6.8.2 ROADS - SITE 1

Roads serving the plant site connect the plant with outside routes and also to convey internal plant traffic. The new roads serving the plant are divided into two types based on their usage:

(1) Access Road
(2) Plant Roads

A description of the existing roads in the area is contained in Section 5.2 Site Data.

6.8.2.1 ACCESS ROAD

There are no existing county or state roads presently connecting the plant site with any major highway or interstate route. Therefore, a new Access Road is constructed to provide access to the site from old State Route 87/212 and Interstate 90.

The Plant Access Road enters the plant at the primary entrance located in the northwesterly corner of the site. The Access Road travels easterly from the primary entrance, parallel to the northernerly boundary of the site, where it meets the access road to the secondary entrance located in the northeasterly corner of the site.

The Access Road then travels in a northerly direction from the site paralleling the proposed plant railroad until it meets old State Route 87/212. The Access Road continues in a northeastererly direction utilizing existing old State Route 87/212. The Access Road then connects old State Route 87/212 with Interstate 90 to Toluca Interchange.

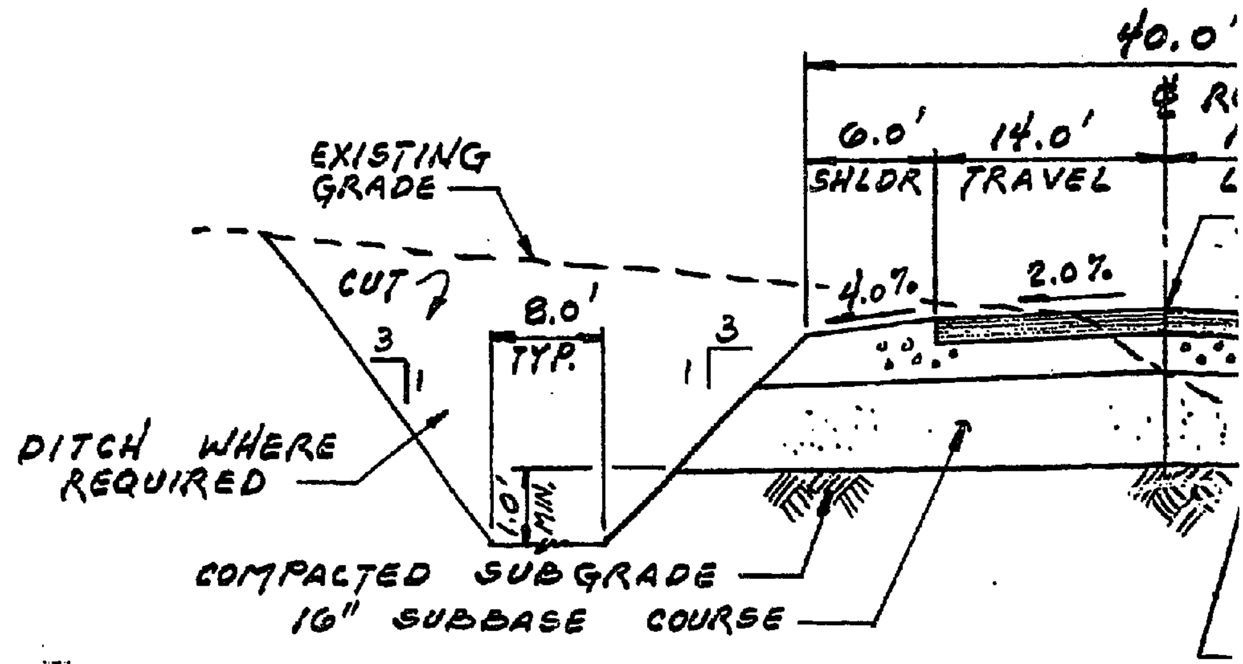
6.8.2.1 (Continued)

The total length of the Access Road is approximately 10 miles. About 2 miles of the Access Road is an upgraded length along existing old State Route 87/212.

The Access Road is designed for an H20-S16-44 loading and will comply with Montana Highway Department Standards. The Access Road has 2 lanes and is asphalt paved. Each lane is 14 feet wide with 6 feet wide shoulders on each side of the road. A cross section of the new length of Access Road is shown on Drawing 835704-00-2-086. A cross section of the upgraded length of Access Road is shown on Drawing 835704-00-2-097.

The typical cross section of the new length of Access Road consists of 16 inch subbase course over a compacted subgrade, 8 inch aggregate base course of crushed rock or stone, and 4 inch asphaltic concrete paving. The typical cross section of the upgraded length of Access Road consists of a 3 inch asphaltic concrete overlay atop the existing road. The existing road is also widened.

The Access Road is provided with drainage ditches as required. These ditches convey runoff to natural drainages in the area. Culverts are provided where the new Access Road crosses natural drainages. A total of approximately 1120 feet of 72 inch diameter reinforced concrete pipe is required. A road overpass is also provided at the crossing of the upgraded section of old State Route 87/212 and the existing Burlington Northern rail line.



TYPICAL SECTION -

REV. NO.	DATE	REVISION DESCRIPTION	DRAWN / CHECK	DATE
1	6/9/82	ISSUED FOR STUDY	M.D.	6/9/82

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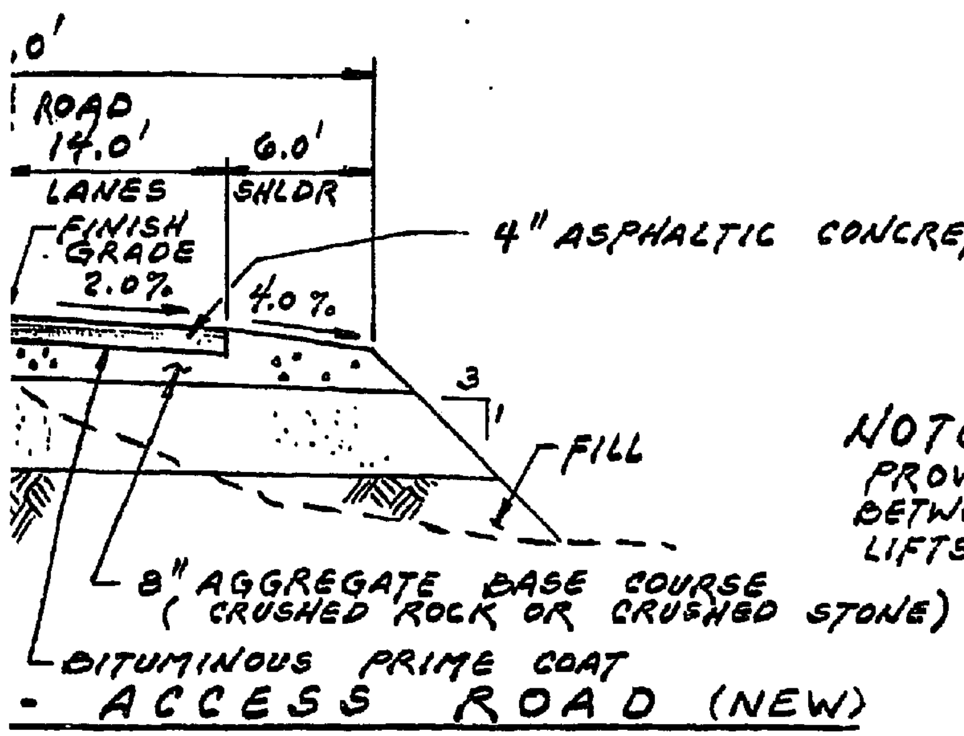


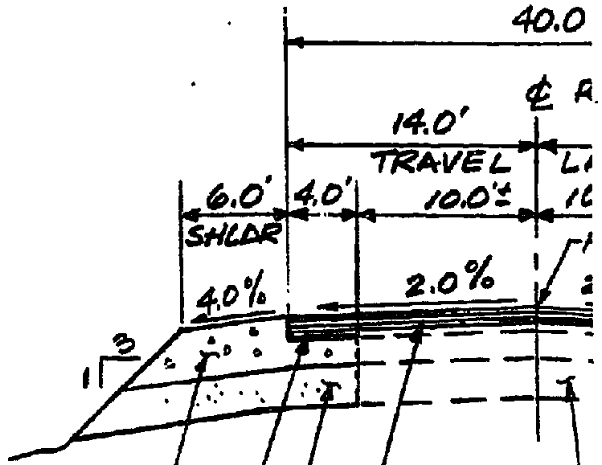
NOTE:
PROVIDE TACK COAT BETWEEN A.C. PAVING LIFTS.

- ACCESS ROAD (NEW)

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

DRAWN BY: M. PIERCE		ACCESS ROAD (NEW)
CHECKED BY: M. DORIN		SYNFUELS FEASIBILITY STUDY
SUPERVISOR: A. QUINONES	RELEASE DATE: 6/9/82	
SUPERVISING ENGR.: M. DORIN	INITIALS: M. Dorin	CROW TRIBE OF INDIANS — MONTANA
PROJECT ENGR.: R. LANG	APP. DATE: RAL 6/9/82	SCALE: NONE; DRAWING NUMBER: 835704-00-2-086; REVISION: 1
CLIENT	APP. DATE	

OR



NEW 8" MIN. AGGREGATE BASE COURSE, (TYP. BOTH SIDES)

NEW 4" ASPHALT CONCRETE PAVING, (TYP. BOTH SIDES)

NEW 16" SUB-BASE COURSE (TYP. BOTH SIDES)

NEW 3" ASPHALT CONCRETE PAVING, OVERLAY

TYPICAL SECTION - ACCES

REV. NO.	DATE	REVISION DESCRIPTION	DRAWN / CHECK	DATE
1	6/9/82	ISSUED FOR STUDY	m.D.	6/9/82

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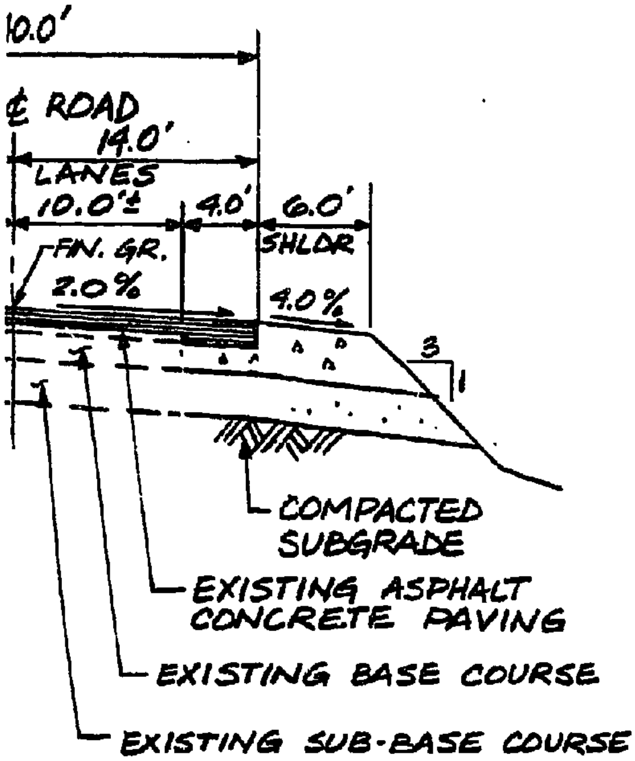


'SS ROAD (UPGRADED)

OR

DRAWN BY	M. PIERCE
CHECKED BY	M. DORIN
SUPERVISOR	A. QUINONES
RELEASE DATE	6/9/82
SUPERVISING ENGR.	M. DORIN
INITIALS	M. Dorin
PROJECT	R. LANG
APP. DATE	RAL 6/9/82
CLIENT	
APP. DATE	

ACCESS ROAD (UPGRADED)

SYNFUELS FEASIBILITY STUDY

CROW TRIBE OF INDIANS — MONTANA

SCALE	DRAWING NUMBER	REVISION
NONE	835704-00-2-097	1

6.8.2.2 PLANT ROADS

There are four types of roads within the plant site:

(1) Access Road
(2) Plant Primary Road
(3) Plant Secondary Road
(4) Plant Security Road

(1) Access Road

The Access Road connects the plant site with existing Interstate 90 as described in Section 6.8.2.1. The Access Road extends into the plant site between the administration building and the employee parking area and ends at the northwesterly corner of the warehouse facility. At this point the Plant Primary Road begins. The Access Road is extended into the plant site to accommodate the heavier traffic in this area due to warehouse deliveries, plant personnel, and visitors.

(2) Plant Primary Road

The Plant Primary Road functions as the major artery for the plant traffic. The Plant Primary Road is narrower than the Access Road, but wider than the Plant Secondary Road. The Plant Primary Road is used for heavily loaded traffic and crane access.

6.8.2.2 (Continued)

The typical cross section of the Plant Primary Road is shown on Drawing 835704-00-2-087. The typical section of the Plant Primary Road consists of 16 inch subbase course over a compacted subgrade, 8 inch aggregate base course of crushed rock or stone, and 3 inch asphaltic concrete paving.

The Plant Primary Road has 2 lanes and will be asphaltic concrete paved. Each lane is 12 feet wide with 4 foot wide shoulders on each side of the road.

The estimated length of Plant Primary Road required is 7 miles.

(3) Plant Secondary Road

The Plant Secondary Road serves traffic travelling between the Plant Primary Road and within the process unit areas. The Plant Secondary Road is narrower than the Plant Primary Road.

The typical cross section of the Plant Secondary Road is shown in Drawing 835704-00-2-088. The typical section of the Plant Secondary Road consists of 16 inch subbase course over a compacted subgrade, 8 inch aggregate base course of crushed rock or stone, and 3 inch asphaltic concrete paving.

The Plant Secondary Road has one lane 12 feet wide with a 4 foot wide shoulder on each side.

The estimated length of Plant Secondary Road required is 2 miles.

6.8.2.2 (Continued)

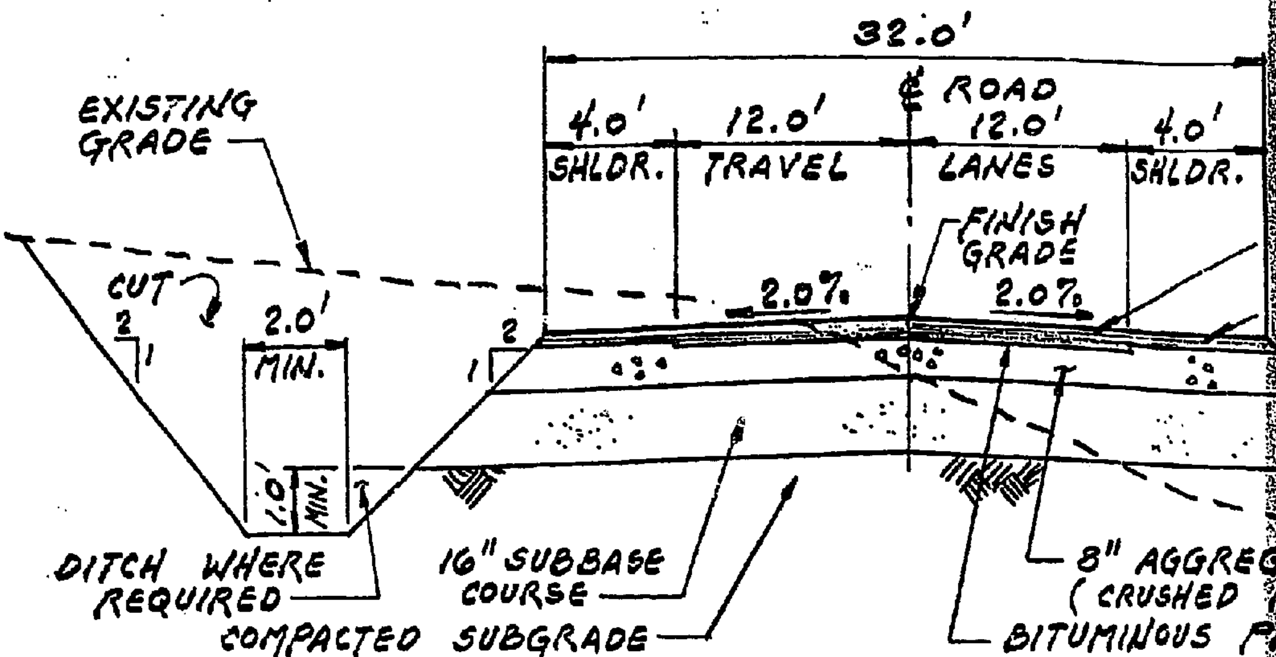
(4) Plant Security Road

The Plant Security Road is located around the perimeter of the plant site to serve guard and security personnel performing surveillance along the fence line.

