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PRODUCT EVALUATION 86-18
JOINT SEALANT STUDY

Construction Report

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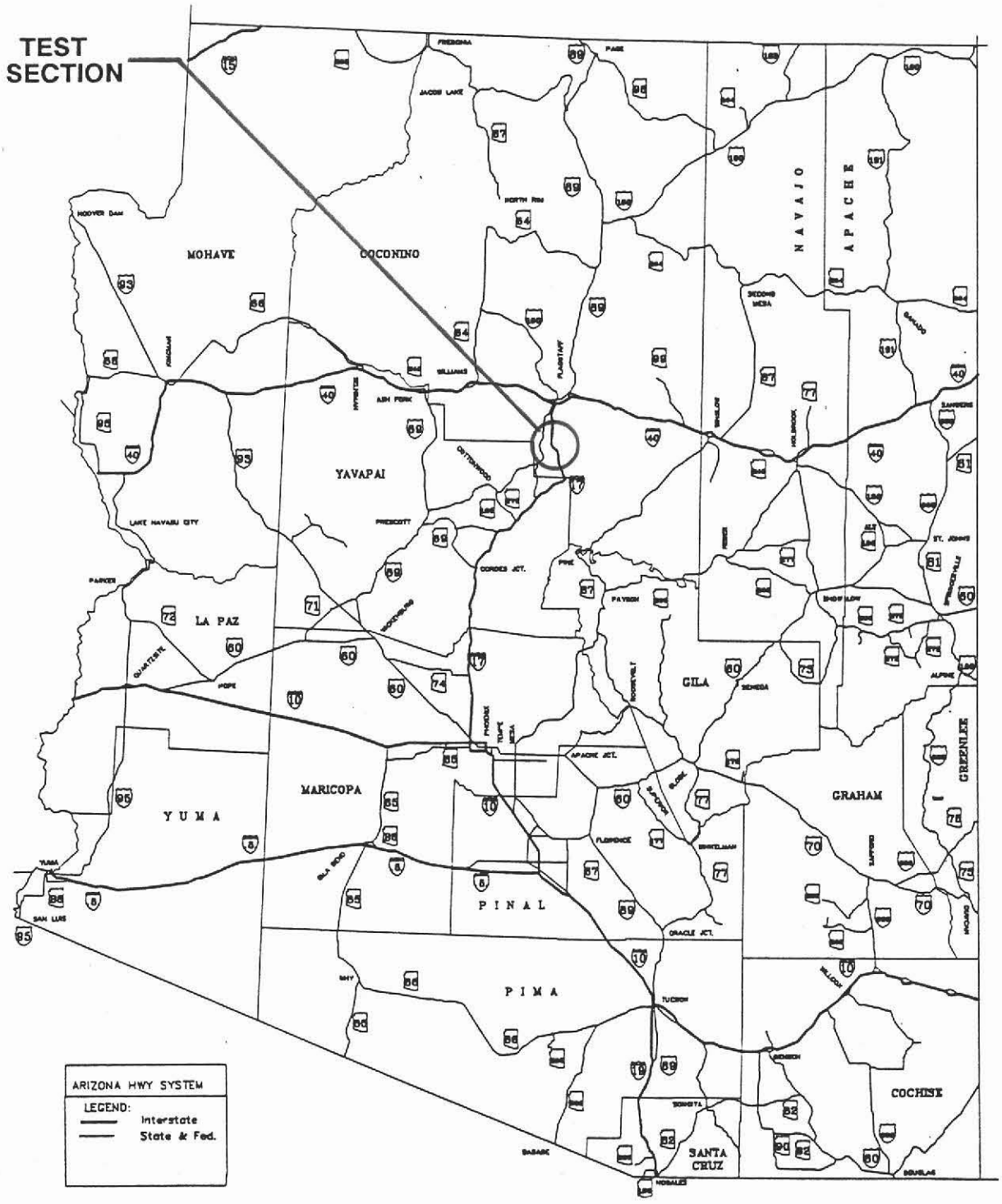

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CONSTRUCTION REPORT

JANUARY 7, 1987

PREPARED BY:

TIMOTHY M. WOLFE
STEVEN L. TRITSCH

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16. ABSTRACT

ADOT has approximamtely 550 lane miles of jointed portland cement pavement under its jurisdiction. The current practice is to saw and seal the joints at the time of construction and reseal the joints under a rehabilitation project. ADOT does not specify a performance criteria for joint sealant.

To evaluate the performance of currently available products, a 0.7 mile test section was constructed on I-17 near flagstaff. The test section, constructed on the southbound roadway from milepost 330.5 to 331.2 compared two silicones , Dow Corning 888 & Superseal 888, and three hotpours Allied-Koch 9001, Craftco Roadsaver 231 and W. R. Meadows SOF-SEAL.

The sealants were placed in July, 1986 by Change Order on project IR-17-2(104). This project consisted of resealing 26 miles of plain jointed concrete pavement constructed in 1974. A total of two hundred transverse joints extending across the entire roadway were sealed. The sealants were placed in a specified pattern alternating one product after another until forty joints of each material had been placed (i.e. within any five joint interval all five products were placed).

The sealant perfermance will be monitoried semi annually for a period of four years with cores obtained after one, two and four years.

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I. INTRODUCTION

ADOT has approximately 550 lane miles of jointed portland cement concrete pavement under its jurisdiction. Traffic patterns vary from 8,400 ADT on a rural four lane interstate highway to 117,000 ADT on an urban six lane freeway system. Truck traffic ranges from 36% on interstate rural highways to 10% on urban freeways in Phoenix.[1]

Climatic conditions in Arizona impact joint sealant performance dramatically. The average low temperature in Arizona's high country (above 6,000 foot elevation) is 15°F during January while the average high temperature is 80°F, in July. The average low temperature in the desert environment (1,000 foot elevation) is 65°F in January and the average high temperature is 115°F in July. Average rainfall varies from 19 inches of precipitation near Flagstaff to 7 inches of precipitation in the Phoenix area.

Not only does a joint sealant have to contend with large temperature variations in regard to flow considerations, it must also contend with stresses associated with slab movement due to frost heave and temperature changes. No one sealant may be capable of meeting the extreme climatic conditions experienced on Arizona's highways.

The Arizona Department of Transportation installed a test section in July, 1986, to address the performance of joint sealants in the Arizona high country under a joint resealing project. The test section will be monitored for a period of four years. The Department does not currently have a performance criteria for joint sealants. Results of this study will be used to aid the Materials Section in determining which types of joint sealants are appropriate for joint resealing projects in the high elevation regions.

II. LOCATION OF TEST SECTION

An advertisement for bid, IR-17-2(104), was let March 28, 1986, to reseal 26 miles of plain jointed portland cement concrete pavement on the southbound lanes of I-17, south of Flagstaff (Figure 1). The joint sealant selected for the resealing project was Superseal 444, a hot-pour material produced by Superior Products. A copy of ADOT's joint sealant specifications for this project is included in Appendix A.

