SANTA YNEZ RIVER FLOOD CONTROL MIGUELITO ROCK-ASPHALT CHANNEL LINING

by

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SANTA YNEZ RIVER FLOOD CONTROL PROJECT
Miguelito Rock Channel Lining

An earth channel, together with appurtenances consisting of reinforced concrete grade control structures and culverts under city streets and county roads, was constructed on one of the improvements under the Santa Ynez River Flood Control Project.

This channel extends from the southerly limits of the City of Lompoc to the Santa Ynez River, a distance of 2.95 miles. Due to a rise in the ground form approaching the Santa Ynez River the channel was excavated to a maximum depth of 25 feet in order to maintain fall.

The channel was designed for a maximum discharge of 1575 c.f.s., trapezoidal section, bottom width of 12 feet, 1-1/2:1 side slopes, s = .0018, velocity 8 ft/sec.

Two conditions of soil instability were encountered: (1) Station 43+00 to Station 48+15 a light textured soil in the lower strata was subject to erosion from channel flow, *(See Photo 1)*. This channel reach was treated by placing a layer of graded river run material in a parabolic section over the original trapezoidal earth channel, 6 inch minimum thickness at the center and edges of the section and a minimum thickness of 18 inches at the toes of the slopes. River run material was selected to resist drag force without binder and conformed to the gradation: *(See Photo 2)*

Screen Size	Percent Retained
3"	10-20
2"	20-60
1-1/2"	60+

(2) Station 10+00 to Station 43+00 unstable heavy (fine) textured soil was encountered in the lower strata of the channel, *(See Photos 3 and 4)*. This soil when subject to wetting and drying had a tendency to crack, and being underlain with supersaturated material sloughed out. Due to ground water a permeable type lining was required. This section was treated in a manner similar to reach (1) except that no attempt was made to obtain rock graded to resist displacement. Crushed rock was used in the following gradation and the surface treated with an emulsified asphalt binder at the rate of 4.43 gallons per square yard applied in one application.

Screen Size	Percent Passing
2"	100
1-1/2"	95-100
3/4"	35-70
3/8"	10-30
No.4	0-5

Rock was clean and free of any substance that would prevent or reduce the bond between the rock and the emulsified asphalt binder. Care was exercised to prevent mixing soil or other foreign substances with the rock during placement since rock dumped or raked down the channel embankments might accumulate suf-

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ficient soil particles to partially fill the voids between the rock and thus reduce penetration of the oil binder.

The emulsified asphalt used was the product commonly designated RS-1, having a penetration of 85-100 measured at 77 F,. 100 g., 5 sec.

Emulsified asphalt was applied by pressure type distributor trucks, equipped with emulsified asphalt type spray jets. Hand applicators were used, *(See Photo 5),* to establish the rate of application. This was done in the presence of Mr. C. W. Thomas, Soil Conservation Service, and Mr. Lackey of the American Asphalt Institute. The depth of penetration sought was 4 inches, which was estimated to require 1 gallon per square yard per inch of depth. Rate of application for depth of penetration required can best be obtained by field trial. Specifications for application of the oil should reserve the right to adjust the rate of application and the total amount applied. The hand applicator method required several passes which allowed puddling and a build up of oil on the surface rock. To gain greater penetration and eliminate surface puddling a spreader bar was constructed and attached to the blade of a D-4 bulldozer, *(See Photo 6),* permitting all of the oil to be applied in one application. The surface of the rock was wetted immediately prior to placing the oil binder, in all methods of application. Attachment of the spreader bar to the blade of the D-4 bulldozer required that the operation be halted every 8 to 10 feet as the distributor trucks were unable to supply sufficient oil under pressure and power to the drivers simultaneously. This resulted in an overlap of oil each time the tractor was halted. To overcome this situation the spreader bar was attached to the leads of a truck crane with boom extended and the distributor truck towed by the truck crane enabling a constant flow of oil at a constant speed, *(See Photo 7).*

Ground water Station 10+00 to Station 16+37 was pumped down during placement of rock and emulsified asphalt application and maintained dry for a period of 24 hours to enable the asphalt binder to set up. *(See Photos 8 and 9).*

As a final operation reach (1) Station 43+00 to Station 48+15 was treated with an emulsified asphalt binder. Application of the emulsified asphalt was completed on November 8, 1952.