The typical cross section of the Plant Security Road is shown in Drawing 835704-00-2-089. The typical section of the Plant Security Road consists of an 8 inch layer of gravel over a compacted subgrade.

The Plant Security Road has one lane 12 feet wide with a 4 foot wide shoulder on each side.

The estimated length of Plant Security Road required is 4 miles.



TYPICAL SECTION - PLANT PRIMA

REV. NO.	DATE	REVISION DESCRIPTION	DRAWN / CHECK	DATE
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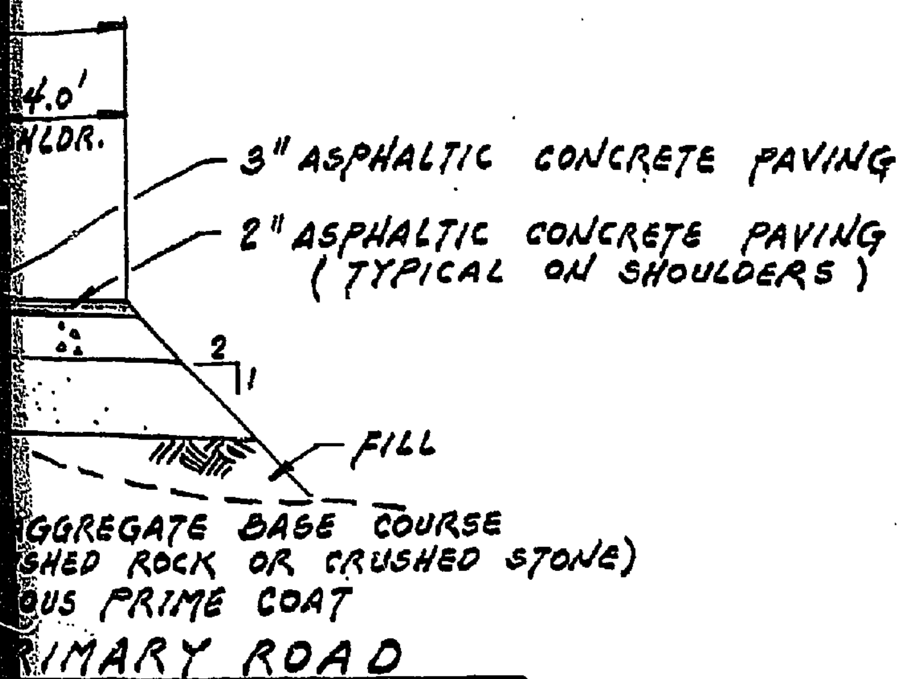
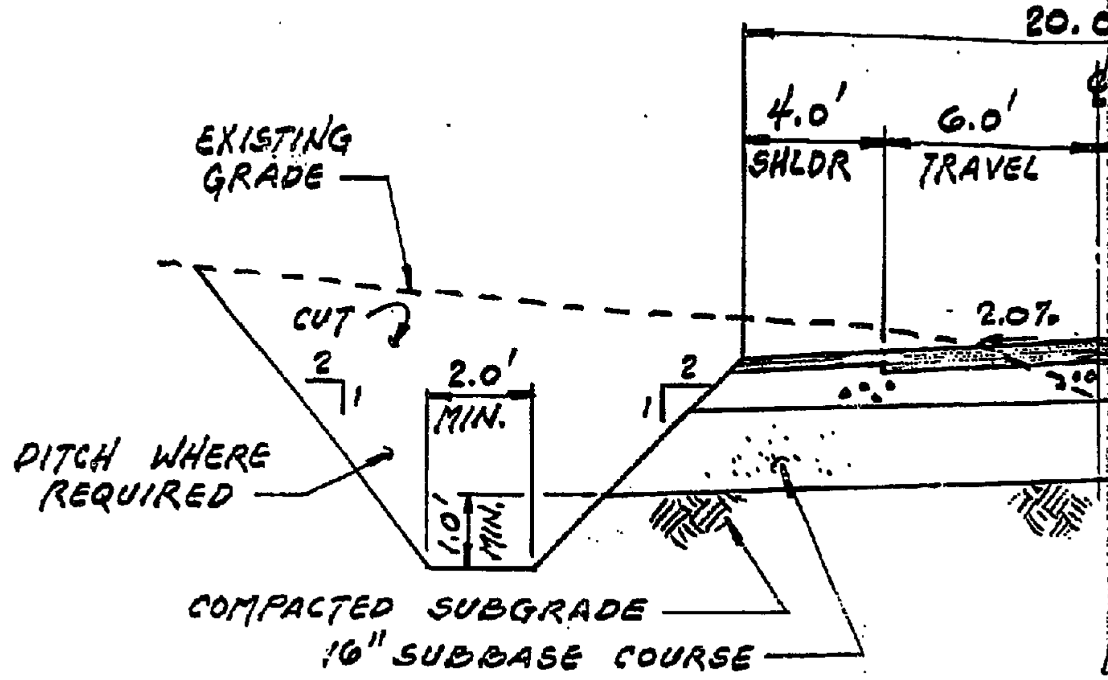


NOTE:
PROVIDE TACK COAT BETWEEN A.C. PAVING LIFTS

DRAWN BY: M. PIERCE		PLANT PRIMARY ROAD	
CHECKED BY: M. DORIN		SYNFUELS FEASIBILITY STUDY	
SUPERVISOR: A. QUINONES	RELEASE DATE: 6/9/82		
SUPERVISING ENGR.: M. DORIN	INITIALS: M. Dorin	CROW TRIBE OF INDIANS	MONTANA
PROJECT: R. LANG	APP. DATE: RAL 6/9/82	SCALE: NONE	DRAWING NUMBER: 835704-00-2-087 — REVISION: 1
CLIENT	APP. DATE		



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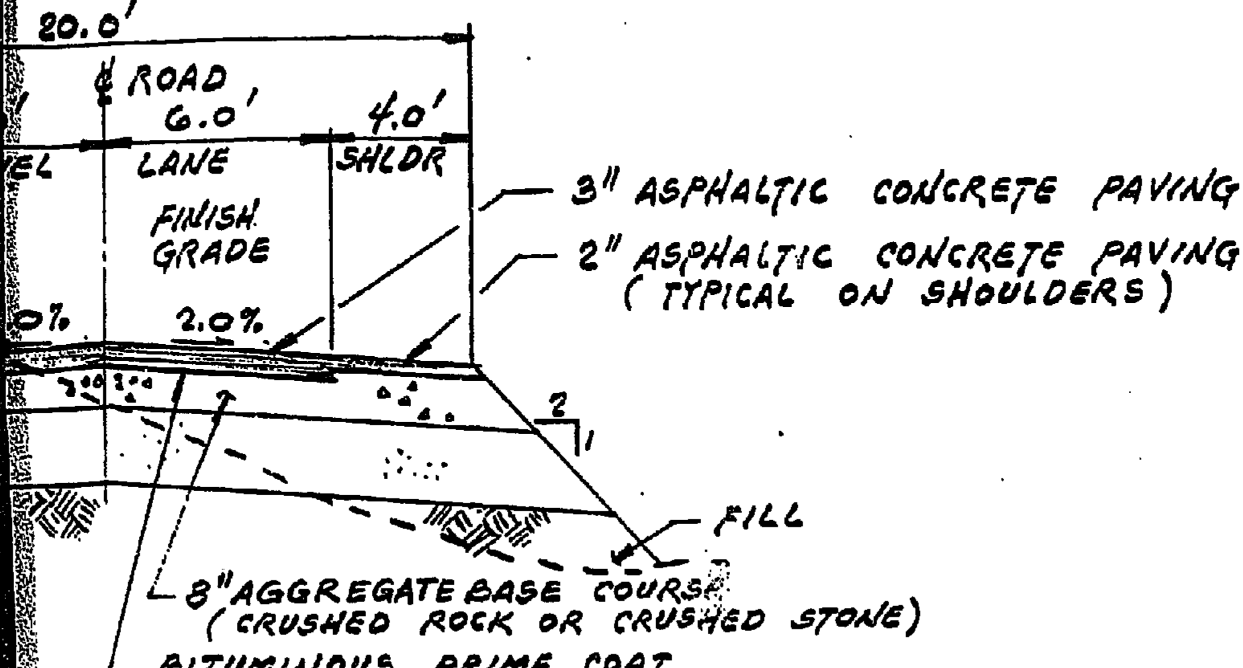


1 - PLANT SECONDARY ROAD

DRAWN BY: M. PIERCE
CHECKED BY: M. DORIN
SUPERVISOR: A. QUINONES — RELEASE/DATE: 6/9/82
SUPERVISING ENGR.: M. DORIN — INITIALS: [illegible]
PROJECT: R. LANG — APP. DATE: RAL 6/9/82
CLIENT: — APP. DATE:

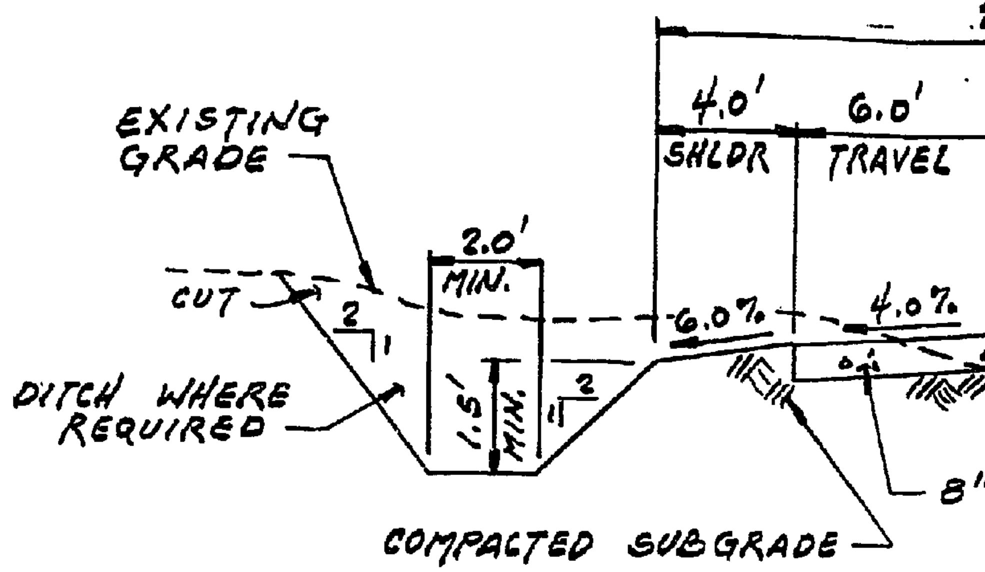
OR

PLANT SECONDARY ROAD

SYNFUELS FEASIBILITY STUDY

CROW TRIBE OF INDIANS — MONTANA

SCALE	DRAWING NUMBER	REVISION
NONE	835704-00-2-088	1



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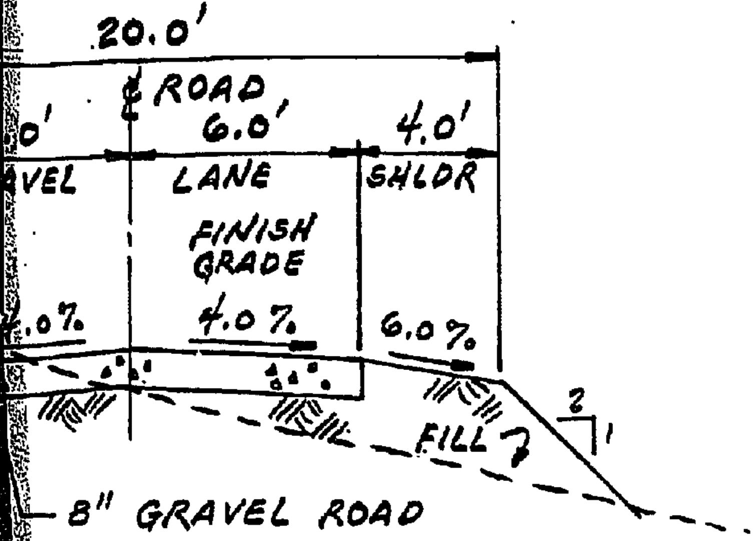


U - SECURITY ROAD

OR	DRAWN BY: M. PIERCE		SECURITY ROAD	
	CHECKED BY: M. DORIN		SYNFUELS FEASIBILITY STUDY	
	SUPERVISOR: A. QUINONES	RELEASE DATE: 6/9/82		
	SUPERVISING ENGR.: M. DORIN	INITIALS: M. Dorin	CROW TRIBE OF INDIANS	MONTANA
	PROJECT: R. LANG	APP. DATE: RAL 6/9/82	SCALE: NONE	DRAWING NUMBER: 835704-00-2-089 — REVISION: 1
	CLIENT	APP. DATE		

6.8.3 RAILROAD - SITE 1

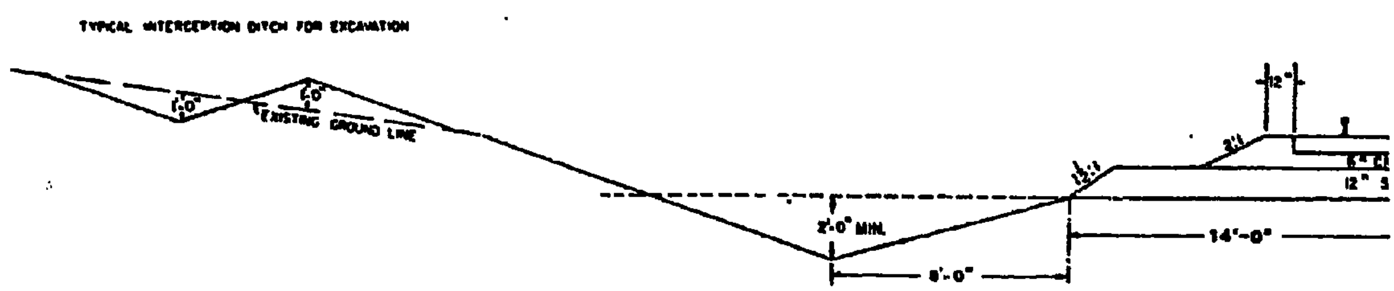
A new rail line is required to connect the plant site with the existing Burlington Northern trackage as shown on Drawing 835704-00-4-079 and Drawing 835704-00-5-080, in Section 5.2. of this volume. Approximately 9 miles of new track is required. The existing rail lines in the area are described in Section 5.2.7.6 of this volume.

The new track runs in a northerly direction from the site and meets the existing Burlington Northern rail line approximately 2 miles west of the Toluca Interchange. The new track loops within the plant boundary. The track enters the plant at the northeasterly corner and exits at the northwesterly corner. A siding is provided at the interchange of the existing main line with the new rail line for traffic control and passing.

Culverts are provided where the new railroad trackage crosses natural drainages. A total of approximately 640 feet of reinforced concrete pipe is required. A road overpass is also provided at the crossing of old State Route 87/212 and the new plant rail line.

A typical cross section of the rail line is shown on Drawing 835704-00-2-112.

A description of the railroad facility within the plant site is contained in Section 6.8.4.1.



