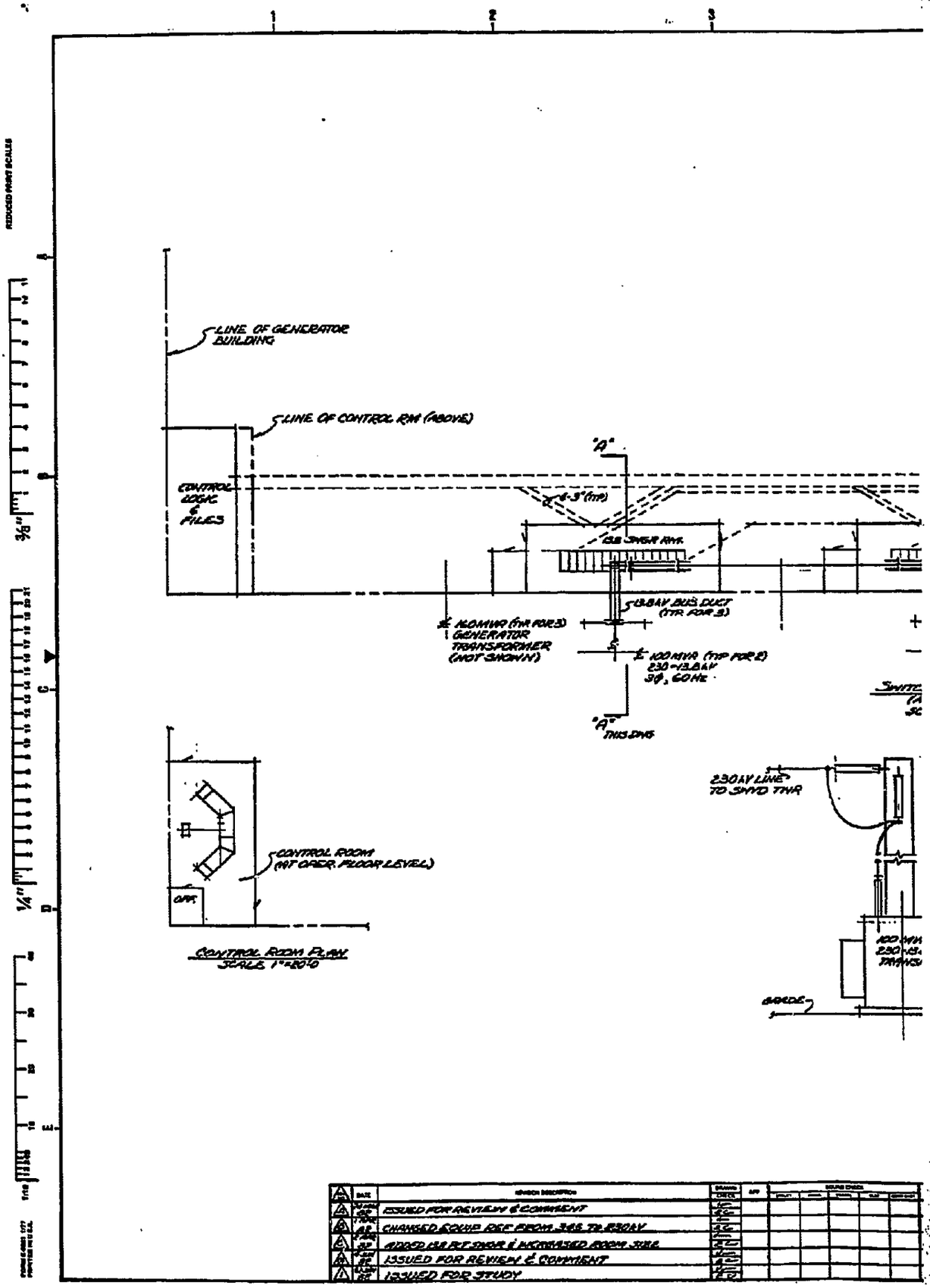
NOTES:

1. FOR DETAILS OF SWITCHGEAR ROOMS IN GENERATOR BUILDING SEE DWG 4-611B.

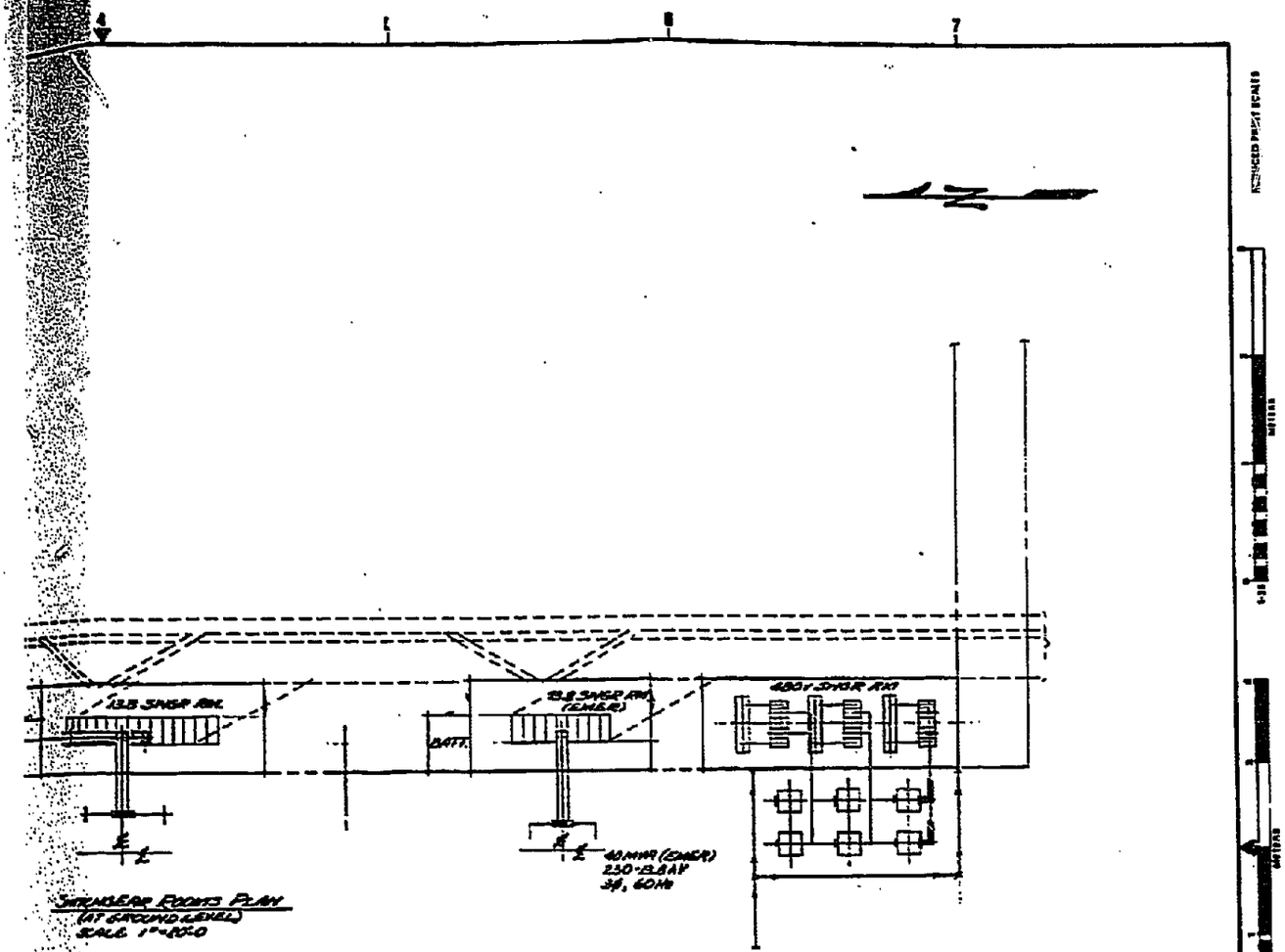
FLUOR

ELECTRICAL
SWITCHYARD PLAN
SYNFUELS FEASIBILITY STUDY
CROW TRIBE OF INDIANS MONTANA

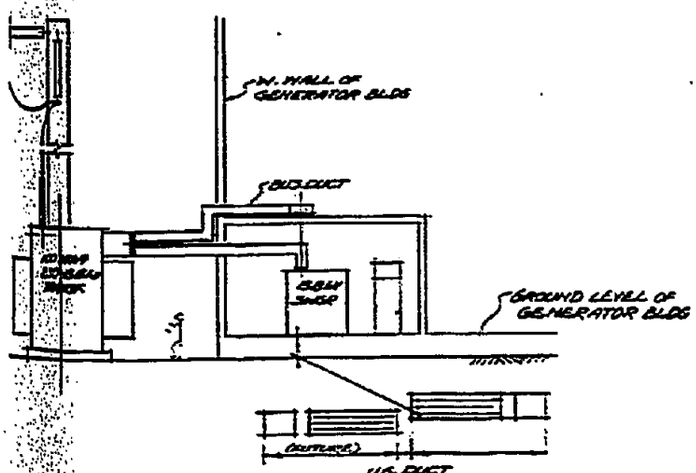
1"=50'-0" | 235706-00-S-611A | 1



MK	DATE	REVISION DESCRIPTION	DRAWN	APP
4	12 JUNE 80	ISSUED FOR REVIEW & COMMENT		
3	28 APR 80	CHANGED SOLID REF FROM 345 TO 230kV		
2	25 JAN 80	ADDED 138 KV SWGR & INCREASED ROOM SIZE		
1	11 DEC 79	ISSUED FOR REVIEW & COMMENT		
0	12 OCT 79	ISSUED FOR STUDY		