This channel was subject to continuous flow from November 15, 1952 to February 5, 1953, with maximum discharge during this period occurring on November 15, 1952. Maximum discharge on November 15, 1952 was 106 c.f.s. The channel functioned as designed and satisfied all requirements.

COST SUMMARY

CONDITION (1) - Station 43+00 to Station 48+15

Rock Blanket (Channel Lining) 515 lin. ft. @ $8.39/ lin. ft. = $4,320.00

(720 cu. yds. @ $6.00/ cu. yd.)

Rock @ $3.15/ cu. yd. FOB job
Handling & Placement $2.85/ cu. yd.

Emulsified Asphalt 32.49 Tons @ $40/ Ton (Applied) = $1,299.60

(1,774 sq. yds. @ 4.437 gal./ sq. yd. = 7,871 gal.)

$$\frac{(7,871)\ (8.256)}{2,000} = 32.49 \text{ Tons}$$

Emulsified Asphalt @ $19.80/ Ton FOB Plant
Transportation & Application $20.20/ Ton

TOTAL - $5,619.60

CONDITION (2) - Station 10+00 to Station 16+37.45
Station 18+59.95 to Station 43+00

Excavation 1,377.5 lin. ft. @ $5.00/ lin. ft. = $6,887.50

(1,093 cu. yd. @ $6.30*/ cu. yd.)

*Excavation in bottom of channel 25 ft. below natural ground under supersaturated conditions. Cost includes pumping ground water to subgrade.

Rock Channel Lining 3,077.5 lin. ft. @ $6.75/ lin. ft. = $20,773.12

(3,005 cu. yds. @ $6.91/ cu. yd.)

Rock @ $3.63/ cu. yd. FOB job
Handling and Placement $3.28/ cu. yd.

Emulsified Asphalt 194.15 Tons @ $40/ Ton (Applied) = $7,766.00

(10,600 sq. yds. @ 4.437 gal./ sq. yd. = 47,032 gal.)

$$\frac{(47,032)\ (8.256)}{2,000} = 194.15 \text{ Tons}$$

Emulsified Asphalt @ $19.80/ Ton FOB Plant
Transportation & Application @ $20.20/ Ton

TOTAL - $35,426.62

Note: Costs based on actual contract price.
Reference: Government Contract Asc-1015 and Supplement No. 10 to Contract Asc-934.

Photo 1. *Miguelito Flood Channel, looking upstream from private vehicular bridge 1 mile south of Central Avenue, showing erosion damage to toe of earth section. This damage developed in a thick layer of non-cohesive material near channel grade.*

Photo 2. *Miguelito Flood Channel, looking downstream from private vehicular bridge 1 mile south of Central Avenue, showing catenary shape of coarse loose rock fill in bottom of the channel.*

Photo 3. *Miguelito Flood Channel, looking upstream from Central Avenue, showing sloughing along toes of channel excavation. Sloughing occurred in a layer of unstable silt clay material.*

Photo 4. *Miguelito Flood Channel, view taken immediately above Central Avenue, showing nature of fracture in silt clay layer. See Photo 3 above.*