EXCAVATION

SINGLE T

SOURCE: BURLINGTON NORTHERN RAILROAD COMPANY

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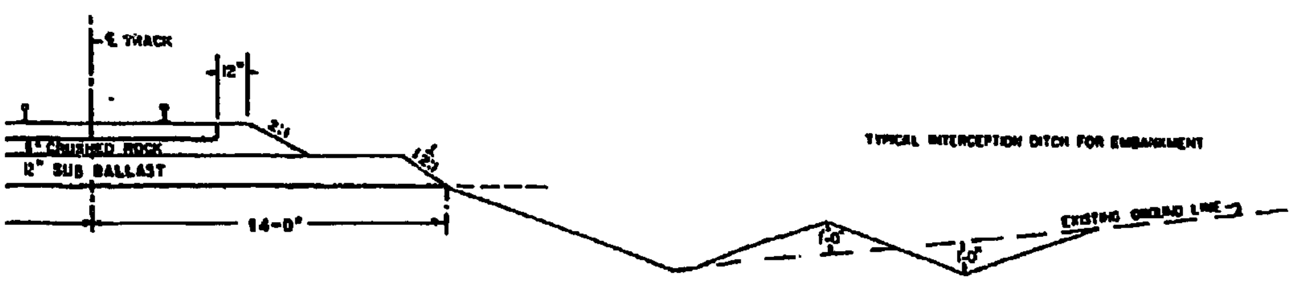

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CHECKED BY M. DORIN		
SUPERVISOR A. QUINONES	RELEASE DATE 6/3/82	
SUPERVISING ENGR. M. DORIN	INITIALS M. Dorin	
PROJECT ENGR. R. LANG	APP. DATE RAL 6/6/82	
CLIENT	APP. DATE	

RAILROAD
TYPICAL ROADBED SECTION
SYNFUELS FEASIBILITY STUDY

CROW TRIBE OF INDIANS — MONTANA

SCALE	DRAWING NUMBER	REVISION
NONE	835704-00-2-112	1

6.8.4 LOGISTIC FACILITIES - SITE 1

The major logistic facilities serving the plant are:

Rail shipping and receiving facilities
Truck shipping and receiving

6.8.4.1 RAIL SHIPPING AND RECEIVING FACILITIES

The layout of the plant railroad facility is shown on Drawing 835704-00-5-083.

The railroad facility serves as an area for loading and shipping of byproducts and spent catalysts. The facility is also used for receiving and shipping of materials during construction and plant operation.

A discussion of the byproducts to be shipped and chemicals to be received are contained in Section 5.5 (Products and Byproducts) of this volume.

The railroad facility is composed of three major loading/unloading areas:

Byproduct shipping and marshalling
Coal unloading
Materials receiving and shipping at warehouse/shops facility

The new rail line enters the site at the northeasterly corner as described in Section 6.8.3. The rail line runs along the easterly, southerly, and western boundaries of the plant site and then exits at the northwesterly corner as shown on Drawing 835704-00-5-083.

6.8.4.1 (Continued)

Byproduct Shipping and Marshalling Area

The by-product shipping and marshalling area is located along the easterly boundary of the plant as shown on Drawing 835704-00-5-083. The facility is composed of six tracks. Three tracks are required for loading and three tracks for car storage and maneuvering. The loop track within the site is left unobstructed.

The byproducts to be shipped include the following:

(1) Ammonia
(2) Naphtha
(3) Sulfur (molten)

All train cars are specially designed and manufactured to transport each particular product. Their design is in accordance with governmental and environmental codes, rules, and regulations.

During the plant construction, tracks within this area may be used to receive construction materials. Areas along the trucks will be gravel or asphaltic concrete paved as required.

Coal Unloading Area

The coal unloading area is located along the westerly boundary of the plant. The unloading facility is composed of a single track about 2 miles in length, with 1 mile on each side of the point of unloading.

6.8.4.1 (Continued)

This spur track branches from the unobstructed loop track at the middle of the southerly boundary of the plant and continues to the north and converges back into the loop track outside of the plant site. The coal is unloaded from the cars as the train moves to the north.

Materials Receiving and Shipping Area

The materials receiving and shipping area is located at the warehouse/shops facility. A spur track branching from the loop track serves the facility. This spur track starts at the northeasterly corner of site, runs east, and converges back into the loop track at the northwesterly corner of the site.

The chemicals to be received included the following:

(1) Isopropyl ether (IPE)
(2) Sodium Hydroxide
(3) Sulfuric Acid
(4) Propylene
(5) Lime
(6) Catalysts

This facility will also receive construction materials, supplies, and equipment during plant construction and operation. Equipment in need of repair and other items may also be shipped from here. All materials to be stored will be trucked from the railroad receiving platform to the warehouse/shops area.

Areas along the tracks will be gravel or asphaltic concrete paved as required.

6.8.4.2 TRUCK SHIPPING AND RECEIVING FACILITIES

There are three major truck shipping and receiving areas provided with platforms for the loading and unloading of materials, equipment, and supplies. These facilities are located at:

(1) Railroad byproduct shipping and marshalling area
(2) Railroad materials receiving and shipping area at the warehouse/shops facility
(3) Truck loading and unloading docks at the warehouse/shops facility

All truck facilities are used for the shipping and receiving of equipment, building materials, chemicals catalysts and other supplies.

The chemicals to be received by truck include the following:

(1) Water treatment chemicals
(2) Catalysts
(3) Sodium Chloride
(4) Phosphoric Acid

6.8.5 PAVING - SITE 1

The following are the types of paving used throughout the plant as shown on Drawing 835704-00-2-091.

Concrete Paving

Concrete is used to pave areas of process units to catch dripping oils and other chemicals and to act as a laydown area for heavy equipment. It is also used as a driving surface for cranes and trucks. The six (6) inch and four (4) inch concrete slabs are used in heavily loaded and lightly loaded areas, respectively.

Asphaltic Concrete Paving

Asphaltic concrete (AC) paving consisting of three (3) inches of AC over eight (8) inches of base course over sixteen (16) inches of subbase, is used in crane access areas at the process units.

Asphaltic concrete paving consisting of two (2) inches of AC over six (6) inches of base course, is used in light traffic areas around process units and in parking areas.

The asphaltic pavements around process units extends a minimum of fifteen (15) feet from the process unit structures. This protects the foundation by minimizing surface moisture infiltration to the expansive soils.

Gravel Paving

Gravel is used in areas of the plant where only foot traffic is expected. A four (4) inch layer is used for surface protection.

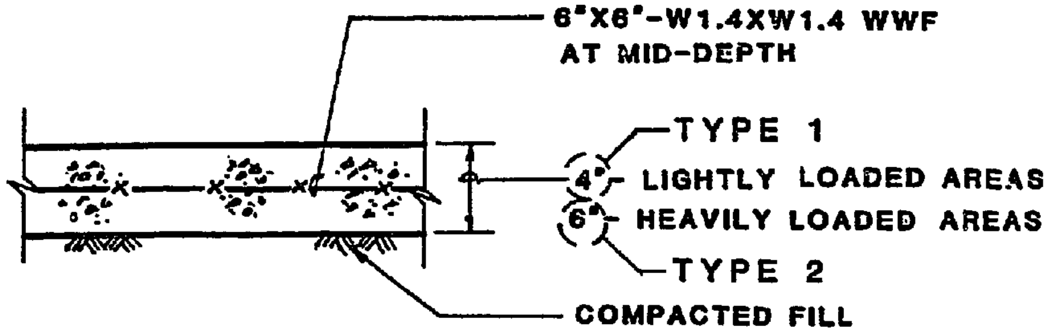
6.8.5 (Continued)

Pavement Design Estimate

The following is a summary of the required pavements for the entire plant area:

Paving Type	Area (Sq. Ft.)
Type 1 (concrete)	1,100,000
Type 2 (concrete)	730,000
Type 3 (asphalt)	400,000
Type 4 (asphalt)	1,600,000
Type 5 (gravel)	1,010,000

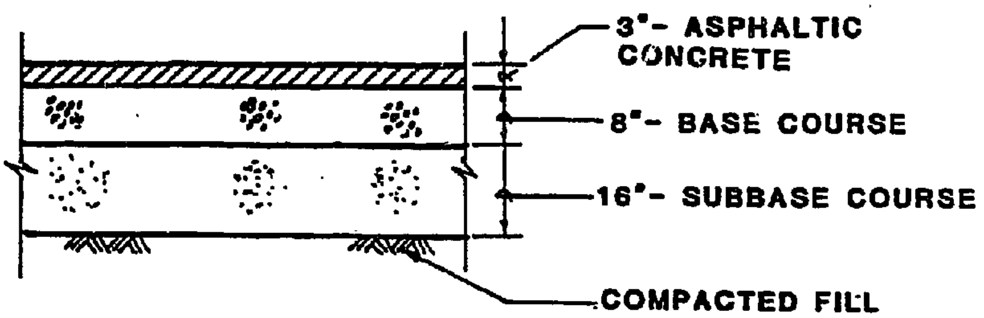
For a description of the Paving Types see Drawing 835704-00-2-091.



CONCRETE PAVING

TO BE USED WITHIN PROCESS UNITS

TYPE 1 & 2



ASPHALTIC CONCRETE PAVING

TO BE USED FOR CRANE ACCESS
AREAS AT PROCESS UNITS

TYPE 3

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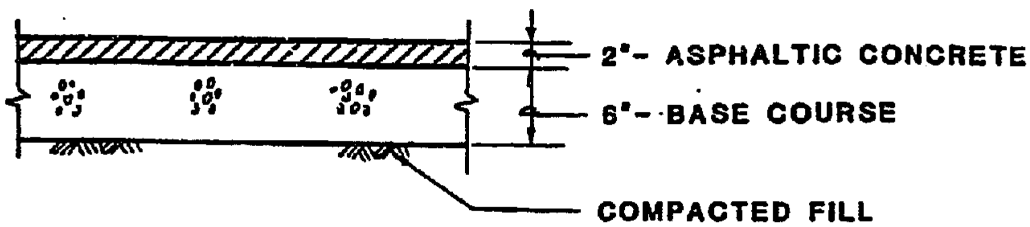
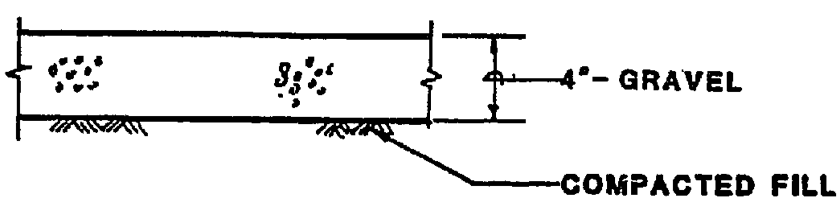
1	6/9/82	ISSUED FOR STUDY	m.D.	6/9/82



ASPHALTIC CONCRETE PAVING

TO BE USED FOR PARKING AREAS
AND LIGHT TRAFFIC AREAS
AROUND PROCESS UNITS

TYPE 4



GRAVEL PAVING

TO BE USED OUTSIDE
PROCESS UNITS

TYPE 5

DRAWN BY: M. PIERCE		PLANT PAVING DETAILS
CHECKED BY: M. DORIN		SYNFUELS FEASIBILITY STUDY
SUPERVISOR: A. QUINONES	RELEASE DATE: 6/9/82	
SUPERVISING ENGR.: M. DORIN	INITIALS: M. Dor…	CROW TRIBE OF INDIANS — MONTANA
PROJECT: R. LANG	APP. DATE: RAL 6/9/82	SCALE: NONE — DRAWING NUMBER: 835704-00-2-091 — REVISION: 1
CLIENT	APP. DATE	

6.8.6 FOUNDATIONS AND STRUCTURES - SITE 1

6.8.6.1 SOILS CHARACTERISTICS

A preliminary geotechnical investigation performed by Woodward-Clyde Consultants for the Crow Electric Power Generation Project Feasibility Study in 1981, indicates that the upper 3 to 7 feet layer of the soils consists of stiff to very stiff clays. The remaining depth of the 20 feet deep test holes show hard claystone bedrock underlying the upper layer. Much of the clay and claystone soils over the site have expansive characteristics. A discussion of the problems associated with the expansive soils and methods to minimize their effects on the stability of foundations is discussed in Section 6.8.1.2.

The frost depth is 48 inches. The bottom of all foundations is placed below the frost depth to prevent uplift from heaving.

6.8.6.2 FOUNDATION TYPES

The plant foundations may be divided into two categories; lightly loaded and heavily loaded. The lightly loaded foundations are usually less sensitive to settlement than the heavily loaded ones. However, the lighter foundations may be more susceptible to uplift from uncontrolled expansive soils.

Lightly loaded foundations may be constructed on soft clay layers which, in this case, a five (5) feet minimum layer beneath the foundation will be mass excavated and recompacted before installation. Lightly loaded foundations may also be constructed within compacted fill. In this case, a five (5) feet minimum layer of soft soil beneath the fill will be mass excavated and recompacted prior to filling the area.

6.8.6.2 (Continued)

However, if the thickness of the compacted fill layer under the foundation is greater than 5 feet, mass excavation in the existing soft soil may not be necessary.

Heavily loaded foundations will be constructed on bedrock whenever feasible. The heavily loaded foundations will be spread over a large area. Therefore it may be more practical and economical to mass excavate the area to the bottom of the footings prior to placing the foundations.

Spread footing foundations will be used wherever possible. However, when foundations of process units with heavy loads are situated in deep, soft soil layers, alternate foundation methods of drilled shafts or steel H piles may be adopted.

Drilled shaft foundations are constructed by drilling a hole through the soft soil layers extending a minimum of 3 feet into the bedrock. Reinforcing steel and concrete are then placed in the shafts. Steel H piles are steel piles driven through the soft soil layers into the bedrock. In both cases, the loads are transferred from the structure to the bedrock.

The mass excavation and recompaction of the soil around the foundations helps to minimize the expansive potential of the soft soils. This is accomplished by densifying the soil layer which minimizes moisture infiltration. The fill is compacted at a controlled moisture content and later covered by pavement.

During excavation, compaction, and placing of foundations, a temporary drainage system is constructed to prevent any ponding of water.

6.8.6.3 TYPICAL FOUNDATION DETAILS

Typical Foundation Details are shown on the following drawings:

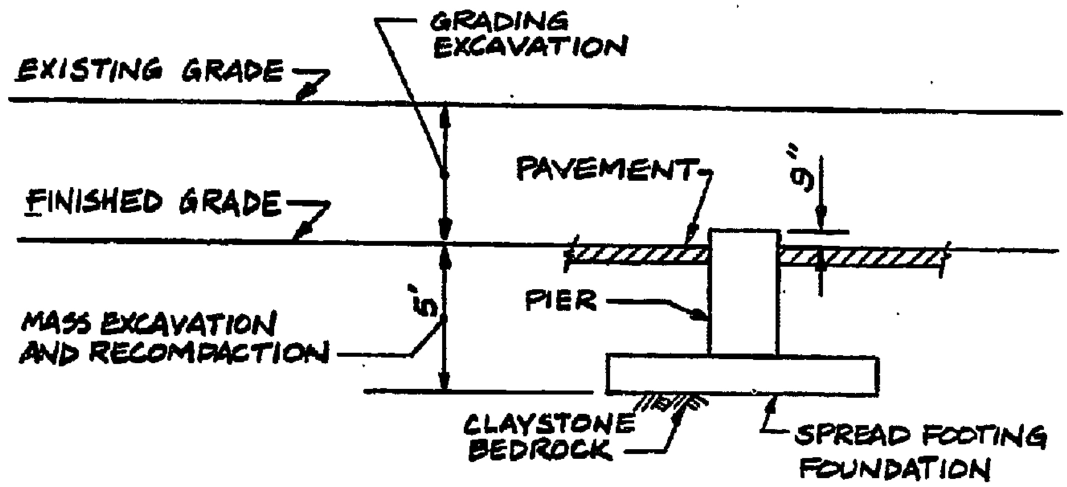
835704-00-1-113	Typical Foundation In Area of Excavation
835704-00-1-114	Typical Foundation In Area of Fill
835704-00-1-115	Typical Foundation in Storage Tankage Area

Drawing 835704-00-1-113 shows the typical foundation in an area of excavation. The area is graded by excavating to finished grade. The area is also mass excavated an additional 5 feet, the foundation is placed, and then the 5 feet layer is backfilled and recompacted. The foundation rests on claystone bedrock.