The test section per change order #4 is located between MP 330.5 and 331.2. MP 330.5 is at the crest of a hill and in the transition of a 0.052 feet per foot superelevation. The elevation of the test section is approximately 6,700 feet.

The original project, I-17-2(35), was built in 1974. The eight inch thick, 24 foot wide slab, was constructed with eight inches of portland cement concrete pavement over six inches of portland cement treated base. Contraction joints were designed to be at 17, 15, 13, 15, 17 foot spacings. Actual spacings and current condition of the test section are documented in Appendix B. Joints are on a 6:1 skew with an original saw cut of 1/4 the pavement thickness (two inches). The original joint sealant material was Superseal 444. (Figure 21)

III. DESCRIPTION OF SEALANTS

There were five joint sealants selected for the study: Allied-Koch 9005, Crafco Roadsaver 231, Dow Corning 888,Superior Products Superseal 888, and W.R. Meadows SOF-SEAL. Dow Corning 888 and Superseal 888 are 100% silicone sealants. W.R. Meadows SOF-SEAL and Allied-Koch 9005 are asphalt based materials and Roadsaver 231 is an asphalt-rubber based material.

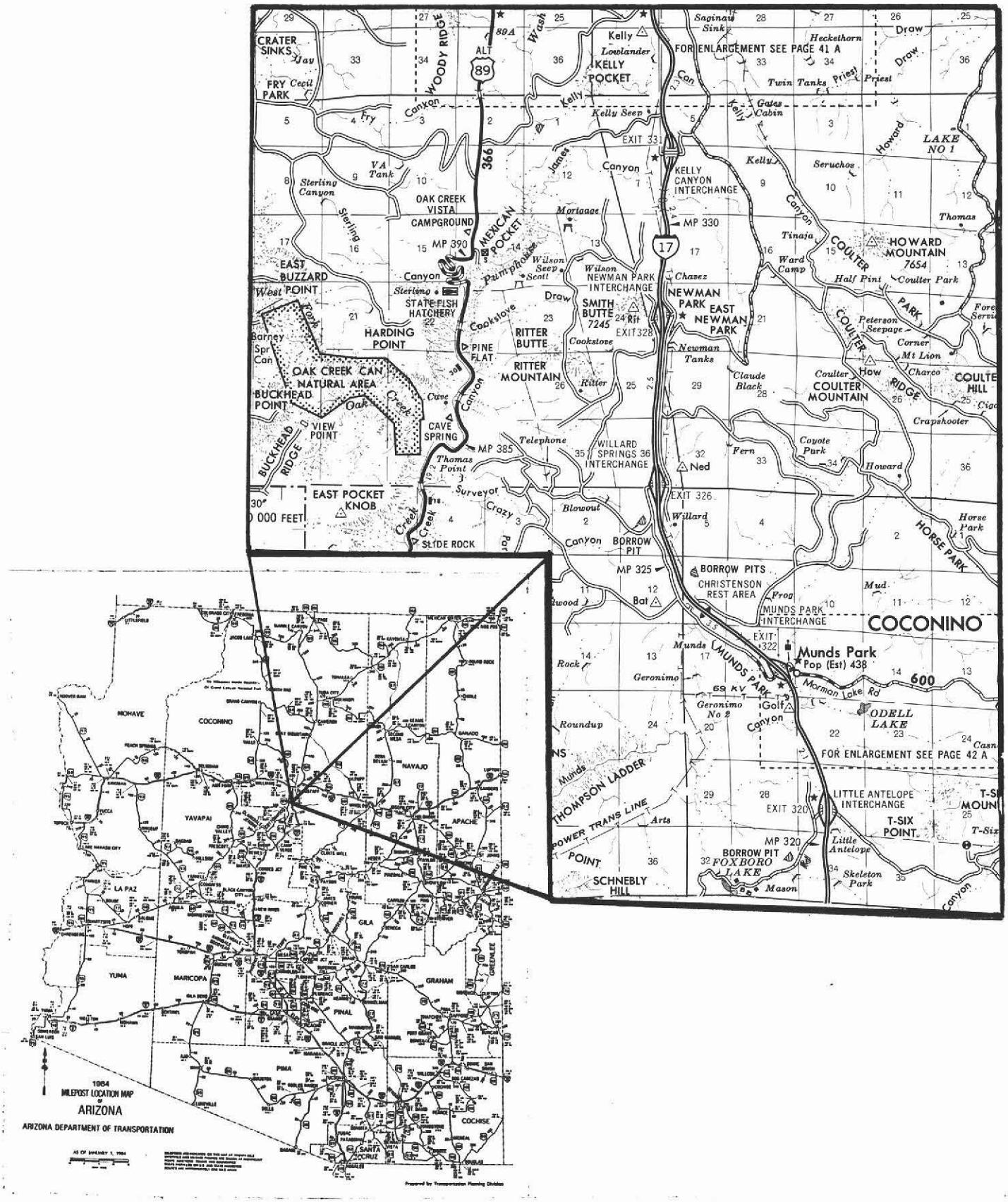


Figure 1- Location of Test Section

The silicone products are placed at ambient temperature, while the asphalt and asphalt-rubber products are placed at 360°F to 380°F. A copy of each material description and specifications is included in Appendix C. The silicones meet Federal specifications SS-5-00230C and SS-5-001543A while Allied Koch meets ASTM D3405 , Roadsaver 231 meets modified ASTM D3405, and SOF-SEAL meets ASTM D3407 for low modulus sealants. A copy of Superseal 444's description and specification is also included in Appendix C.

The estimated material cost, per 100 lineal feet of joint, for each product on this project is:

PRODUCT	$/ 100 '
Allied- Koch 9001	13
Crafco Roadsaver 231	22
Dow Corning 888	69
Superseal 888	67
W. R. Meadows SOF-SEAL	26

IV. CONSTRUCTION REPORT

The placement pattern for the five joint sealants was selected to minimize any biases and to be statistically valid. A total of 200 joints were sealed in the test section, 40 joints for each material. The sequence of placement was A, B, C, D, E, A, B, C, D, E, and so on, where A is Dow Corning 888, B is Superseal 888, C is Allied-Koch 9005, D is Roadsaver 231, and E is W.R. Meadows SOF-SEAL. Four of the products were placed in a two-day period: July 8, 1986, and July 9, 1986. The fifth product, Superseal 888, was placed July 14 and July 25. The average high temperature for each day's placement was approximately 76°F,and the average low was approximately 48°F.

The placement of A, B, C, and E was performed by the contractor, Conseal of Layton, Utah. Material D was placed by Robert Rutherford, a field representative of Crafco, using a Crafco EZ Pour 50 Melter. All joints were sawed to a depth of 2 inches and a 1/2 inch nominal width by the contractor. Actual joint width was closer to 3/4 inches. All joints were sand blasted and air-blown by the contractor. (Figure 3) The backer rod was Hercules XL, a 7/8 inch closed cell polyethalene material. All joints utilized the same backer rod; however, different depths were used for different products. The backer rod was placed with steel wheels set to the necessary depth. (Figure 4)

A. DOW CORNING 888

The Dow Corning 888 silicone was placed in a two day period. On July 8, 40 joints in the passing lane and 27 joints (beginning at MP 330.5) in the driving lane were placed. The remaining 13 joints were placed on July 9.