SWITCHGEAR ROOMS PLAN
(AT GROUND LEVEL)
SCALE 1"=10'-0

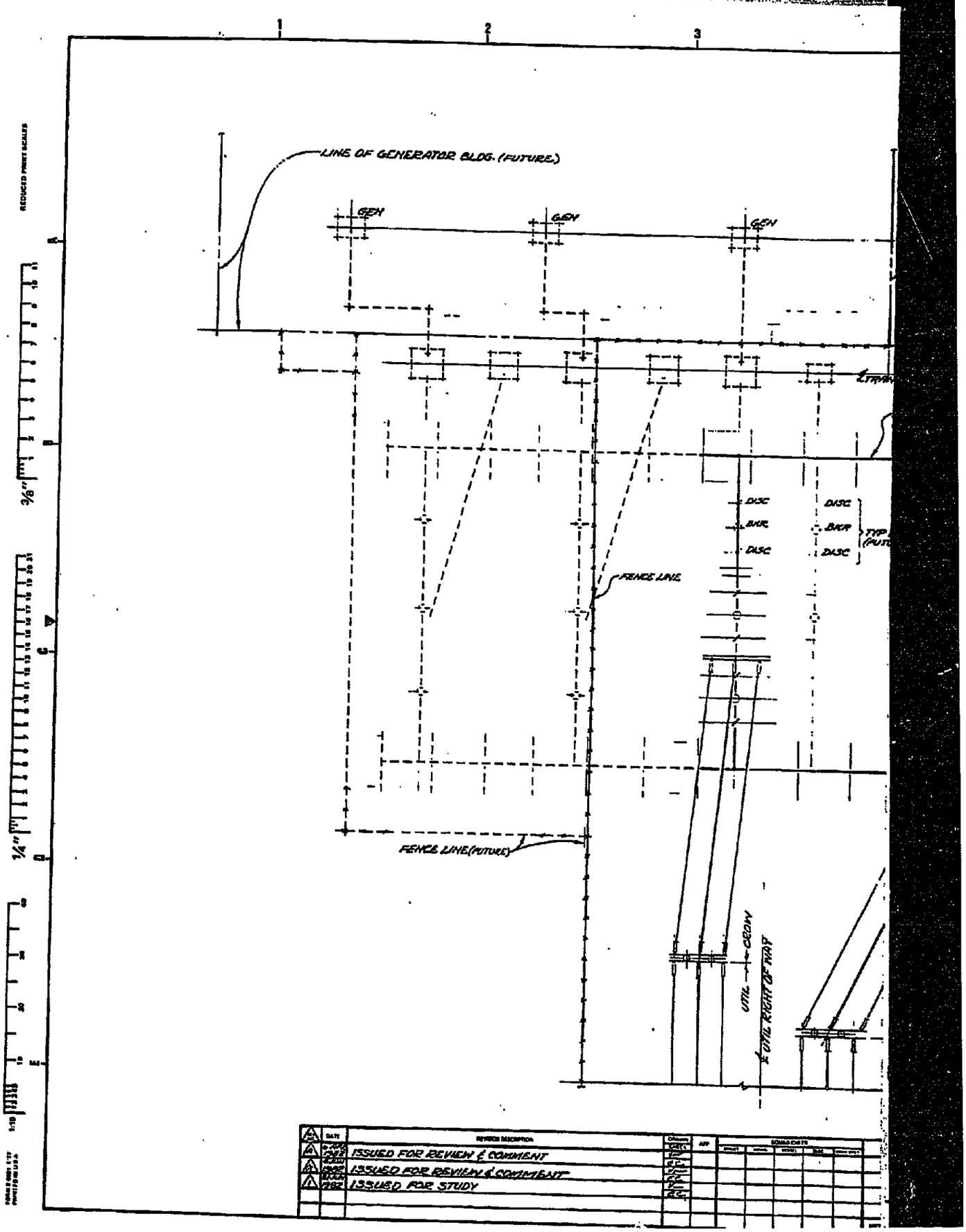


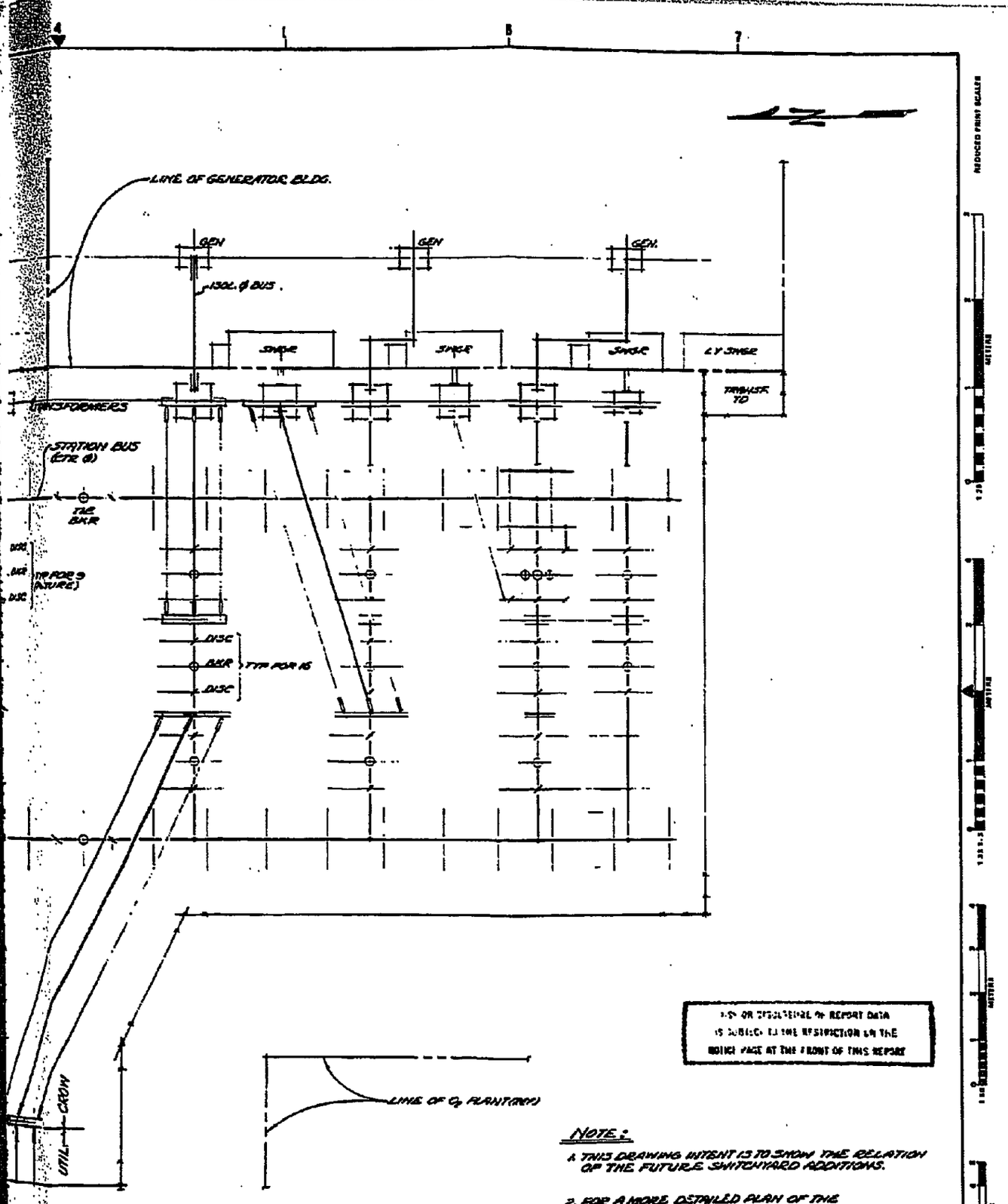
SECTION "A-A"
SCALE 1"=10'-0

NOTE:
1. USE THIS DRAWING WITH DWG 5-611A.

THIS SHEET OF DISCLAIMER OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

		FLUOR	N. VIERA	ELECTRICAL SWITCHYARD PLAN SYNFUELS FEASIBILITY STUDY		
			N. VIERA	CROW TRIBE OF INDIANS	MONTANA	
			E. COOK	AS NOTED	835704-00-4-611B	1
			R. LANG			


1
2
3
LINE OF GENERATOR BLDG. (FUTURE)
GEN
GEN
GEN
DISC
BKR
DISC
DISC
BKR
DISC
FENCE LINE
FENCE LINE (FUTURE)
UTIL
CEDW
UTIL RIGHT OF WAY
REVISION DESCRIPTION
ISSUED FOR REVIEW & COMMENT
ISSUED FOR REVIEW & COMMENT
ISSUED FOR STUDY



U.S. OR FOREIGN PATENT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

NOTE:

1. THIS DRAWING INTENT IS TO SHOW THE RELATION OF THE FUTURE SWITCHYARD ADDITIONS.
2. FOR A MORE DETAILED PLAN OF THE SWITCHYARD SEE DWG 00-S-611A.