Drawing 835704--00-1-114 shows the typical foundation in an area of fill. The area is mass excavated 5 feet below existing grade and then backfilled and recompacted to the bottom of the foundation. The bottom of the foundation is approximately 5 feet below finished grade. After the foundation is placed, the remaining 5 feet layer is backfilled and recompacted to finished grade. The foundation rests on compacted fill with an assumed allowable bearing pressure of 4,000 pounds per square foot (k.s.f.).

Drawing 835704-00-1-115 shows the typical foundation for storage tank areas. The area is graded to finished grade. The tank pads rest on claystone bedrock or 5 feet of compacted fill which have an assumed allowable bearing pressure of 15 k.s.f. and 4 k.s.f., respectively.

The engineering of the grading, mass excavation, and surface and underground drainage system is designed to utilize spread footing foundation systems throughout the plant site. The spread footing foundation system has the advantages of generally being more economical and also more flexible regarding engineering design and construction scheduling as compared to drilled shaft and steel H pile foundations.



FLUOR

DR J. GRAU	**TYPICAL FOUNDATION IN AREA OF EXCAVATION**
CH M. DORIN	SYNFUELS FEASIBILITY STUDY
SUPR A. QUINONES	CROW TRIBE OF INDIANS — MONTANA
SUPR ENG. M. DORIN	
SCALE NONE	DRAWING NUMBER 835704-00-1-113 — REV. 1

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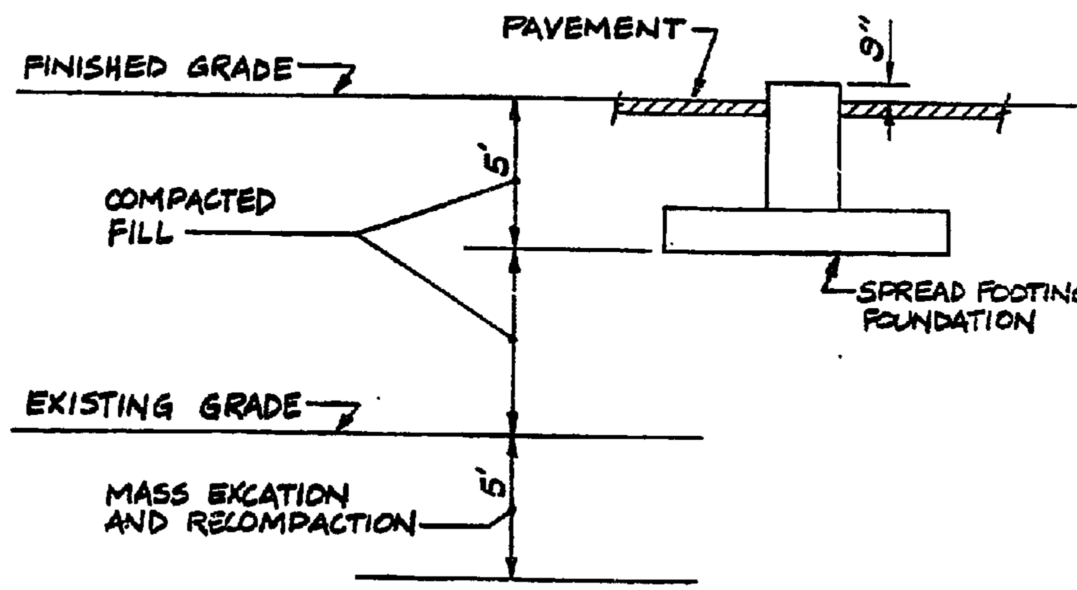
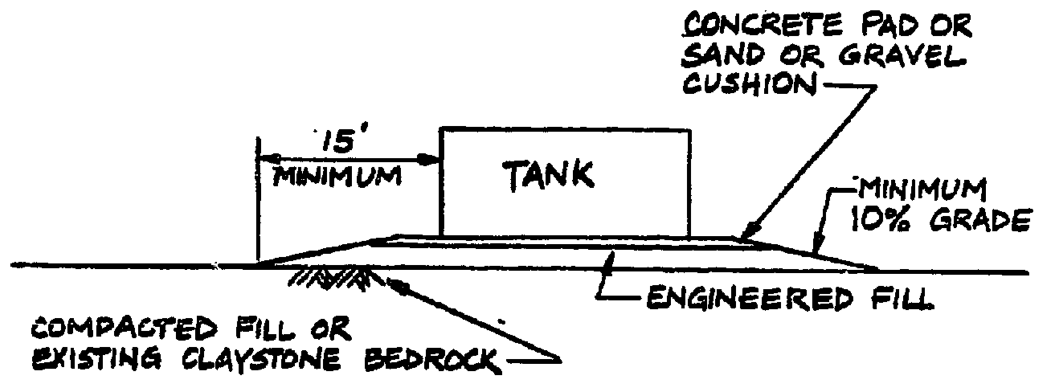


FLUOR	DR J. GRAU	TYPICAL FOUNDATION IN AREA OF FILL
	CH M. DORIN	
	SUBS A. QUINONES	SYNFUELS FEASIBILITY STUDY
	SUPR ENG. M. DORIN	CROW TRIBE OF INDIANS — MONTANA
	SCALE NONE	DRAWING NUMBER 835704-00-1-114 — REV. 1



FLUOR	DR J. GRAU	TYPICAL FOUNDATION IN STORAGE TANKAGE AREA	
	CH M. DORIN	SYNFUELS FEASIBILITY STUDY	
	SUPN A. QUINONES	CROW TRIBE OF INDIANS — MONTANA	
	SUPR ENG. M. DORIN		
	SCALE NONE	DRAWING NUMBER 835704-00-1-115	REV. 1

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6.8.6.4 ALTERNATE FOUNDATIONS

As indicated in the foregoing, spread footing foundations are utilized throughout the plant. However, details for alternate foundations of drilled shafts and steel H piles are provided. These alternate foundation systems may be required at the time final detailed engineering is performed. At this time, additional information will be known regarding soil layers, locations of equipment and magnitude of loads.

Drawing 835704-00-1-116 shows the drilled shaft alternate foundation system

Drawing 835704-00-1-117 shows the steel H pile alternate foundation system

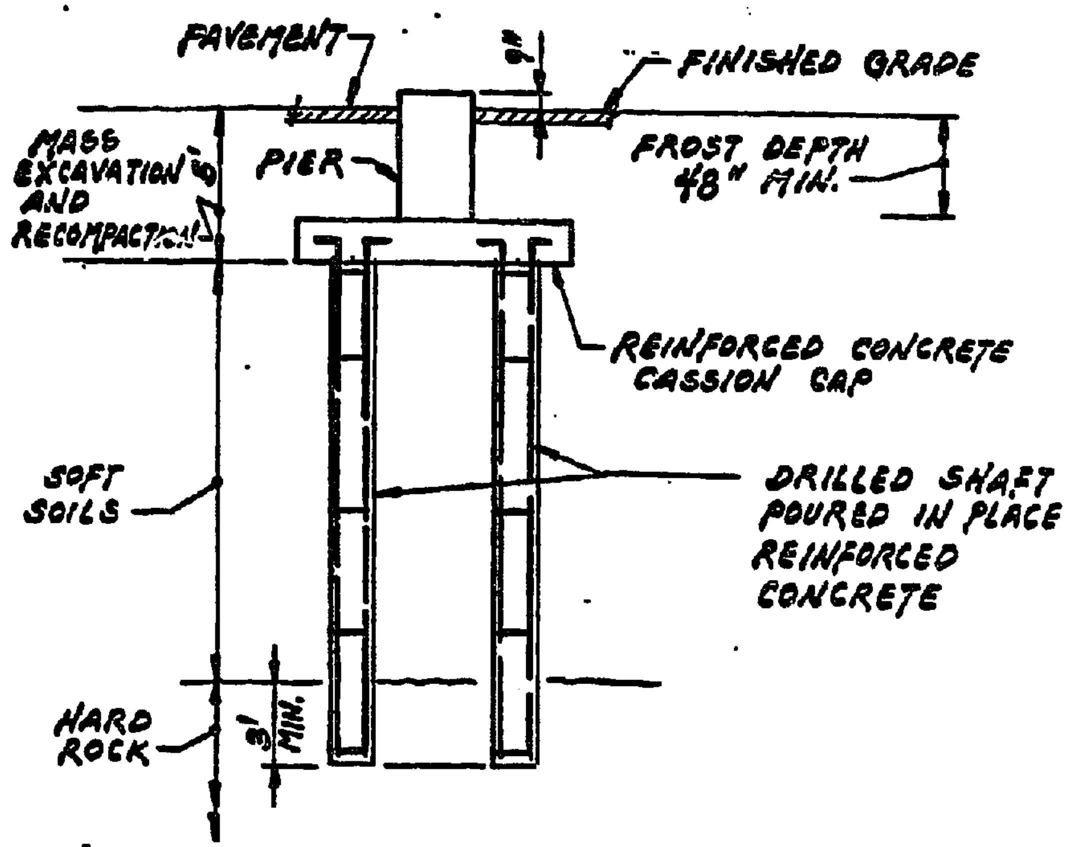
A discussion of the utilization of these alternate foundation systems is contained in Section 6.8.6.2. The drilled shafts and steel H piles extend a minimum of 3 feet into the bedrock transferring the loads through deep, soft soil layers from the structure to bedrock.

6.8.6.5 SLEEPERS AND PIPE SUPPORTS

An estimate of the pipe supports and pipe sleepers was prepared. Pipe supports are defined as supports for elevated pipe runs. Pipe sleepers are defined as supports for pipe runs near ground level.

A design of the pipe supports and sleepers within the process unit boundaries was not prepared. These pipe supports and sleepers located within the units are accounted for in the factoring estimate of the computer estimating program.

The estimate prepared includes pipe supports and sleepers interconnecting the units and also those located offsite. Offsite and utility areas are



FLUOR

DR: J. GRAU	**ALTERNATE FOUNDATION DRILLED SHAFT FOUNDATION**	
CH: M. DORIN		
SUPR: A. QUINONES	SYNFUELS FEASIBILITY STUDY	
SUPR ENG.: M. DORIN	CROW TRIBE OF INDIANS — MONTANA	
SCALE: NONE	DRAWING NUMBER: 835704-00-1-116	REV. 1

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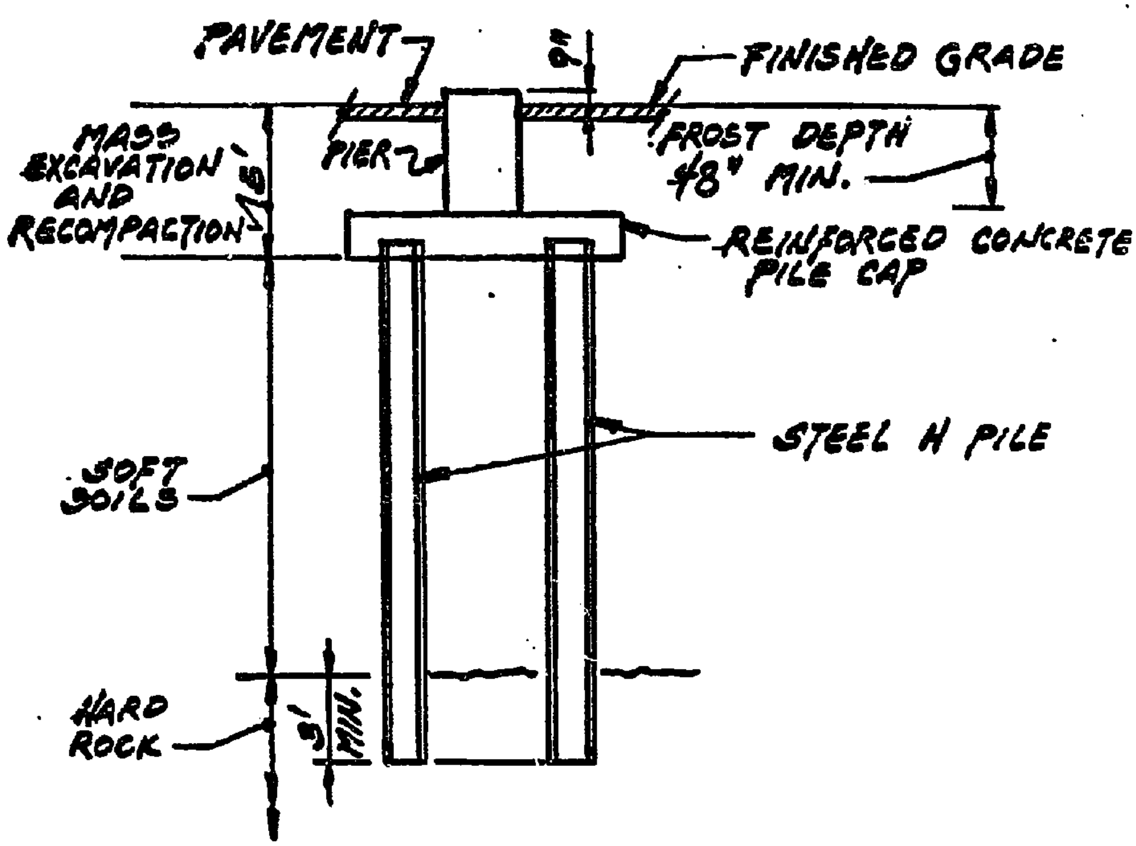

FLUOR	DR J. GRAU	ALTERNATE FOUNDATION STEEL H PILE FOUNDATION
	CH M. DORIN	SYNFUELS FEASIBILITY STUDY
	SUPR A. QUINONES	
	SUPR ENG M. DORIN	CROW TRIBE OF INDIANS — MONTANA
	SCALE NONE	DRAW NO NUMBER 835704-00-1-117 — REV. 1

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6.8.6.5 (Continued)

those outside the production process areas. The offsite and utility units include the following:

Unit 41	Steam Generation
Unit 42	Power Generation
Unit 43	Flue Gas Desulfurization
Unit 44	Raw Water Treating
Unit 45	BFW and Condensate Treating
Unit 46	Air and Nitrogen Supply
Unit 47	Process Cooling Water
Unit 48	Utility Cooling Water
Unit 49	Potable Water
Unit 50	Utility Water
Unit 51	Firewater System
Unit 52	Flue Gas
Unit 53	Flare
Unit 54	Wastewater Treating
Unit 55	Tank Farm and Dispatch
Unit 56	Sanitary Sewer
Unit 65	Electrical Distribution
Unit 67	Control System

Pipe Sleepers

Two basic types of sleepers were used in the feasibility cost estimate:

(1) Concrete Sleepers
(2) Steel Sleepers

6.8.6.5 (Continued)

(1) Concrete Sleepers (Drawing 835704-00-1-118)

Concrete sleepers are used for narrow width pipeways (up to a width of 20 feet). The concrete sleepers are composed of a continuous pier running the full width of the pipeway. The full length of the pipe is supported on a continuous foundation. The pipeway rests on a mild steel anchor imbedded along the top of the pier for its entire length.