After the joints were prepared the backer rod was placed approximately 1/2 inch from the top of the slab. The silicone was supplied in five gallon buckets and placed by an air driven pump. After placement, it was immediately tooled with a rubber hose on the end of a broom stick. The tooling was necessary to ensure that the sealant was below the surface of the joint. Figures 5, 6, and 6 are photos of typical silicone joint sealant placement. A four man crew was used to place the material: a driver, an operator for the injection, a tooler, and a clean-up person.

No major problems were encountered during the Dow Corning placement. The technical representative was satisfied that all joints were placed in the proper manner with the exception of the first three joints in the passing lane at MP 330.5. These joints still had residue of the previous sealant in several locations. The technical representative stated that he could not guarantee adhesion in those

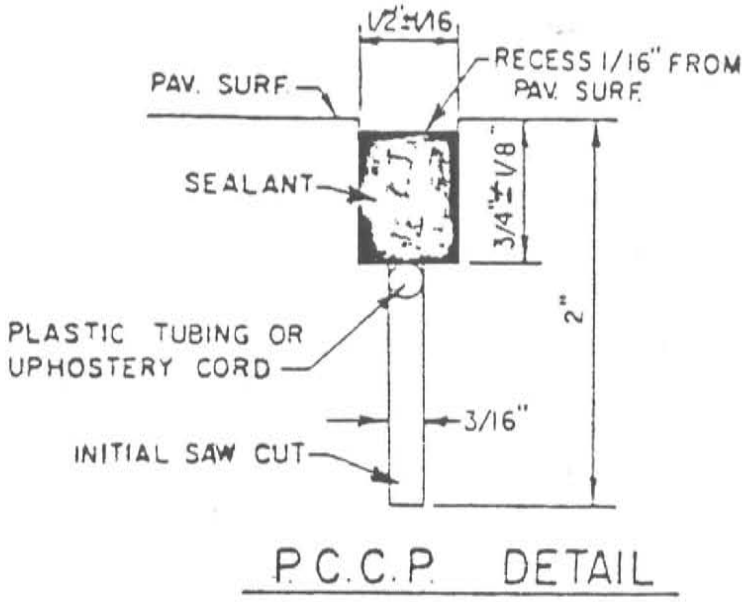


Figure 2- Original Pavement Joint Detail

Figure 3- Sand Blasting and Blowing Joints

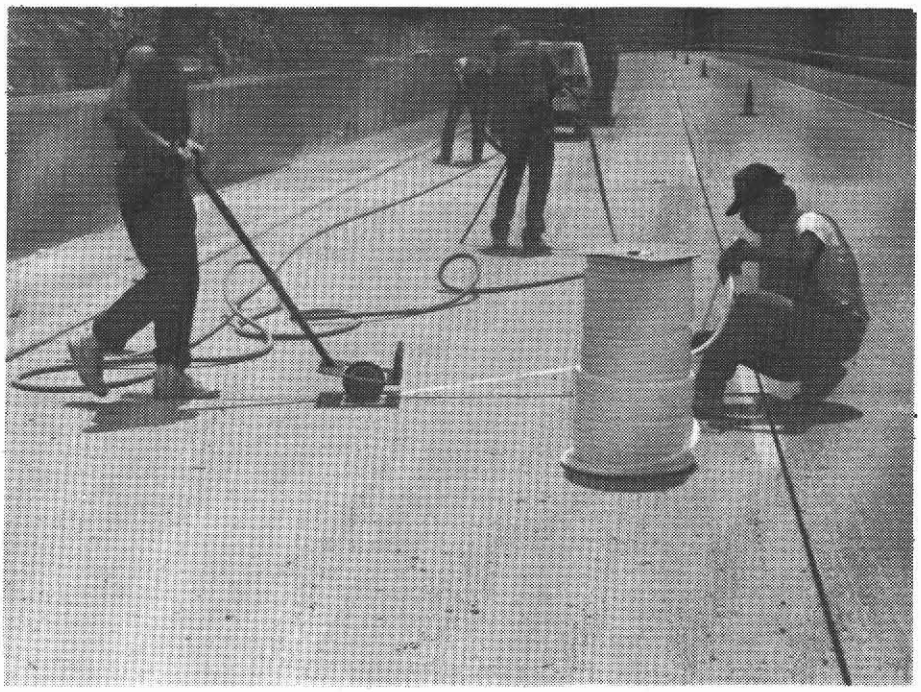


Figure 4- Placing Backer Rod

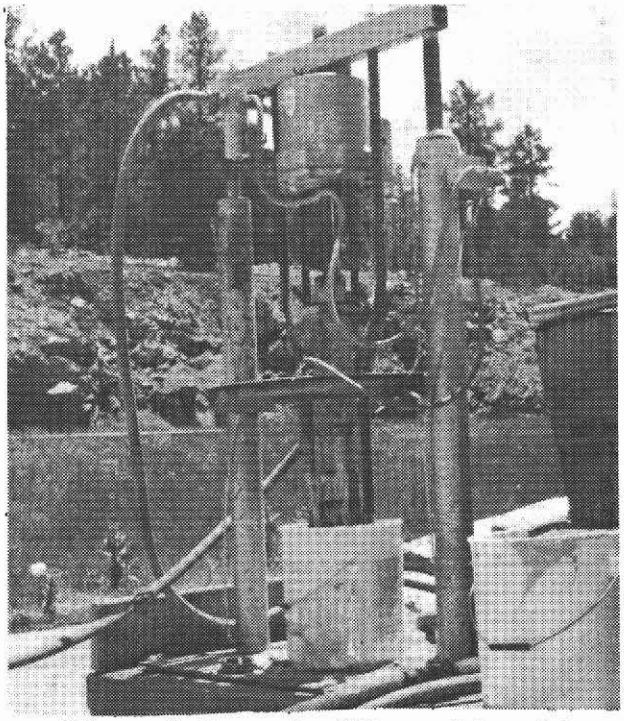


Figure 5- Pump for Silicone Material

areas. The contractor's representative stated that based on his experience the sealant would hold. The joints were, therefore, sealed with the silicone in order to determine the effectiveness of the adhesion to an improperly cleaned joint.

B. SUPERSEAL 888

Superior Products was unable to supply their material in time for the two-day project. The Superseal 888 product was placed on the 14th of July in the passing lane and on the 25th of July in the driving lane. The equipment and installation procedure was the same as for the Dow Corning 888. Prior to placing the product, the pump had to be purged, so as not to contaminate the material with the previous Dow Corning 888. Figures 5, 6, and 7 are photos of typical silicone joint sealant placement.

Superior Products failed to provide a technical representative during the placement. They had been given an opportunity to provide a representative. Frank Gauss, president of Superior Products, stated that the contractor CON-SEAL, had extensive experience placing Superior Products 888 and was confident that the material would be properly installed.