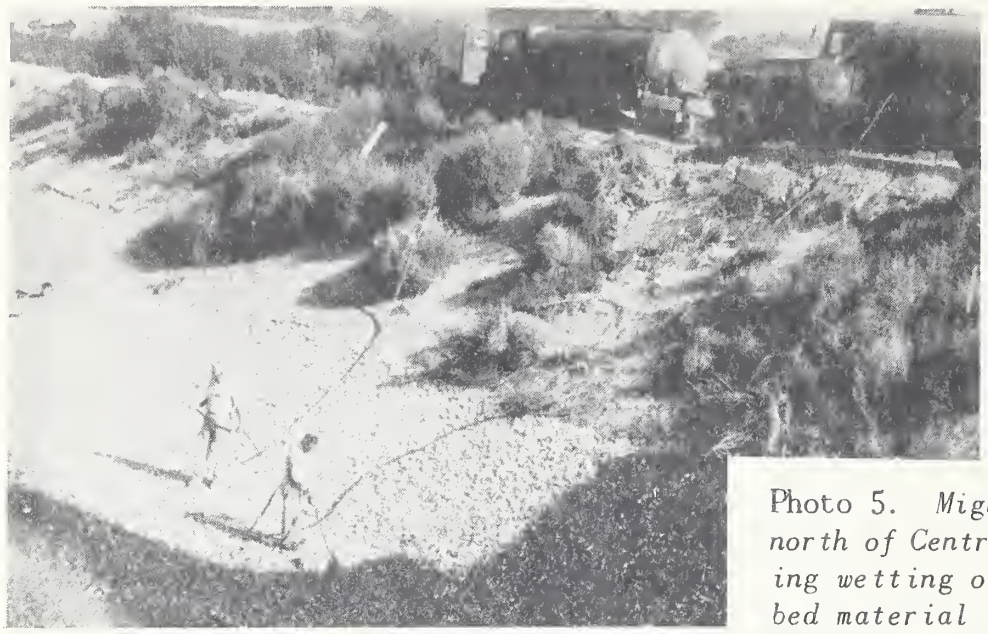

Photo 5. *Miguelito Flood Channel north of Central Avenue, view showing wetting of coarse rock gravel bed material and hand-spraying of emulsified asphalt binding material.*

Photo 6. *Miguelito Flood Channel north of Central Avenue, view showing use of spraying bar to accomplish uniform application of asphalt binding material to coarse gravel bottom fill. Note moistened gravel area immediately ahead of asphalt machine.*

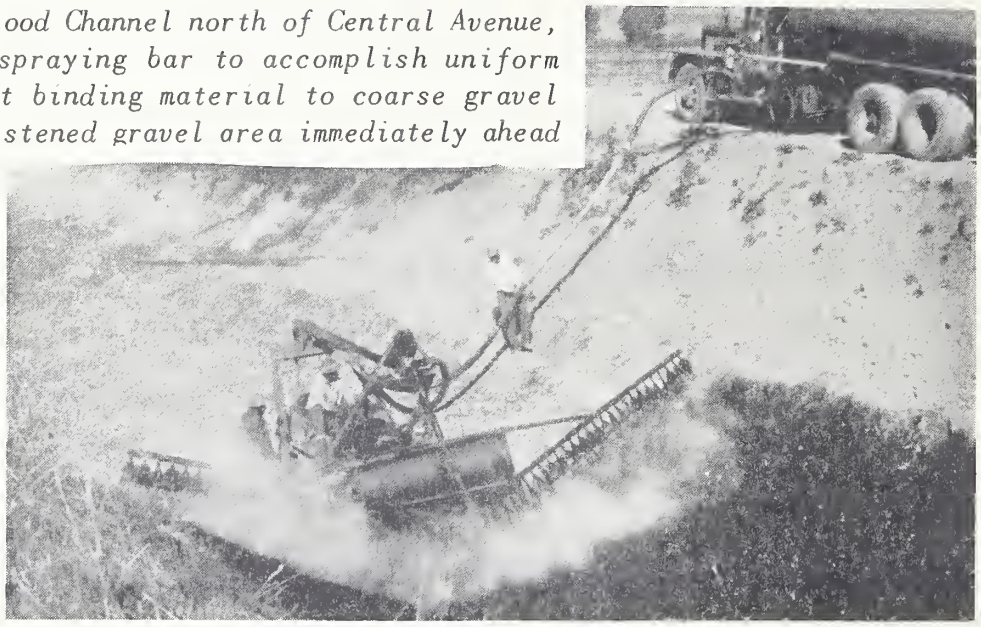

Photo 7. *Miguelito Flood Channel, view showing use of clam bucket to move asphalt spray bar.*

Photo 8. *Miguelito Flood Channel, view looking downstream from Central Avenue, showing unstable nature of channel bottom material.*

Photo 9. *Miguelito Flood Channel, looking downstream from Central Avenue, showing condition of channel immediately after application of coarse gravel and application of emulsified asphalt binding material.*