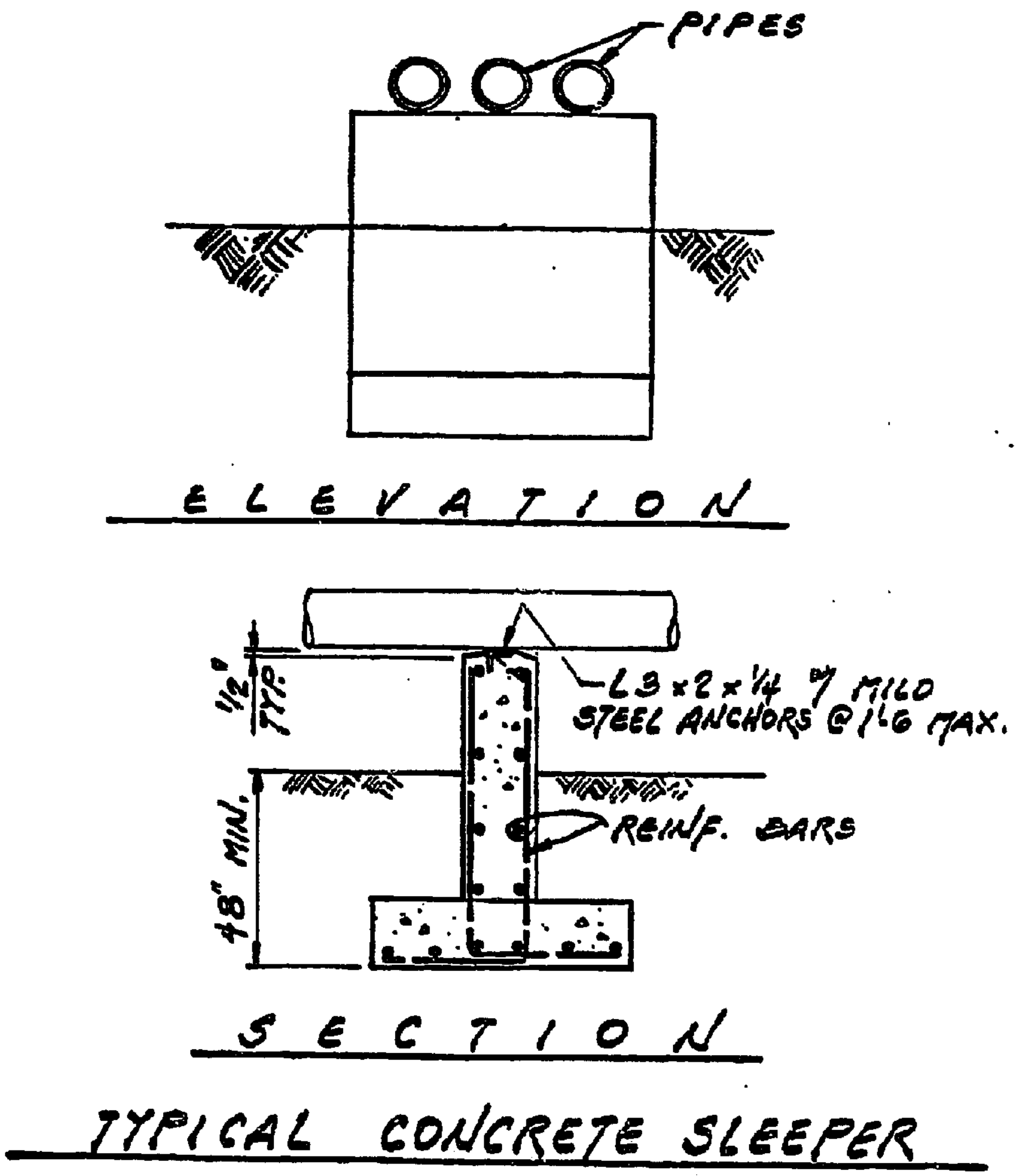
(2) Steel Sleepers (Drawing 835704-00-1-119)

Steel sleepers are used for very wide pipeways (greater than 20 feet). The steel sleepers are composed of individual concrete piers supported by their individual concrete foundations. The concrete piers are spaced apart a distance of 15 to 20 feet. Steel beams span between the piers to support the pipeway. The steel beams are fastened to the piers with anchor bolts.

During the detailed engineering phase and when the fire insurance underwriter requirements are established, some of the steel beams may be required to be fireproofed with concrete. Precast concrete beams can also be used to meet fireproofing requirements.

Sleeper Road Crossings (Drawing 835704-00-1-120)

All pipe runs on sleepers that cross roads require an underground crossing. This crossing is constructed of a reinforced concrete structure similar to a box culvert.



FLUOR	DR J. GRAU	TYPICAL CONCRETE SLEEPER
	CH M. DORIN	
	SUPR A. QUINONES	SYNFUELS FEASIBILITY STUDY
	SUPR ENG M. DORIN	CROW TRIBE OF INDIANS — MONTANA
	SCALE NONE	DRAWING NUMBER 835704-00-1-118 — REV. 1

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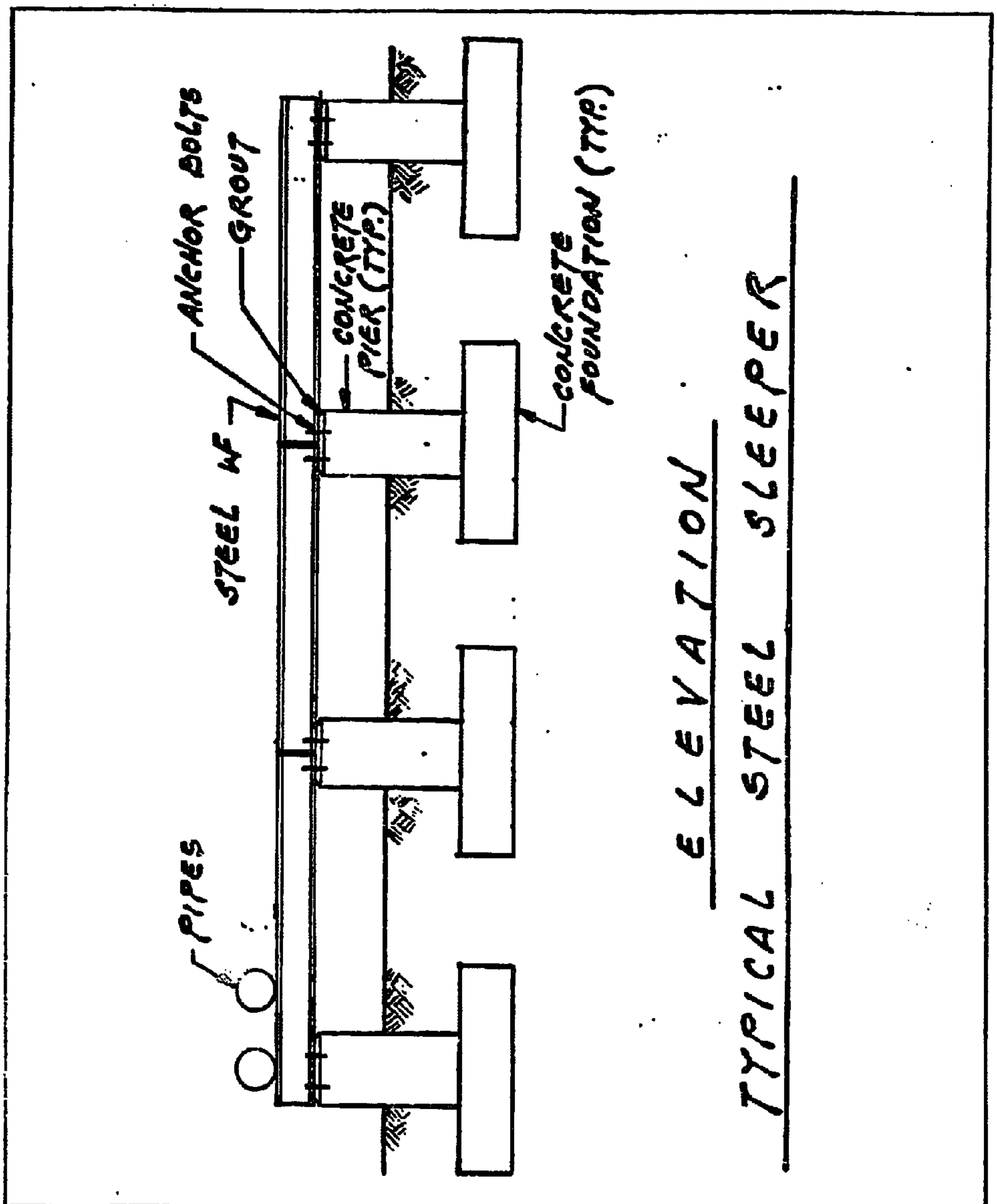

FLUOR

DR J. GRAU	TYPICAL STEEL SLEEPER
CH M. DORIN	
SUPR A. QUINONES	SYNFUELS FEASIBILITY STUDY
SUPR ENG M. DORIN	CROW TRIBE OF INDIANS — MONTANA
SCALE NONE	DRAWING NUMBER 835704-00-1-119 — REV. 1

FORM E-305 REV. 1/73
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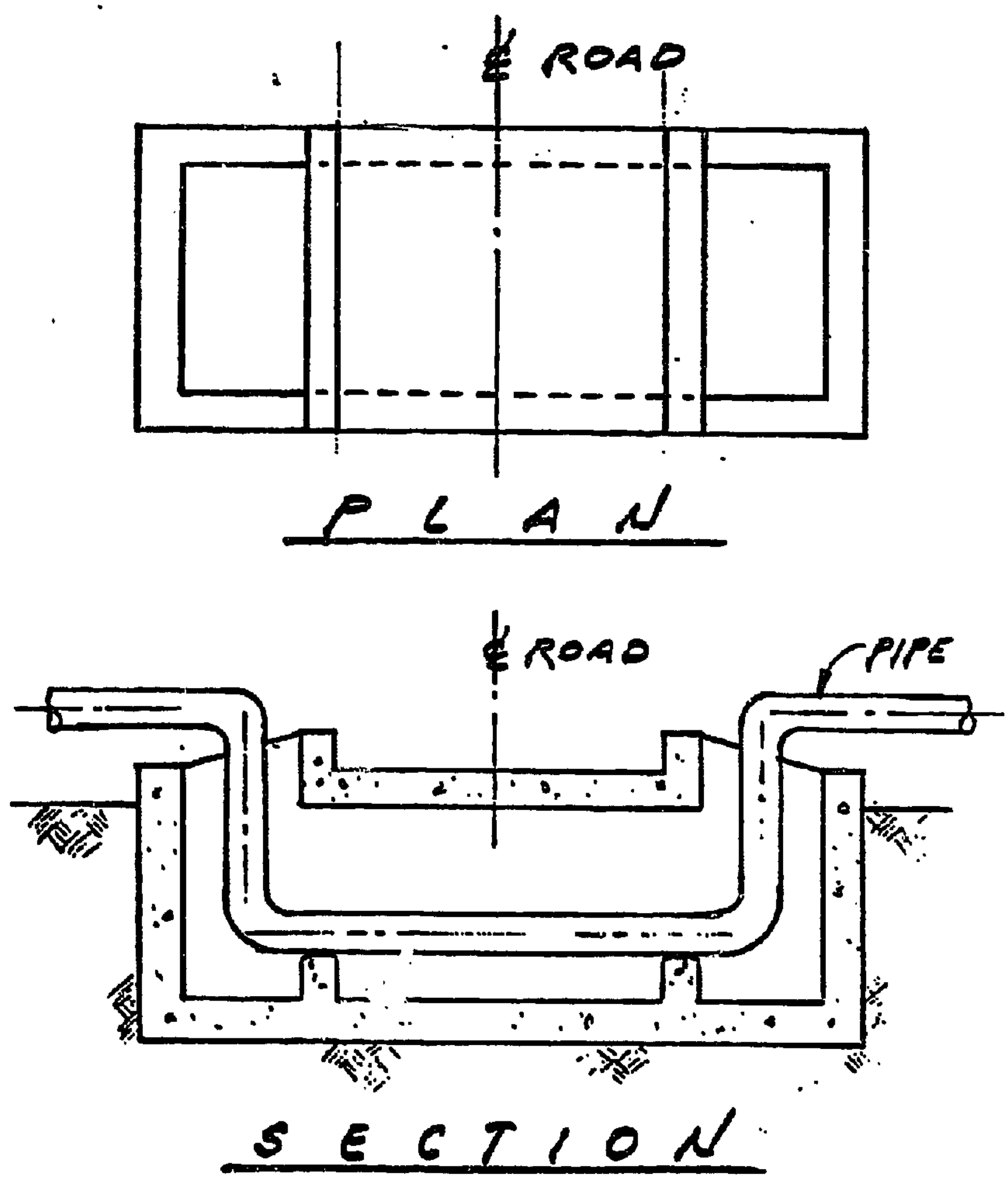

TYPICAL SLEEPER ROAD CROSSING

FLUOR

DR	J. GRAU
CH	M. DORIN
SUPR	A. QUINONES
SUPR ENG	M. DORIN
SCALE	NONE

TYPICAL SLEEPER ROAD CROSSING

SYNFUELS FEASIBILITY STUDY

CROW TRIBE OF INDIANS MONTANA

DRAWING NUMBER: 835704-00-1-120 REV.: 1

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6.8.6.5 (Continued)

Pipe Supports

Five basic types of pipe supports were used in the feasibility cost estimate:

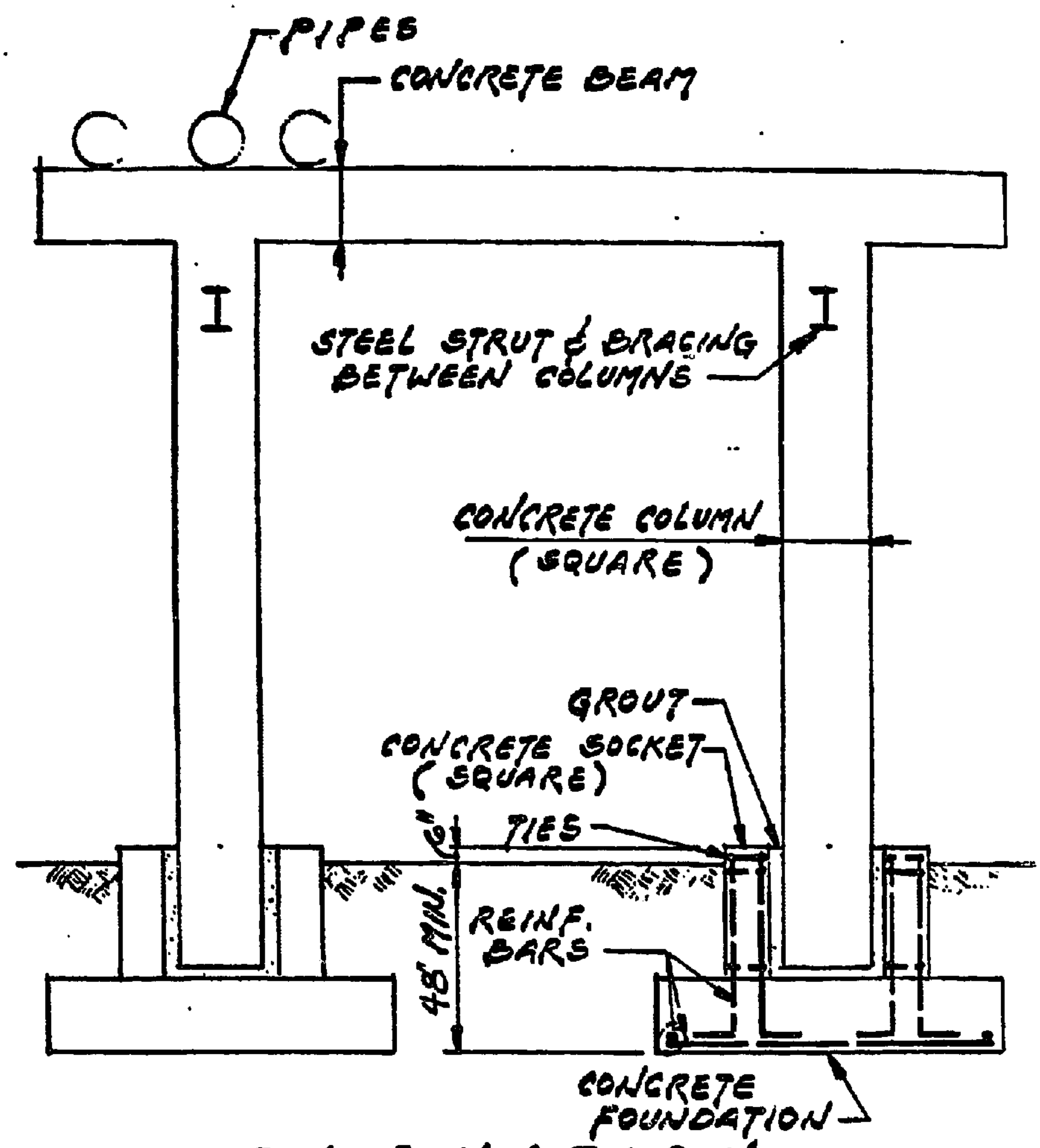
(1) Precast Concrete Pipe Supports
(2) Steel Pipe Supports
(3) Precast Concrete "T" Pipe Supports
(4) Steel "T" Pipe Supports
(5) Pipe Support Road Crossings

(1) Precast Concrete Pipe Supports (Drawing 835704-00-1-121 and Drawing 835704-00-1-122)

Precast concrete pipe supports were assumed to be used for the feasibility cost estimate. Most of the concrete pipe supports have single decks. However, in some cases, the interconnecting pipe supports have double decks requiring two cross beams as shown on Drawing 835704-00-1-122.