No problems occurred during the placement of Superseal 888. The product performed much like the other silicone except that it did not tool as easily. The contractor had to make more passes over the joint in order to make it neat and get it below the surface.

C. ALLIED-KOCH 9005

Allied-Koch 9005 is a low modulus, hot-pour asphalt based material placed at 365^{O}F. Both the driving lane joints and the passing lane joints were sealed on July 8, 1986. This was done in order to clear the pot at the end of the day and use the same pot for the W.R. Meadows product the next day.

After preparing the joints the backer rod was placed 1-1/4 inches below the top of the slab. The material was heated in a melting pot until the temperature reached 370^{O} to 380^{O}F. The crew consisted of a driver and an applicator. Figures 8 and 9 are photos of typical hot-pour placement.

The Allied-Koch 9005 exhibited a great deal of flow on the .052 foot per foot superelevated horizontal curve. Also, a large number of bubbles were observed immediately after placement. It was visually estimated that there were two to three bubbles per lineal inch.

D. CRAFCO ROADSAVER 231

Roadsaver 231 is a hot melt material which is heated to 380^{O}-400^{O}F for placement. Three joints in the passing lane (MP 331.2) were filled on July 8th before an equipment failure stopped the operation. The balance of the joints were sealed on the following day, July 9.

The placement of Crafco 231 was basically the same as the placement of the Allied-Koch. The depth of the backer rod was 1-1/4 inches and the material was heated to 380^{O}-400^{O}F and poured at 365^{O}F. Two people were required for the Crafco operation: a driver for the vehicle, and an operator for the pot. Figures 8 and 9 are photos of typical hot-pour placement.

The material did not exhibit the same flow characteristics as the Allied-Koch 9005 and SOF-SEAL materials. The Roadsaver 231 material appeared stiffer and, therefore, a more uniform depth of sealant was evident in the superelevated portions of the curves. Air bubbles were present immediately after placement of the sealant - approximately three bubbles per lineal inch.

The Roadsaver 231 was also placed in a transverse crack in the inside asphalt shoulder and in the longitudinal joint for about six to eight feet at MP 331.4. Also, at MP 330.6, a longitudinal crack extending through three panels in the passing lane was sealed with the Crafco product. It was estimated that two applications of sealant would be required to fill the crack; however, only one application was needed.

E. W.R. MEADOWS SOFT-SEAL

W.R. Meadows sealtight SOF-SEAL is a low modulus, hot applied material placed at 380°F. Both the driving lane and passing lane joints were sealed on July 9, 1986. The same melting pot was used for both this product and the Allied Koch which had been placed the previous day. Before heating, the pot was purged and the equipment cleaned out. The backer rod was placed at 1-1/4 inches below the surface of the slab. The crew consisted of a driver and an applicator. Figures 8 and 9 are photos of typical hot-pour placement.

The SOF-SEAL exhibited the same characteristics as the Allied-Koch 9005. It did not flow quite as much, but it still tended to run on the elevated joints. It also bubbled much like the Allied-Koch.

F. LONGITUDINAL JOINTS

The longitudinal joint between the driving lane and passing lane was filled with different materials. On July 8, the contractor placed approximately 340 feet of Allied-Koch sealant in the longitudinal joint from station 6938+80 to 6942+00. On July 9, Crafco placed their product from station 6927+10 to 6938+80. On the same day, W.R. Meadows SOF-SEAL was placed from station 6944+88 to 6945+60.

On July 14, the contractor placed the last of the Dow Corning 888. From station 6944+00 to approximately 6944+80, Superior Products 888 was placed from station 6945+60 to 6946+00. The remainder of the longitudinal joints were filled with Superior 444: station 6926+50 to 6927+10 and station 6946+00 to 6956+50.

V REFERENCES

1) Arizona Department of Transportation, "Traffic on the Arizona Highway System 1984", July 1, 1985.

2) F. R. McCullagh and M. D. Souza, "A Five Year Evaluation of Concrete Pavement Joint Sealants", Arizona Department of Transportation, 1984.

3) F. R. McCullagh and M. D. Souza, "ADOT's Joint Sealant Study". Arizona Department of Transportation, 1985.

4) D. K. Stephens, "Joint Sealants", Arizona Department of Transportation, September 1979.