FLUOR

N. VIERA

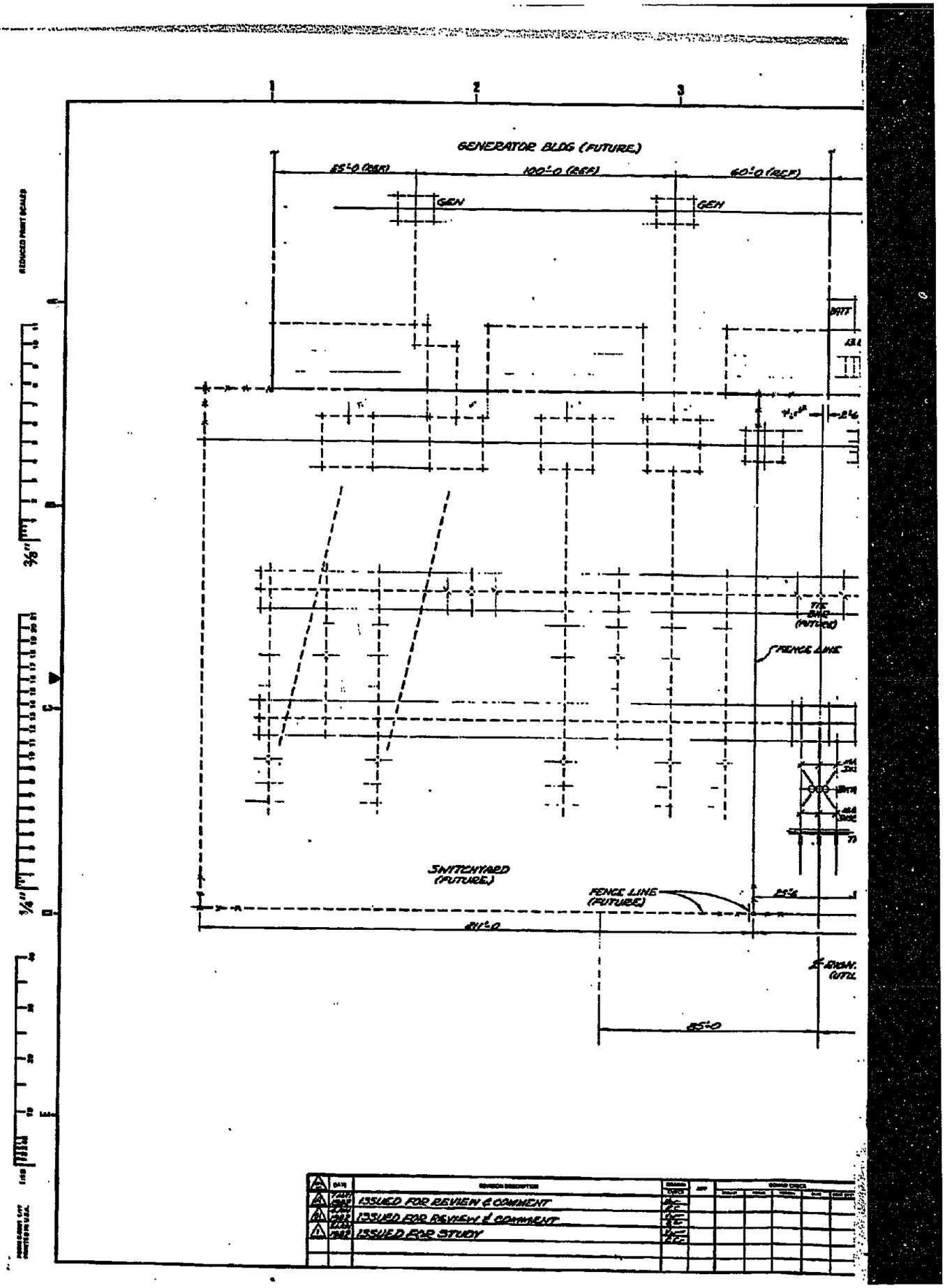
ELECTRICAL
SWITCHYARD PLAN
SYNFUELS FEASIBILITY STUDY

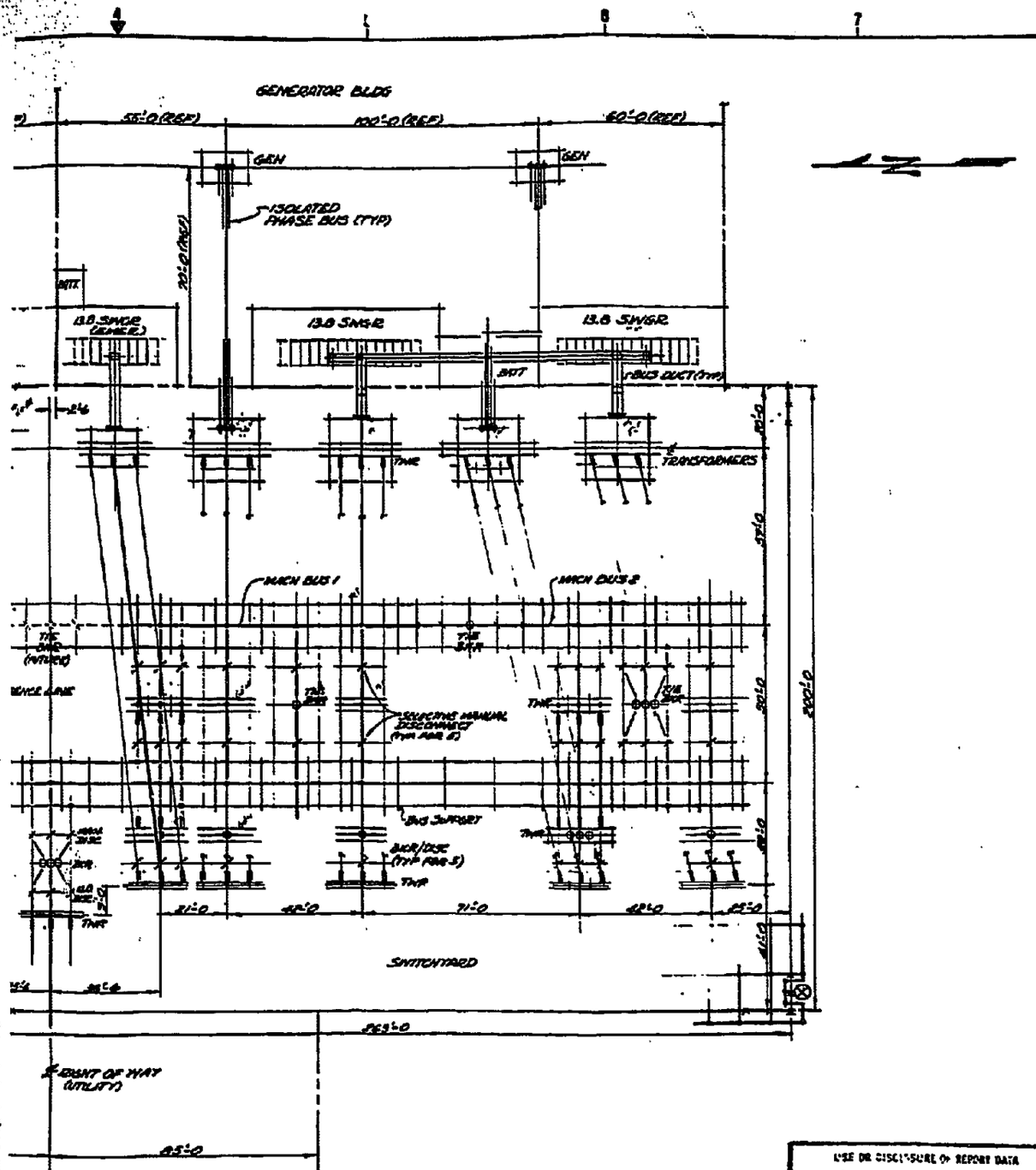
CROW TRIBE OF INDIANS MONTANA

1"=40'-0

835704-00-4-611C

1


GENERATOR BLDG (FUTURE)
85'-0 (BBF)
100'-0 (BEF)
60'-0 (BCF)
GEN
GEN
FENCE LINE
SWITCHYARD (FUTURE)
FENCE LINE (FUTURE)
85'-0
REVISION DESCRIPTION
ISSUED FOR REVIEW & COMMENT
ISSUED FOR REVIEW & COMMENT
ISSUED FOR STUDY



USE OR DISCLOSURE OF REPORT DATA IS SUBJECT TO THE RESTRICTION ON THE NOTICE PAGE AT THE FRONT OF THIS REPORT

NOTE:

1. ALTERNATE 1 IS THE POWER SELF SUFFICIENCY CASE.

FLUOR

M. VIERA

ELECTRICAL
SWITCHYARD PLAN (ALTERNATE 1)
SYNFUELS FEASIBILITY STUDY

CROW TRIBE OF INDIANS — MONTANA

1"=20'-0" | 835704-00-4-611E | 1