The precast concrete pipe supports are constructed of a precast concrete rigid frame composed of two columns and a cross beam or beams. During construction, the concrete frame is inserted into socket-type concrete piers and grouted in place. The concrete piers are supported by individual concrete foundations.

During the feasibility study, no insurance company was selected to finalize the fireproofing requirement. Therefore, full fireproofing was assumed to be required which lead to the conservative assumption of using precast concrete pipe supports. During the detailed engineering phase, when fireproofing requirements



ELEVATION

TYPICAL PRECAST CONCRETE PIPE SUPPORT

FLUOR	DR J. GRAU	TYPICAL PRECAST CONCRETE PIPE SUPPORT
	CH M. DORIN	SYNFUELS FEASIBILITY STUDY
	SUPR A. QUINONES	
	SUPR ENG M. DORIN	CROW TRIBE OF INDIANS — MONTANA
	SCALE NONE	DRAWING NUMBER 835704-00-1-121 — REV. 1

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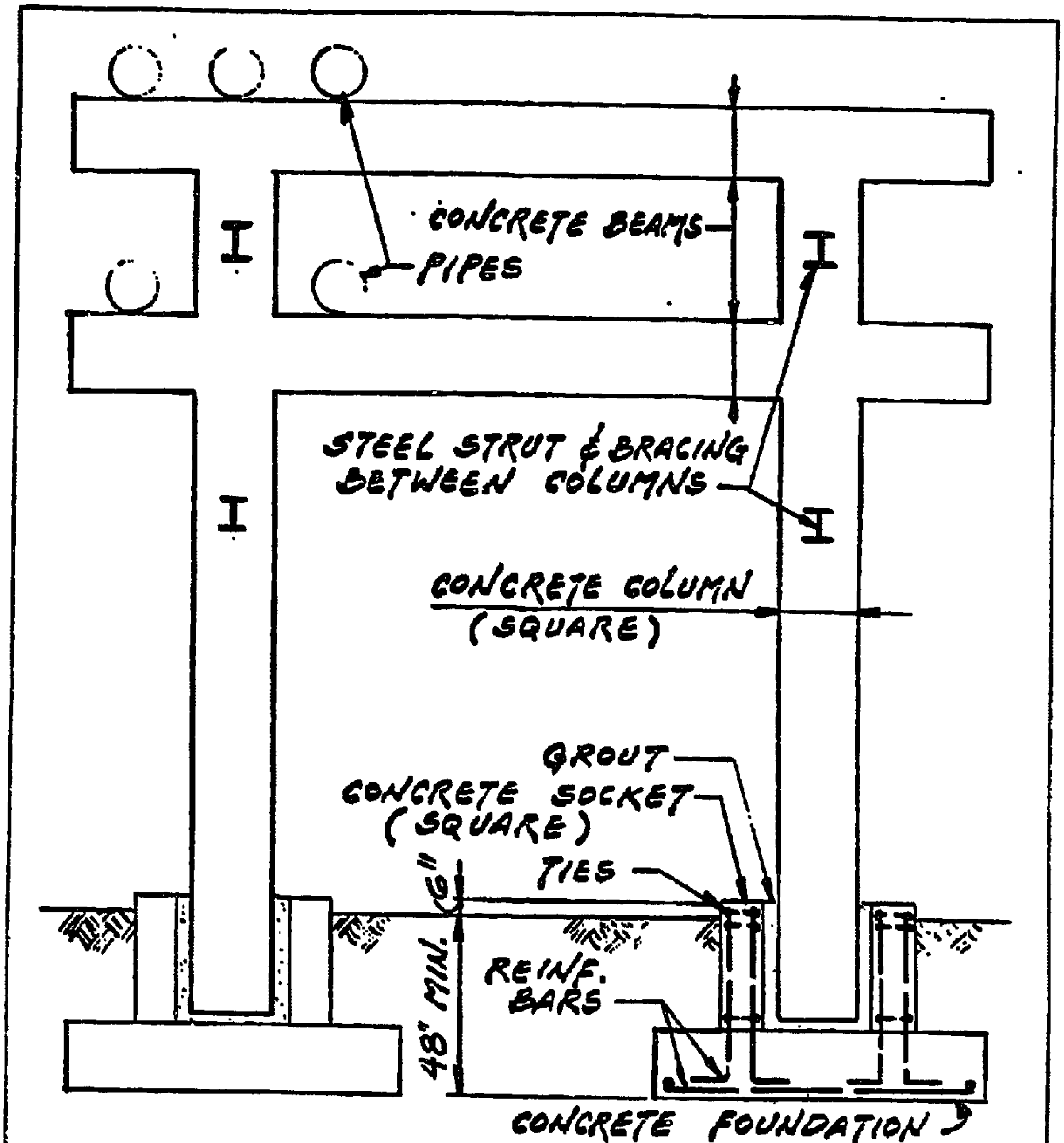

TYPICAL PRECAST CONCRETE DOUBLE DECK PIPE SUPPORT

FLUOR	DR J. GRAU	TYPICAL PRECAST CONCRETE DOUBLE DECK PIPE SUPPORT
	CH M. DORIN	SYNFUELS FEASIBILITY STUDY
	SUPR A. QUINONES	CROW TRIBE OF INDIANS MONTANA
	SUPR ENG M. DORIN	
	SCALE NONE	DRAWING NUMBER 835704-00-1-122 — REV. 1

FORM E-305 REV. 1/73
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6.8.6.5 (Continued)

are further defined, a determination of whether to use concrete or steel pipe supports will be made. The use of precast concrete pipe supports results in a conservative cost estimate compared to the use of steel.

(2) Steel Pipe Supports (Drawing 835704-00-1-123)

Steel pipe supports are used where it is impractical and uneconomical to use precast concrete due to the large height requirements.

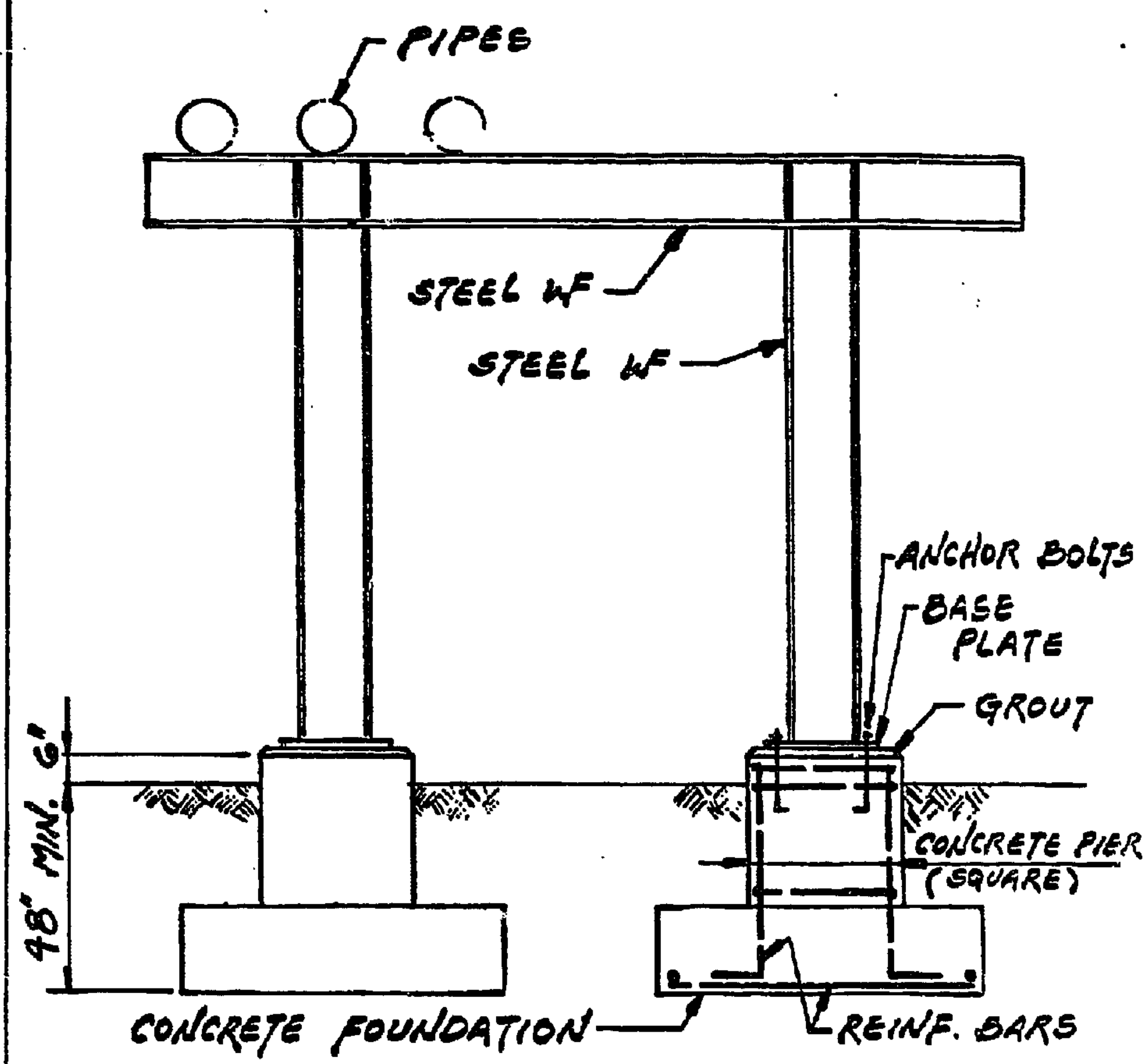
The pipe support is composed of a steel rigid frame which is fastened by anchor bolts to concrete piers. The piers are supported by individual foundations.

Steel pipe supports are fireproofed as required.

(3) Precast Concrete "T" Pipe Supports (Drawing 835704-00-1-124)

Precast concrete "T" pipe supports are composed of a precast concrete "T". During construction, the concrete "T" is inserted into a socket-type pier and grouted in place. The concrete pier is supported by a concrete foundation.

During the detailed engineering phase, a determination of whether to use precast concrete or steel will be made (See discussion above in description of Precast Concrete Pipe support.)

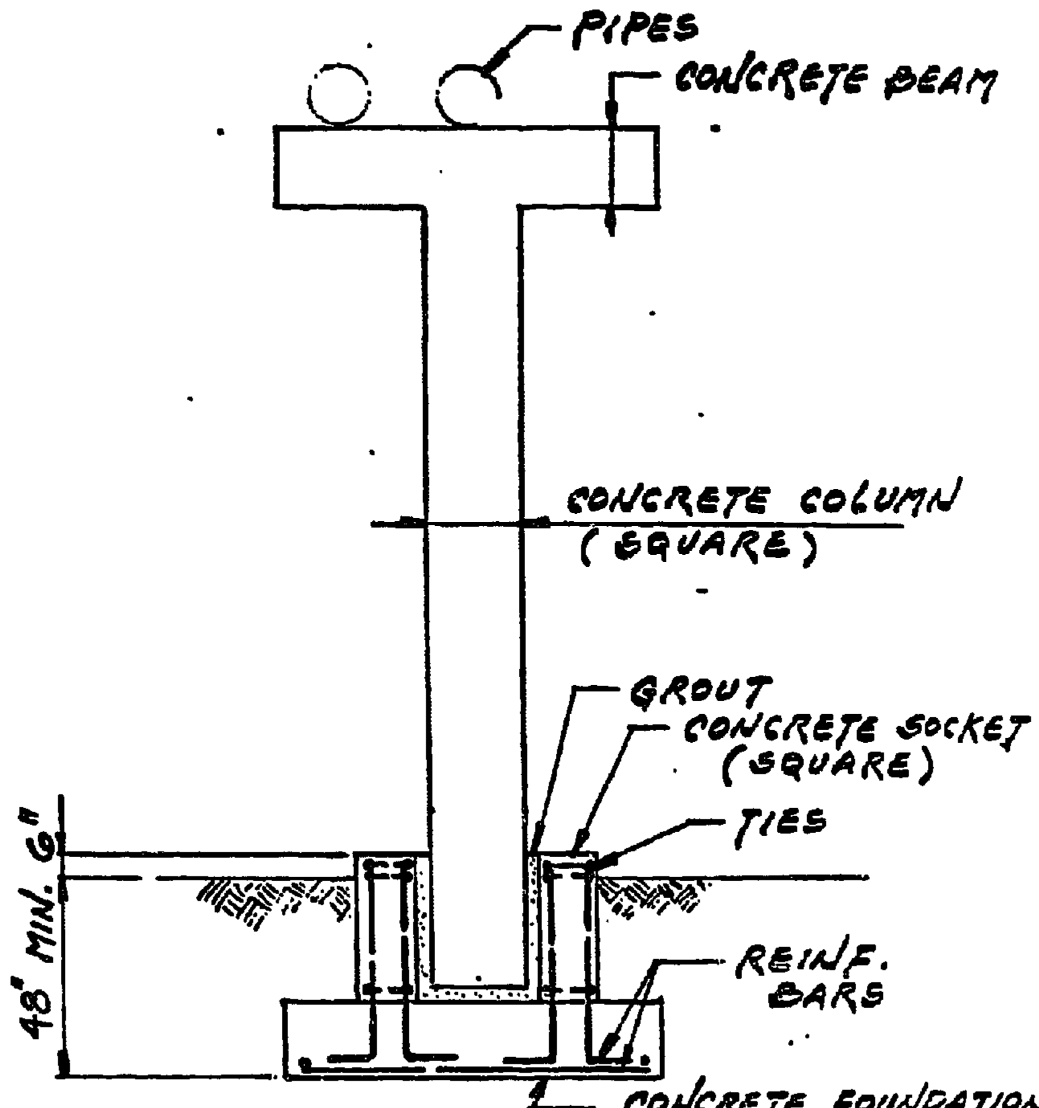


ELEVATION

TYPICAL STEEL PIPE SUPPORT

FLUOR	DR J. GRAU	TYPICAL STEEL PIPE SUPPORT
	CH M. DORIN	
	SUPR A. QUINONES	SYNFUELS FEASIBILITY STUDY
	SUPR ENG M. DORIN	CROW TRIBE OF INDIANS MONTANA
	SCALE NONE	DRAW NO NUMBER 835704-00-1-123 — REV 1

FORM E-305 REV. 1/73 PRINTED IN U.S.A.