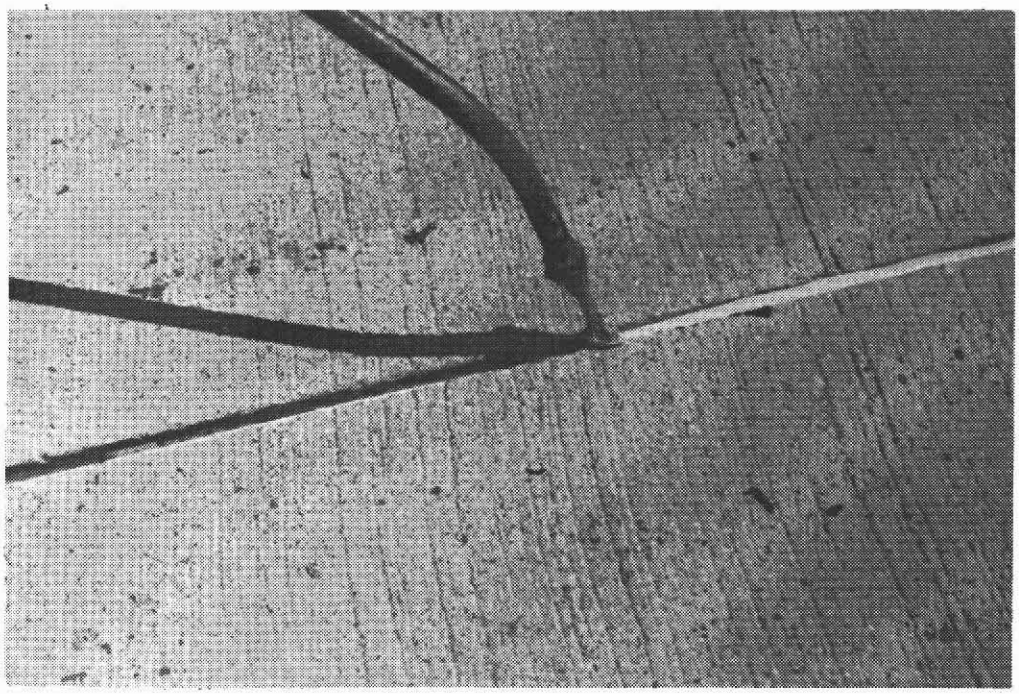


Figure 6- Placement of Silicone Material

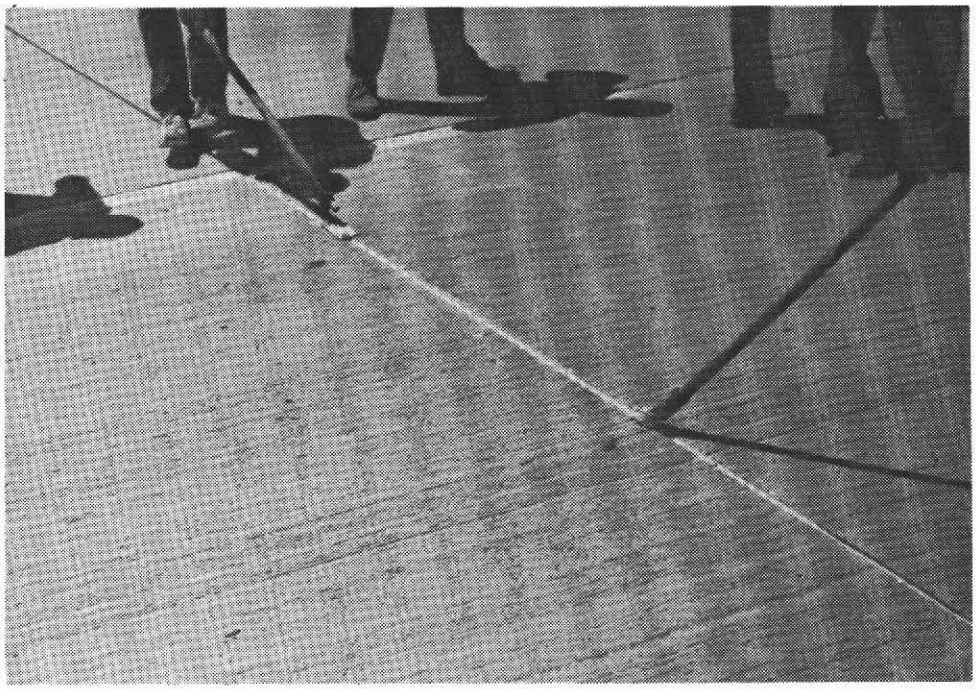


Figure 7 - Tooling Silicone Material

Figure 7 - Placing Hot-Pour Joint Sealant

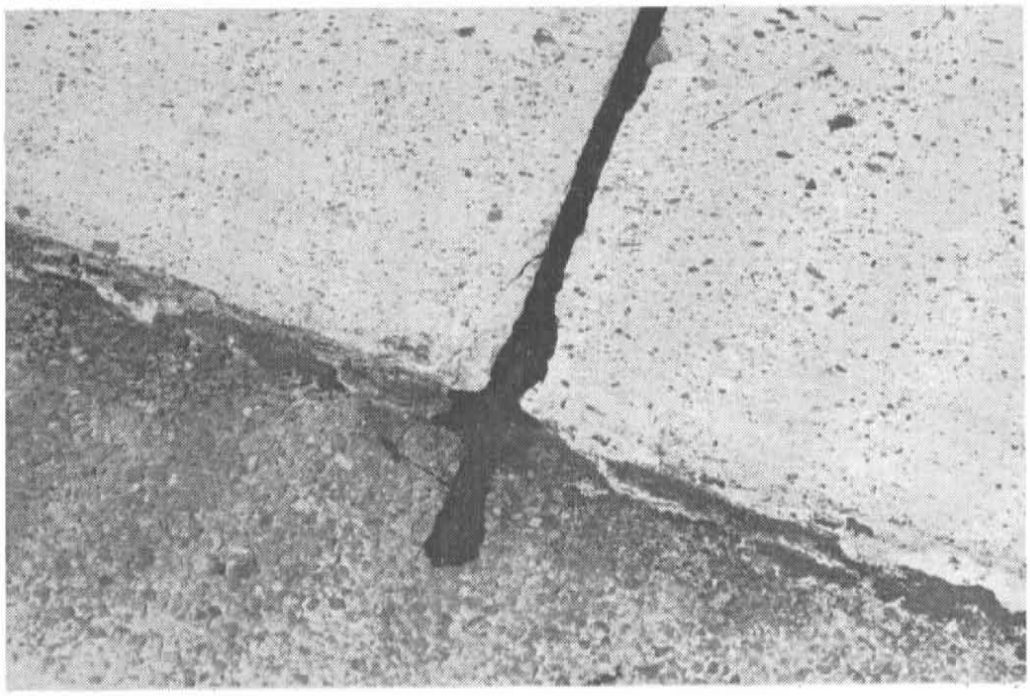


Figure 8 - Typical Hot-Pour Material

APPENDIX

SECTION 108 - PROSECUTION AND PROGRESS:

108.01 Subletting of Contract: of the Standard Specifications is modified to add:

Item: The following item is hereby designated as a Specialty 7010001.

(JCREP401, 6 10/21/85)

ITEM - 4010051 - RECONSTRUCT CONCRETE PAVEMENT JOINTS

1 Description:

The work under this item shall consist of renovating longitudinal and transverse construction joints and Anchor Slab expansion joints in existing portland cement concrete pavement, as specified herein, detailed on the project plans and as directed by the Engineer.

2 Material Requirements:

Joint sealant shall be an approved hot poured type conforming to the requirements of ASTM D3406 with the following requirement added to Paragraph 5.1:

> The minimum ambient temperature during application and ambient temperatures under various storage conditions shall be clearly marked on the container.

In addition to the above, the material shall meet the requirements for Resiliency, Artificial Weathering and Tensile Adhesion. When tested at 77 degrees F. in accordance with the requirements of Paragraph 8.2 of ASTM D 3408, the recovery shall be a minimum of 60%. When tested in accordance with the requirements of Paragraph 9 of ASTM D 3408, the joint sealant shall not flow, show tackiness, presence of an oil-like film or reversion to a masticlike substance, formation of surface blisters either intact or broken, form internal voids, surface crazing or cracking, or hardening or loss of resilient, rubber-like properties. Evidence of physical change in the surface of the material by visual and tactile examination shall constitute failure of this test. When tested in accordance with the requirements of Paragraph 10 of ASTM 3408, the average of three test specimens shall be a minimum of 500 percent elongation.

Grout for filling wide joints shall be a low modulus moisture insensitive epoxy-resin grout of a viscosity suitable for flowing into the irregular cracked portion of the joint. The ratio of epoxy-resin to sand shall be between 1:7 and 1:10. Epoxy binder material shall conform to the requirements of ASTM Std. C-881-78(83).

Sand used in epoxy grout shall conform to the requirements of Subsection 1006-2(B) except that the gradation shall be as follows:

Sieve Size	Percent Passing
No. 8	100
No. 16	95 - 100
No. 50	10 - 40
No. 200	0 - 4.0

A rapid set portland cement concrete pavement patching material may be substituted for epoxy grout as approved by the Engineer.

3 Construction Requirements:

.01 General:

Joint repairs shall be accomplished by first removing old sealant and joint inserts, then refacing and cleaning the joints followed by installation of a backer rod (if required) and installation of new sealant.

Joint sealing operations shall be completed within 48 hours of sawing and cleaning of the existing joints or as approved by the Engineer.

.02 Joint Preparation:

Inserts shall be removed from insert formed joints by sawing to provide a clean vertical face. The width and depth of the sawcuts shall be sufficient to insure complete removal of the insert and to provide a finished joint of the dimensions specified for the sealant material to be used.

Joints that are not insert formed shall be sawed to the widths and depths specified herein. Joints previously sawed and sealed will be inspected to assure the proper dimensions and shall be resawed to the proper widths and depths, when required.

Joints shall be sawed as follows:

Initial Joint Width "W"	Sawed Width	Sawed Depth "D" ("D" is the distance from pavement surface to bottom of backer rod)
$W \leq 1/2$	1/2"	D = 1 3/4
$1/2 < W \leq 3/4$	3/4"	D = 2 1/8
$3/4 < W \leq 1\ 1/2$	No Sawing Required	D = 2W + 3/4

Immediately after sawcutting a joint, old sealant shall be removed and the internal surfaces of the joint shall be thoroughly cleaned by sandblasting. Sand for sandblasting shall be sharp and clean and shall be capable of passing a number 10 sieve. The amount of compressed air and the nozzle pressure shall be such that the joints will be thoroughly cleaned and the edges will have etched surfaces.

.03 Dowel Placement:

Dowel bars shall be placed in transverse joints when the initial joint width is greater than 1 1/2 inches. Slots for dowel bar placement shall be made with two saw cuts perpendicular to the joint and 1 1/2 $\pm$1/8 inch apart. Saw cuts shall be one half the depth of the slab plus 1/2 inch. Concrete shall be removed between the saw cuts and smooth epoxy coated dowels, 1 1/4 inch diameter by 18 inches long, shall be be inserted into the formed slot. Dowels shall be supported above the bottom of the slot so that epoxy grout can flow around the circumference of the dowel. Dowels shall be placed so that the dowel is embedded equal distance into the two slabs. Dowel bars shall conform to the requirements of AASHTO M254 with Type B coating, except that the core material shall conform to the requirements of ASTM A 615, Grade 40. Dowel bars shall be placed as shown on the plans, and shall be placed at mid-depth of the existing slab. The bar shall be throughly and evenly greased prior to placement into the slot then covered with an approved epoxy grout. A 1/2 inch thickness of preformed joint filler shall be placed next to one edge of the joint such that a 1 inch deep sealant reservoir, $\pm$ 1/8, can be formed at the top, as shown on the plans. The wide joint shall be filled with epoxy grout.

On longitudinal joints where the joint opening exceeds 1 1/2 inches, the saw cuts for placement of tie bars perpendicular to the joint, shall be 7/8 inch apart so that a No. 5 deformed tie bar 24 inches long can be inserted into the slot. This 24 inch tie bar shall be placed at mid slab depth and equal distance into each slab, then covered with an approved epoxy grout. The bars shall be at 36 inch spacing. The wide joint shall also be filled with the epoxy grout.

.04 Separating or Blocking Medium (Backer Rod):

Immediately following the Sawing and cleaning of joints and prior to the application of sealant, a backer rod composed of an inert, compressable material shall be inserted along the lower portion of the joint groove at a uniform depth as shown on the project plans.

The backer rod shall be compatible with the sealant in accordance with the manufacturer's recommendations. The product shall be clean, free of scale, foreign matter, oil or moisture and shall be non-absorbing. The Engineer shall be assured that the material proposed for use has been used successfully in similar installations.

Backer rod sizes shall be as follows:

Joint Width (Inches)	Backer Rod Dia. (Inches)
1/2	5/8
3/4	1
1	1 1/4
1 1/4	1 1/2
1 1/2	2

.05 Cleaning Prior to Sealing:

Prior to sealing, all foreign or loosened particles shall be removed from the joints to the full depth of the original sawed joints. The removal of all foreign or loosened particles shall be accomplished by means of compressed air or other methods approved by the Engineer. Air compressors shall be capable of furnishing a sufficient amount of compressed air to clean the joints properly.

.06 Installation of Sealant:

Sealant compound shall not be placed unless the joint is dry, clean and free of dust. The face of the joint shall be surface dry and the ambient and pavement temperatures shall both be at least 50 degrees Fahrenheit at the time of application of the sealant. Installation of the sealant shall be such that the in-place sealant shall be well bonded to the concrete and free of voids or entrapped air. The joints shall be sealed in a neat and workmanlike manner, so that upon completion of the work, the surface of the sealant material will be 1/4 inch, $\pm$ 1/8, below the adjacent pavement surface. The contractor shall "spot-up" or refill all low joints before final acceptance. Any excess material on the surface of the pavement shall be removed and the pavement surface shall be left in a clean condition. Vehicular or heavy equipment traffic shall not be permitted on the pavement in the area of the joints during the curing period.

5 Method of Measurement:

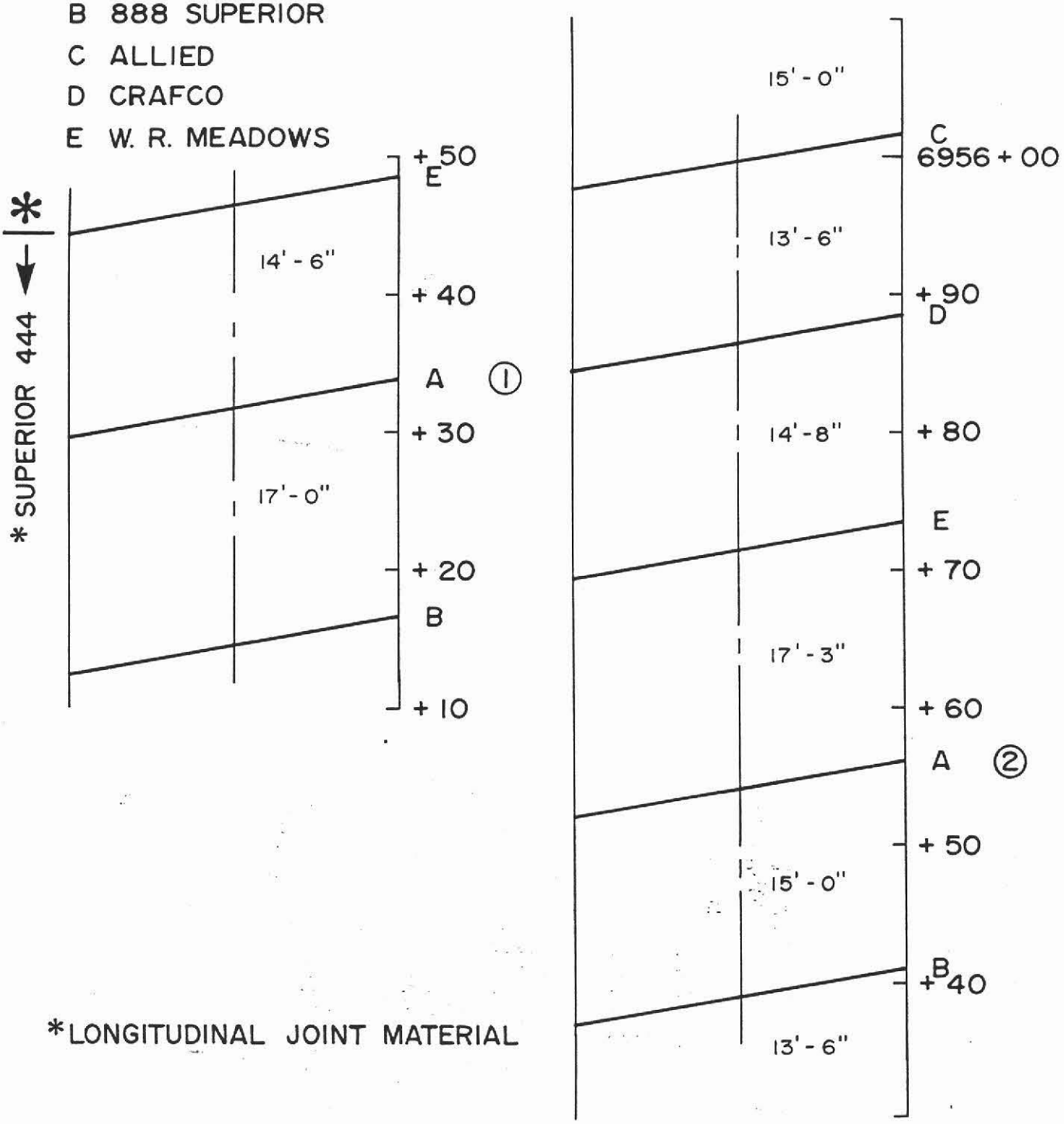
Reconstruct concrete pavement joints and reconstruct anchor slab expansion joints in portland cement concrete pavement will be measured by the linear foot.