TYPICAL PRECAST CONCRETE "T" TYPE PIPE SUPPORT

FLUOR

DR J. GRAU	TYPICAL PRECAST CONCRETE "T" TYPE PIPE SUPPORT
CH M. DORIN	
SUPR A. QUINONES	SYNFUELS FEASIBILITY STUDY
SUPR ENG M. DORIN	CROW TRIBE OF INDIANS MONTANA
SCALE NONE	DRAWING NUMBER 835704-00-1-124 — REV. 1

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6.8.6.5 (Continued)

(4) Steel "T" Pipe Supports (Drawing 835704-00-1-125)

Steel "T" pipe supports are used for narrow width pipeways. This type of pipe support is composed of a "T" shaped rigid steel frame. The steel frame is fastened by anchor bolts to concrete piers. The piers are supported by individual concrete foundations.

Steel pipe supports are fireproofed as required.

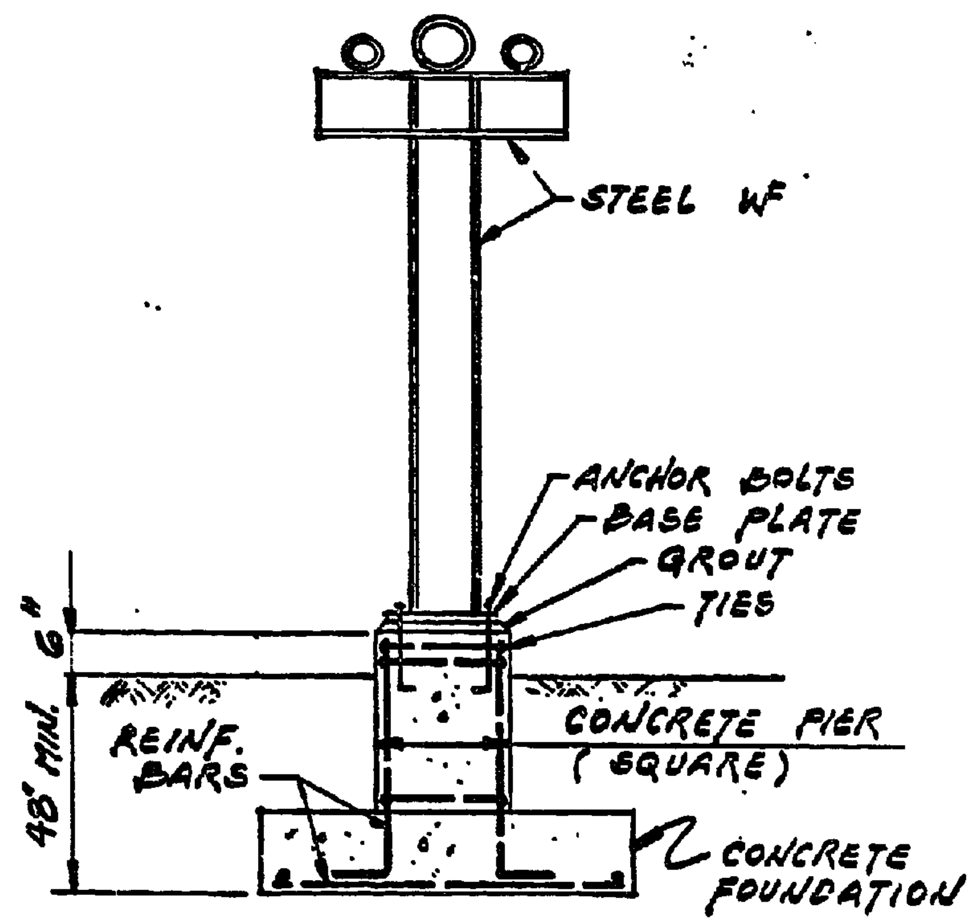
(5) Pipe Support Road Crossings (Drawing 835704-00-1-126)

All pipe runs on pipe supports that cross roads require a pipe support bridge. The bridge is constructed of two trusses. The trusses are composed of structural tees. The trusses are also braced with structural tees. The pipe run is supported in the center by a cross beam. The trusses are supported by a pipe support on each end of the bridge.

6.8.6.6 FLARE SUPPORTING STRUCTURES

A design estimate for the two major flare supporting structures of Unit 53 was prepared.

A derrick-type structure was selected to support the steel pipe stack. The derrick structure consists of three faces of plane trusses as shown on Drawing 835704-00-1-127. Each face represents a plane truss whose chords (columns) are common to the adjacent face.



ELEVATION

TYPICAL STEEL "T" TYPE PIPE SUPPORT

FLUOR	DR J. GRAU	TYPICAL STEEL "T" TYPE PIPE SUPPORT	
	CH M. DORIN		
	SUPR A. QUINONES	SYNFUELS FEASIBILITY STUDY	
	SUPR ENG M. DORIN	CROW TRIBE OF INDIANS	MONTANA
	SCALE NONE	DRAWING NUMBER 835704-00-1-125	REV. 1

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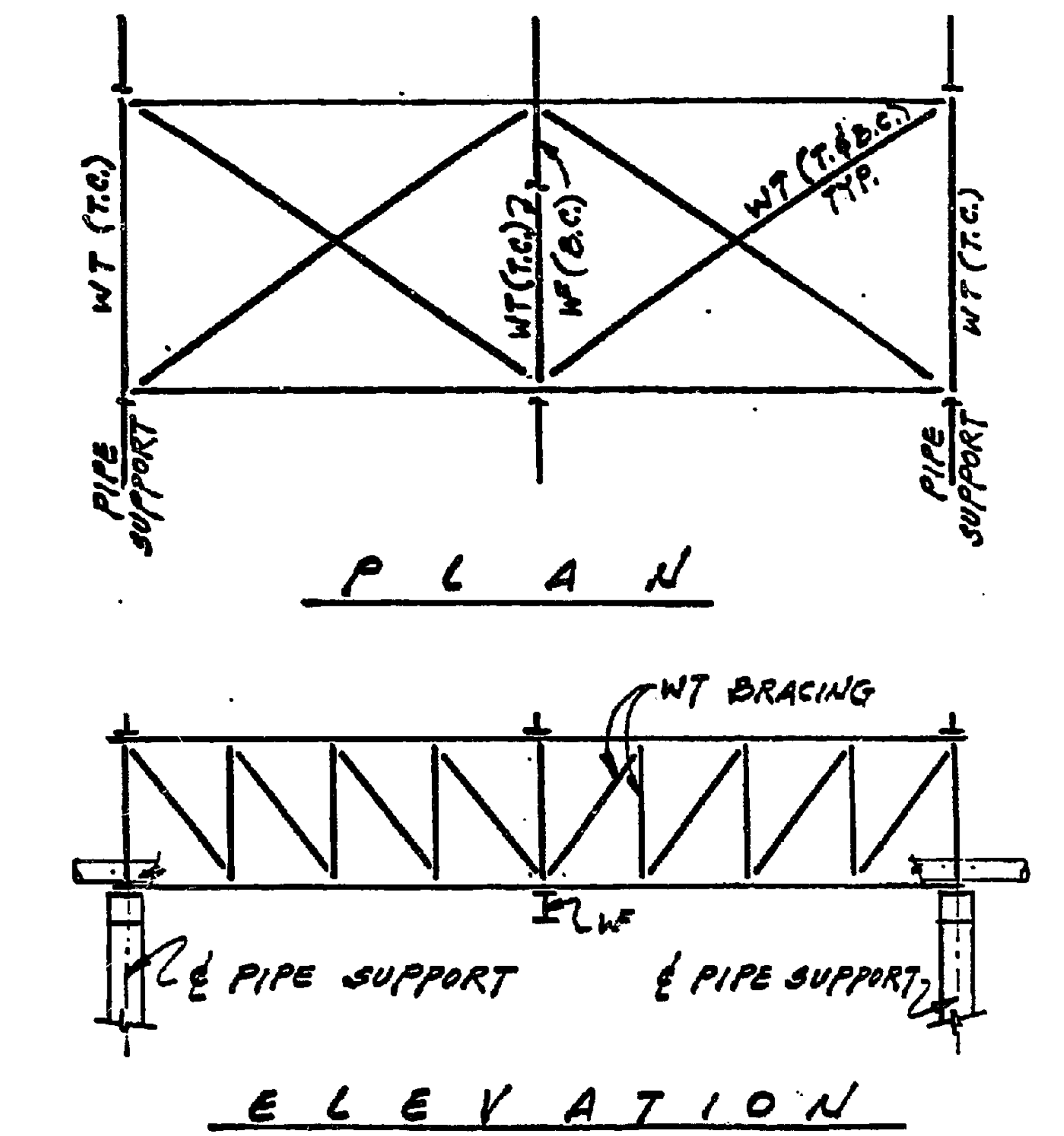

TYPICAL PIPE SUPPORT BRIDGE

FLUOR

DR J. GRAU	TYPICAL PIPE SUPPORT BRIDGE	
CH M. DORIN		
SUPR A. QUINONES	SYNFUELS FEASIBILITY STUDY	
SUPR ENG M. DORIN	CROW TRIBE OF INDIANS	MONTANA
SCALE NONE	DRAWING NUMBER 835704-00-1-126	REV. 1

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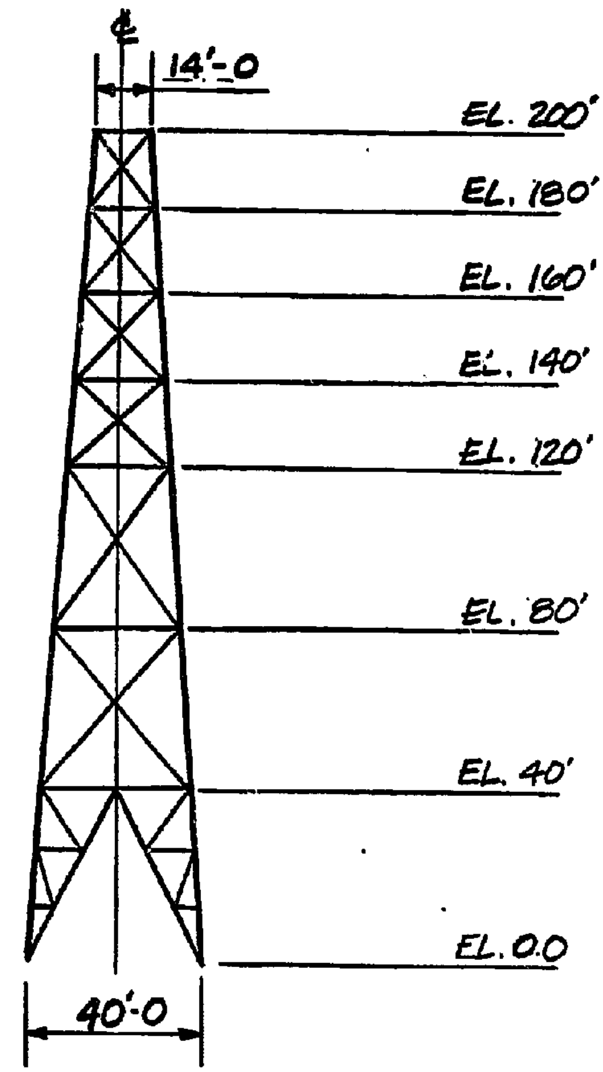

ELEVATION - TYP. 3-SIDES

FLUOR	DR J. GRAU	FLARE SUPPORT STRUCTURE
	CH M. DORIN	SYNFUELS FEASIBILITY STUDY
	SUPP A. QUINONES	CROW TRIBE OF INDIANS — MONTANA
	SUPP ENG M. DORIN	
	SCALE NONE	DRAWING NUMBER 835704-00-1-127 — REV. 1

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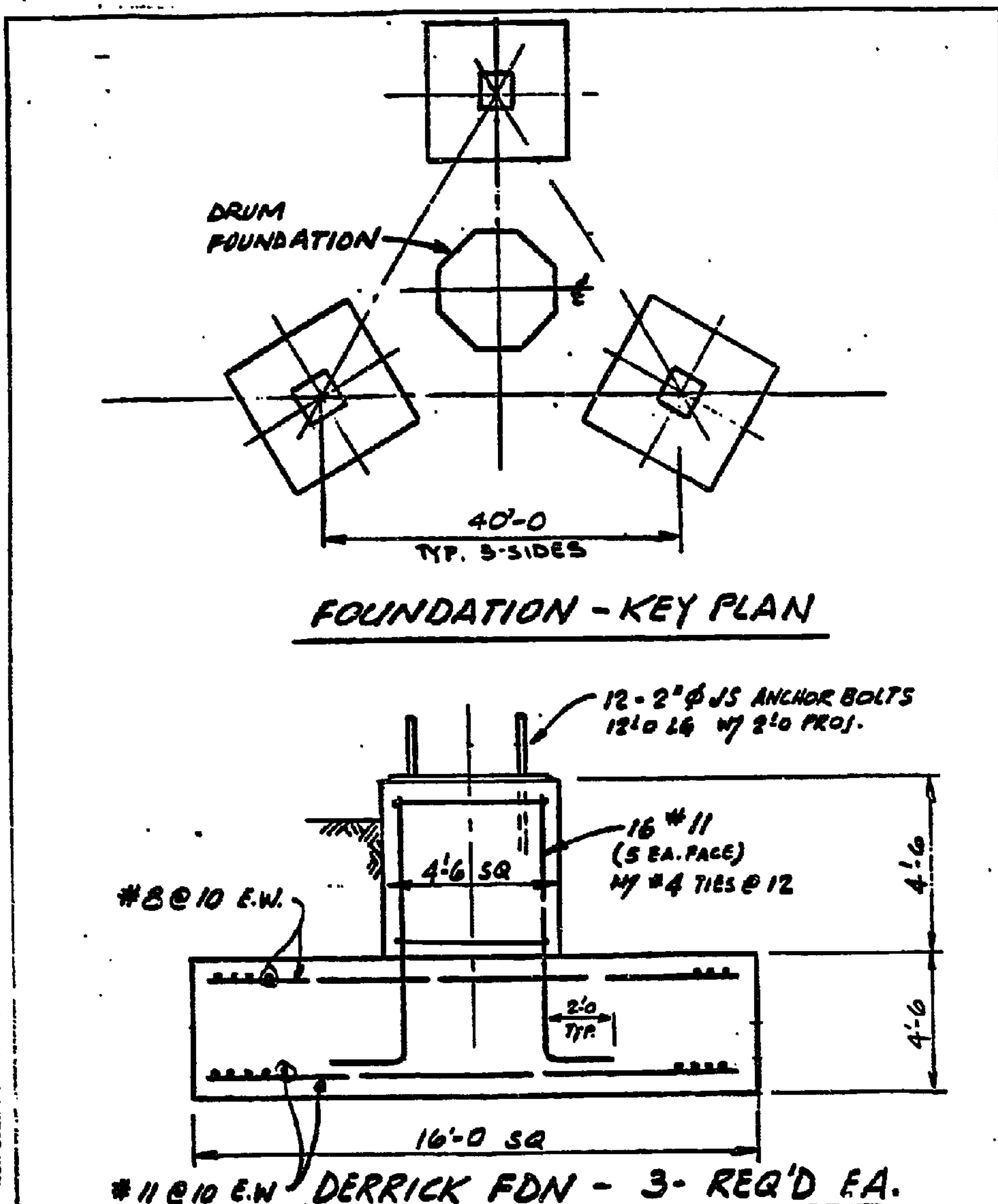
6.8.6.6 (Continued)

A ladder, platform, and handrails are provided for maintenance personnel. A davit is provided at the top of the flare supporting structure for removing the flare tip and lowering it to the ground. The davit is also used to install a replacement tip.

The foundation details of the flare structure is shown on Drawing 835704-00-1-128.



FLUOR	DR J. GRAU	**FOUNDATION DETAILS OF FLARE SUPPORT STRUCTURE**
	CH M. DORIN	SYNFUELS FEASIBILITY STUDY
	SUPR A. QUINONES	
	SUPR ENG M. DORIN	CROW TRIBE OF INDIANS — MONTANA
	SCALE NONE	DRAWING NUMBER 835704-00-1-128 — REV. 1

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6.8.7 BUILDINGS - SITE 1

The buildings are designed to accommodate an estimated permanent operating plant staff of approximately 850 people. Buildings are also used to enclose and protect process equipment, instrumentation, stored materials and shops. All equipment requiring operator maintenance or equipment that is sensitive to severe weather or snow drifts are enclosed. Most of the buildings are heated and some are also air conditioned.

The buildings within the plant are situated according to their function and relation to the process system that they serve. In locating each building, consideration was also given to noise, dust, direction of the wind, and utilizing the existing topography to the best advantage.

Landscaping is used to create a pleasant work environment in the plant facilities, especially in the Administration Complex area. Vegetation is used to "screen" the process areas of the plant and also to create "green-belts" in certain areas.

6.8.7.1 REQUIREMENTS

The plant buildings are grouped into the following categories based on their usage and function:

Administration Complex
Maintenance Facility
Process Buildings
Control Buildings
Substation Buildings

Design drawings of the major plant buildings are located at the end of this section.

6.8.7.1 (Continued)

(1) Administration Complex

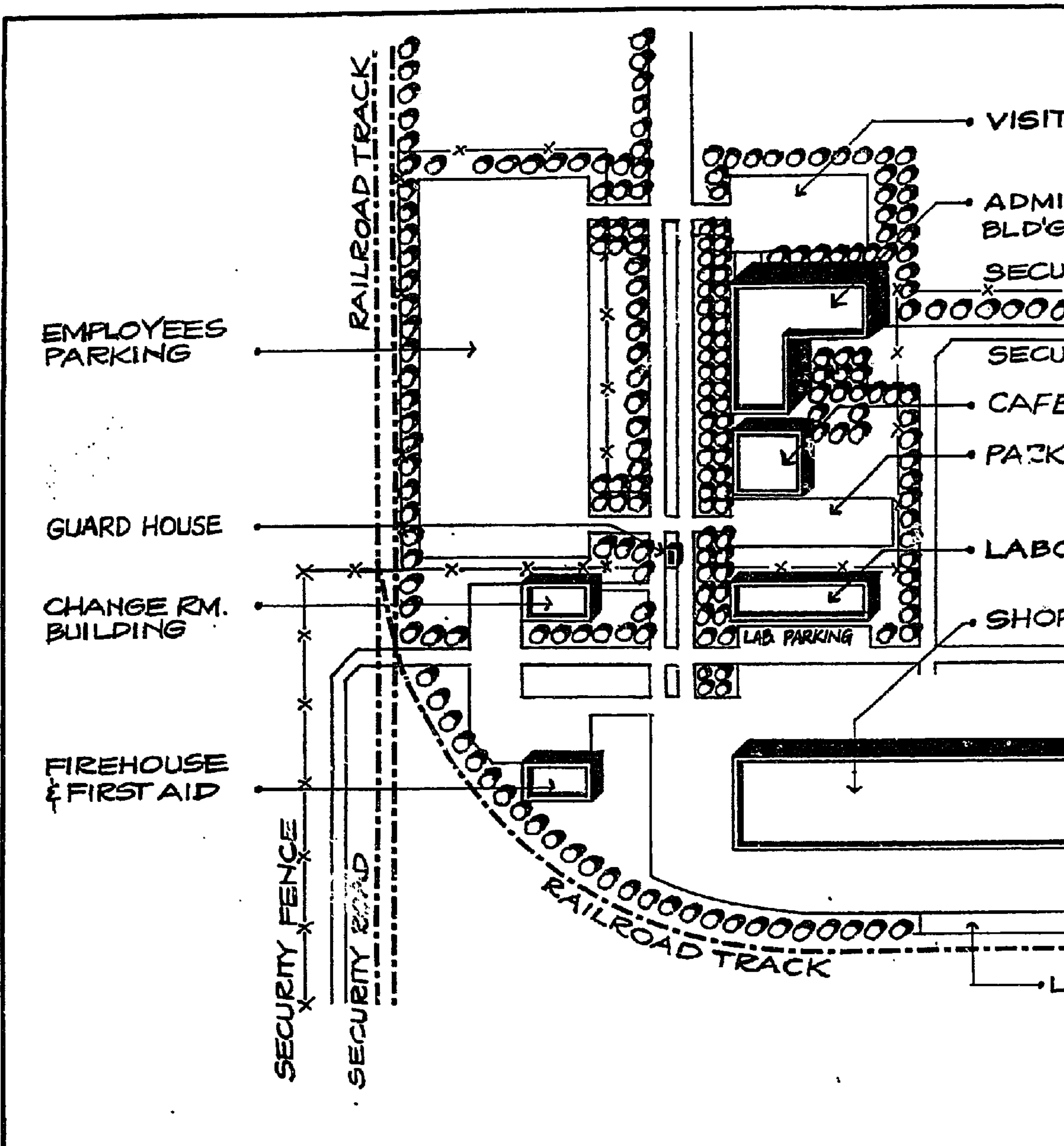
The Administration Complex is located in the northwesterly corner of the plant site upwind of the plant process areas. The buildings of the Administration Complex are situated where the access road enters the plant site. The layout of the Administration area is shown on Drawing 835704-61-2-300.

The Administration Complex consists of the following buildings:

Administration and parking areas
Cafeteria
Laboratory
Change Room
Fire House
First Aid
Guard House

Located adjacent to the Administration Complex are the Warehouse, Shops and Storage, and Maintenance Yards.

The Administration Building houses the plant manager and his staff. Also, other personnel such as administration engineering, technical services and health/safety/security are housed in the building. The building contains the administration and management offices, a computer center, the main telephone equipment room, the main communication center, and a reception area. The building is also equipped with the following items: an elevator, a fire sprinkler, an alarm system, and a flag pole.



REV NO.	DATE	REVISION DESCRIPTION	DRAWN / CHECK	DATE
1	5/3/82	ISSUED FOR STUDY		5/3/82

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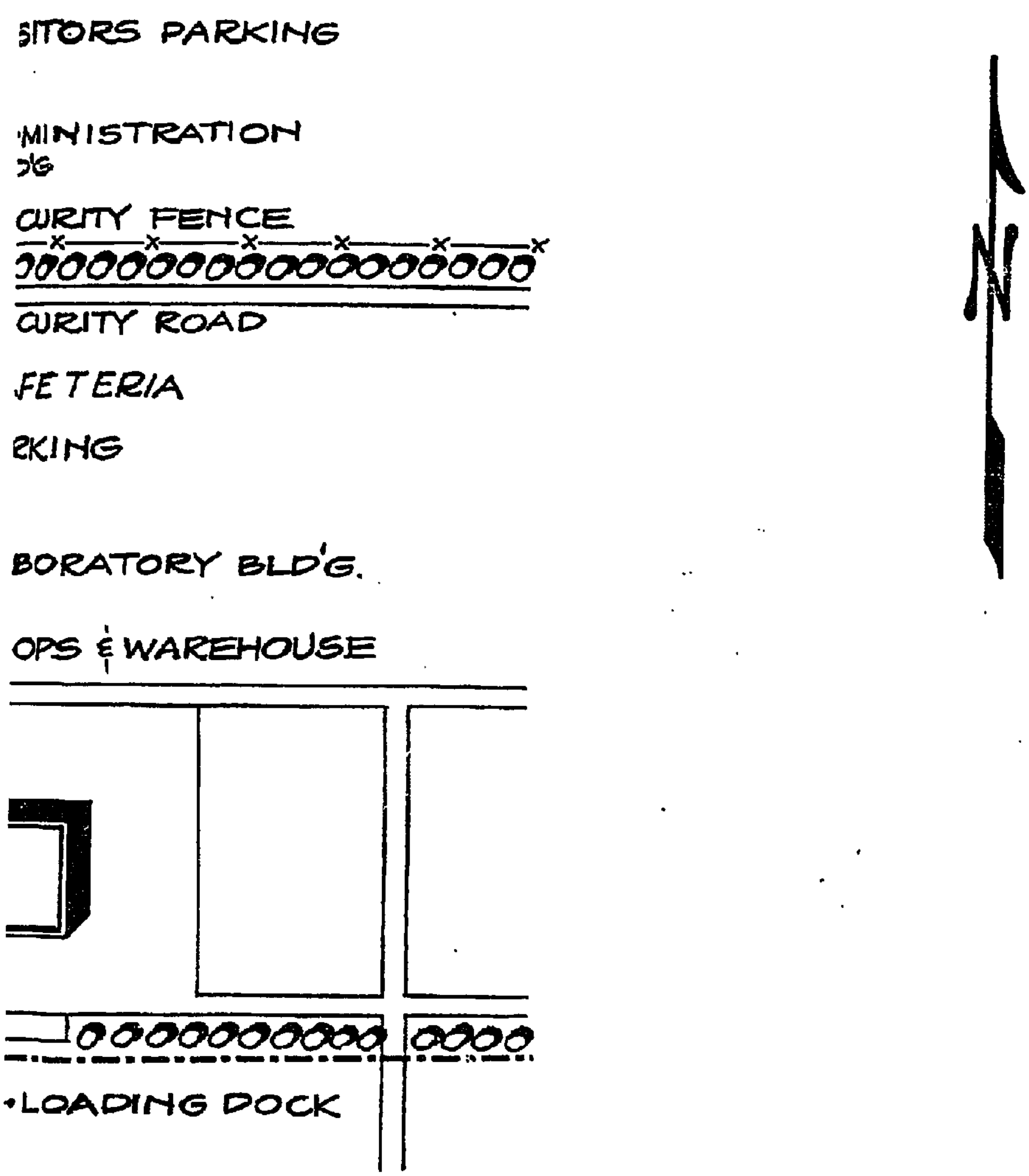

USE OR DISCLOSURE OF REPORT DATA
IS SUBJECT TO THE RESTRICTION ON THE
NOTICE PAGE AT THE FRONT OF THIS REPORT

DRAWN BY: A. CYGA		SITE #1 LAYOUT OF ADMINISTRATION/WAREHOUSE AREA	
CHECKED BY: M. DORIN			
SUPERVISOR: J. ADISSI	RELEASE DATE: 5-3-82	SYNFUELS FEASIBILITY STUDY	
SUPERVISING ENGR.: M. DORIN	INITIALS: M. Dorin	CROW TRIBE OF INDIANS	MONTANA
PROJECT ENGR.: R. LANG	APP. DATE: RAL 6/4/82	SCALE: 1"=200'	DRAWING NUMBER: 835704-61-2-300 — REVISION: 1
CLIENT	APP. DATE		

DR

6.8.7.1 (Continued)

The Cafeteria is adjacent to the administration building. The cafeteria serves the administration personnel, visitors, and can also serve some maintenance and operating personnel. The cafeteria is equipped with a fire sprinkler and alarm system. A covered outdoor dining terrace is also provided.

The administration and cafeteria buildings are the only structures outside the secured portion of the synfuels plant.

The Laboratory is housed in its own building. The laboratory acts as the plant center for major testing and analyzing of the process materials and products. The laboratory is equipped with a fire sprinkler and alarm system.

A Change Room Building is provided to allow incoming and outgoing personnel to change their clothes and to wash and shower. In addition, the building is used by operations and maintenance technicians and other personnel whose clothing comes in contact with plant process chemicals. In this case, the contaminated clothing is accumulated and laundered within the building.

A Firehouse and all fire fighting facilities are provided. The fire house is located between the employee parking and the maintenance yard. There is easy road access to all process units. The fire station houses the fire trucks, chemicals, and all fire fighting equipment.

The First Aid Building is attached to the firehouse. The first aid building serves as the main first aid station for the plant. The first aid building houses the treatment room, emergency room and the nurse's office.

6.8.7.1 (Continued)

The Guard House is located at the main entry to the plant. The guard house serves as a center for all security activities and also as an entrace for incoming equipment and supplies. One lift gate each is provided for incoming and outgoing traffic. Personnel gates are also provided. The guard house houses security and guard personnel. It also acts as a center for issuing permanent and temporary identification cards. The guard house also stores all security records. Guard communications equipment is also provided in the guard house.

(2) Maintenance Facility

The Maintenance Facility is located adjacent to and south of the Administration Complex as shown on Drawing 835704-61-2-300. The Maintenance Facility consists of:

Warehouse and Trade Shops
Paint Storage Building
Chemical Storage Building

The Warehouse and Trade Shops are located in the same building. The warehouse functions as the central shipping and receiving area for the plant. The warehouse also acts as the center for parts and materials distribution for the process units. All shops within the warehouse complex act as the center for major repairs and refurbishings of equipment for the plant. All shops are located adjacent to one another and are also located in the same building as the warehouse for efficiency of operations. Offices for the maintenance supervisors are housed in this same building.

6.8.7.1 (Continued)

The electrical and instrument shop is an enclosed area within the trade shops area. Within the instrument shop, another enclosed "controlled clean area" is provided. This "clean area" is used for servicing delicate electronic equipment and has its own separate controlled environment.

A steam cleaning station for cleaning large mechanical parts is provided in close proximity to the maintenance shops. Space is provided outside the warehouse for pipe storage racks and compressed gas bottle storage. Near the steam cleaning station, space is provided for a cleaning and repair station for heat exchangers.

Adjacent to the warehouse is a storage and maintenance yard.

A Paint Storage Building is adjacent to the warehouse. All paints and painting and spraying equipment are housed in this building. An 8 inch reinforced concrete slab is provided for this heavily loaded area. The building is heated during cold weather to prevent freezing of the paints. The building is equipped with a fire sprinkler and alarm system.

A Chemical Storage Building is also located adjacent to the warehouse. Chemicals and catalysts are stored in this building. A temperature and humidity controlled environment is provided for the materials as required.

6.8.7.1 (Continued)

(3) Process Buildings

Process Buildings house various process equipment and machinery. All equipment requiring operator maintenance and equipment that is sensitive to severe weather or snow drifts are enclosed in the process buildings. Most of the process buildings are heated and portions of some buildings are air conditioned. The buildings are constructed with steel frames and insulated metal sandwich wall and roof panels.

(4) Three types of Control Facilities are provided in the plant design:

Control Building
Control Shelters
Analyzer Buildings

The Control Building houses the control room with the operator consoles and control panels. The consoles are used to monitor and control the various plant processes. The building also houses the operating personnel who monitor and supervise the operations. The major area of the control building is the control room where the display consoles are located. Adjacent to the control room are the computer room, battery room and mechanical equipment room. Offices and locker rooms are also provided. The operations superintendents will have their offices in this facility.

The construction of the control building is composed of structural steel frames and reinforced concrete exterior walls and roof. The building is constructed to be blast resistant due to its proximity to high pressure or hydrocarbon processing.

6.8.7.1 (Continued)

The temperature and humidity are controlled within the control buildings. In addition, the buildings are pressurized to prevent contamination from the outside.

The floor in the control room and computer room of the control building is a vinyl covered, computer-type, raised floor supported on concrete. Office floors in the control building are carpeted.

The computer area and control room of the control building are fire protected by a Halon system. The rest of the control building is protected by fire sprinklers.

Control Shelters are dispersed throughout the plant and contain electronic equipment which interface directly with the process sensors and final control elements and transmit to and receive data from the control equipment contained within the control room.

Control shelters are skid mounted, environmentally controlled units which house distributed and computer system electronics modules. The shelters are located throughout the plant as close as possible to the process areas they support.

Sizing of these shel... was based on the estimated number of electronic cabinets, the back-up power system requirements and a field operators area. Twenty-three buildings of this type are provided.

6.8.7.1 (Continued)

Analyzer Buildings are located in the process areas and contain process analyzers and their supporting sampling systems.

These buildings house the automatic process analyzers and associated sampling systems. Nine structures of this type are provided.

(5) Substation Buildings

The Substation Buildings house switch gear, test cables, panels, and circuit breakers.

The buildings are composed of an elevated reinforced concrete slab supported on concrete columns. The bearing walls are constructed of concrete masonry blocks. The roof is constructed of a metal deck with concrete fill.

6.8.7.2 BUILDING DESIGN

(1) Building List

The following is a compilation of the permanent facility buildings. The construction type referred to in the building list is described in a later section.