6 Basis of Payment:

The accepted quantities of reconstruct concrete pavement joints and reconstruct anchor slab expansion joints in portland cement concrete pavement, measured as provided above, will be paid for at the contract unit price per linear foot, which price shall be full compensation for the work, complete in place, including furnishing all labor, materials and equipment necessary to complete the work as specified herein.

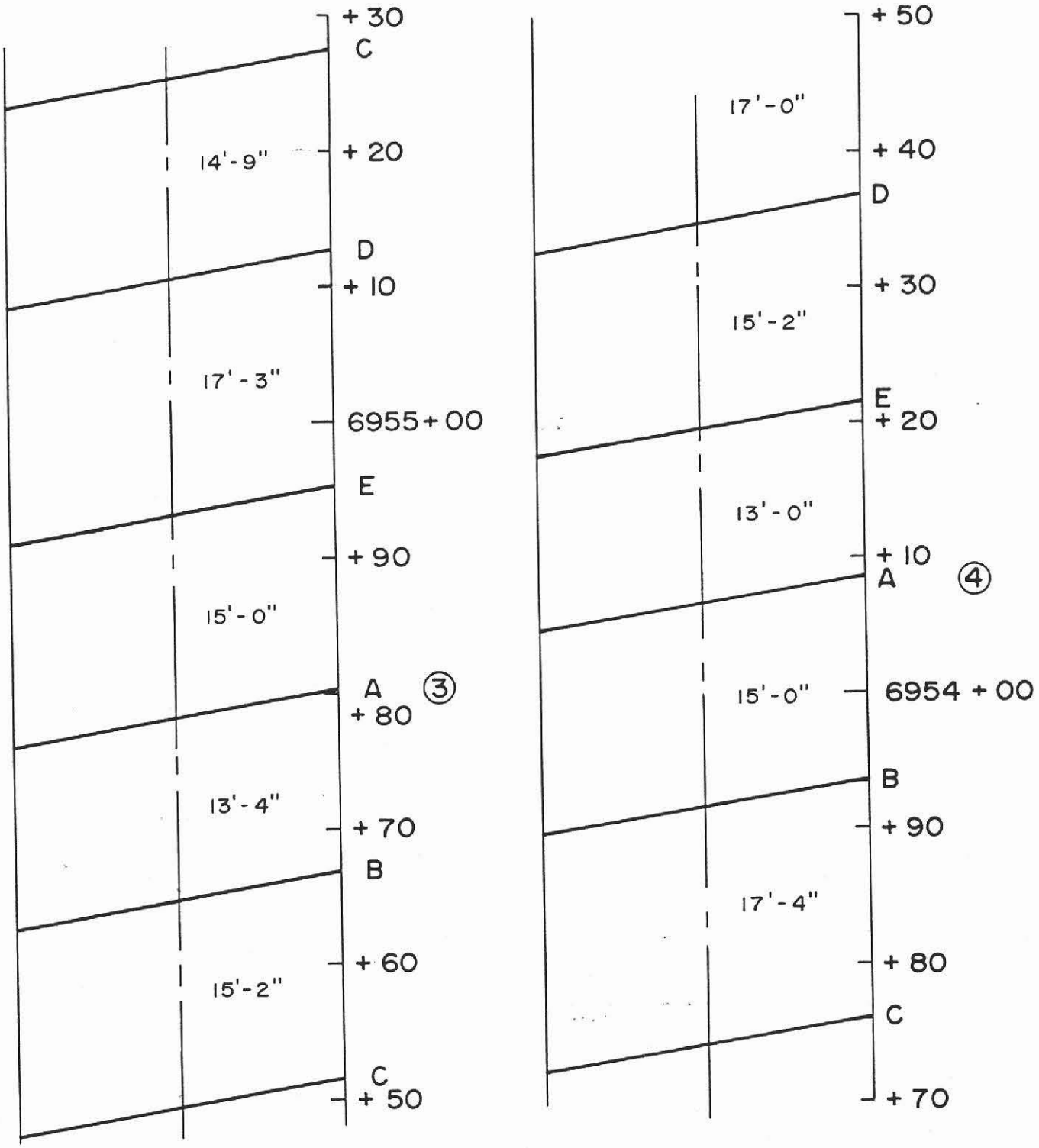
JOINT SEALANT STUDY
I 17, SOUTHBOUND

A 888 DOW CORNING
B 888 SUPERIOR
C ALLIED
D CRAFCO
E W. R. MEADOWS



*LONGITUDINAL JOINT MATERIAL

JOINT SEALANT STUDY
I 17, SOUTHBOUND



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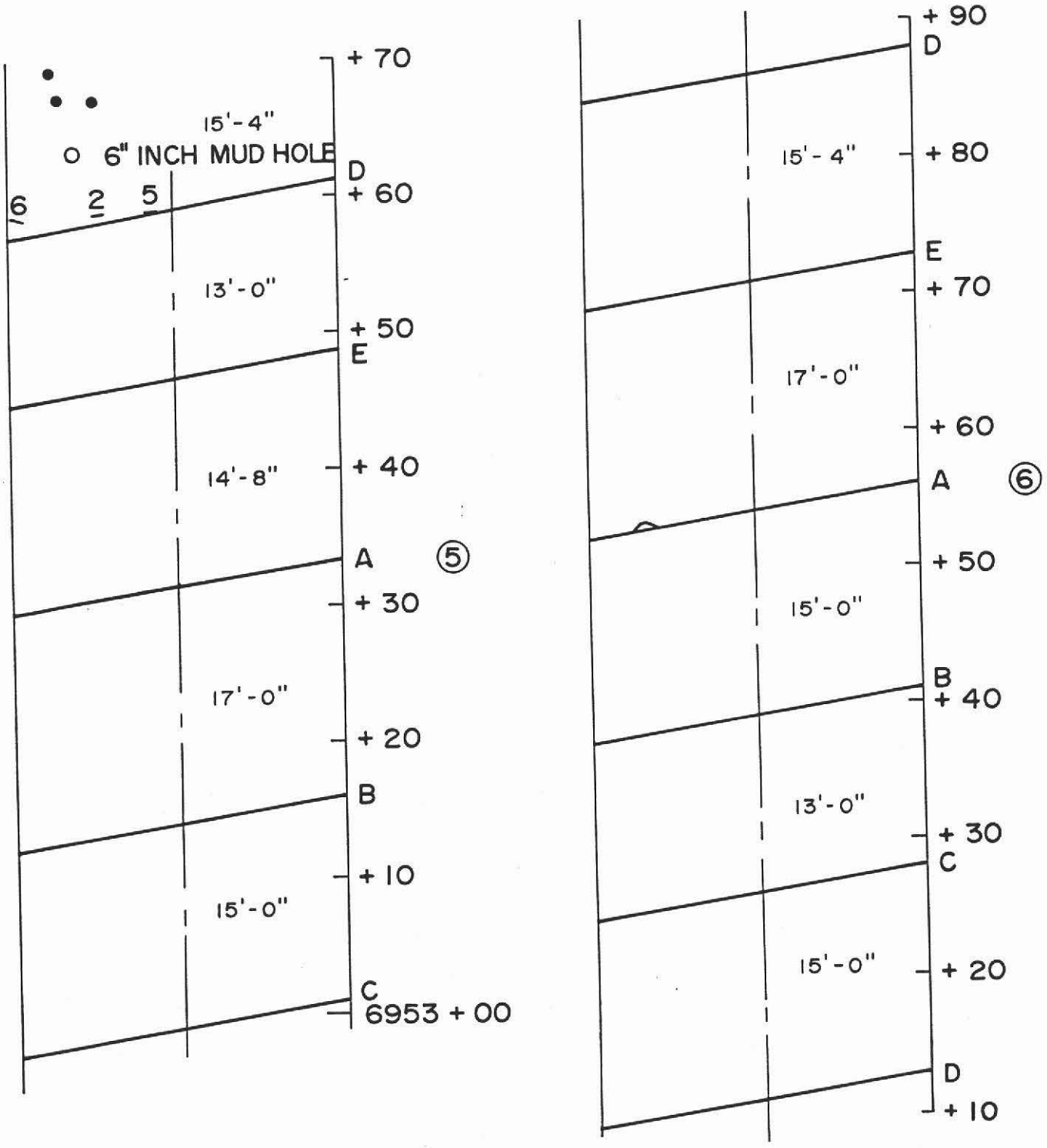

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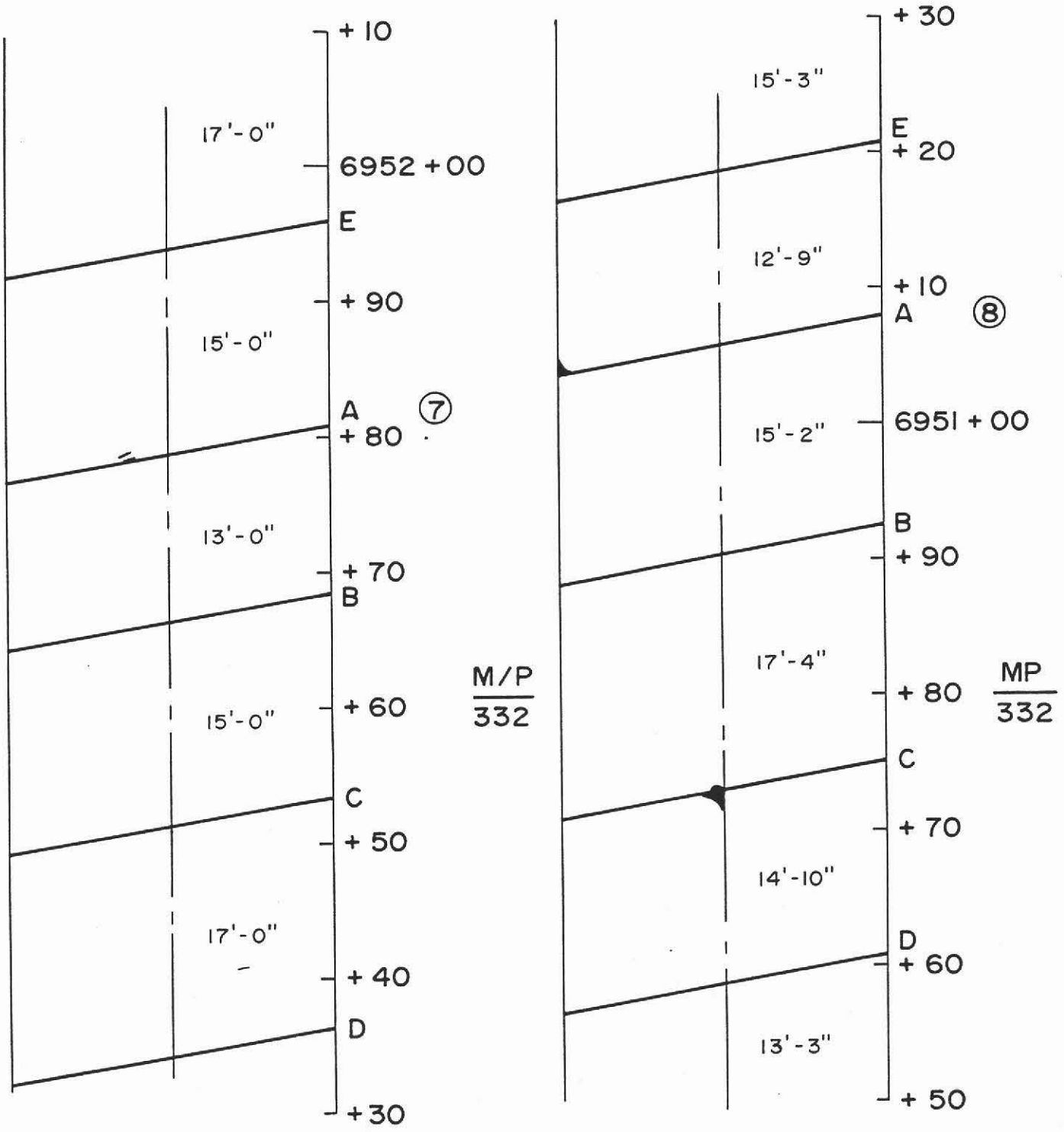

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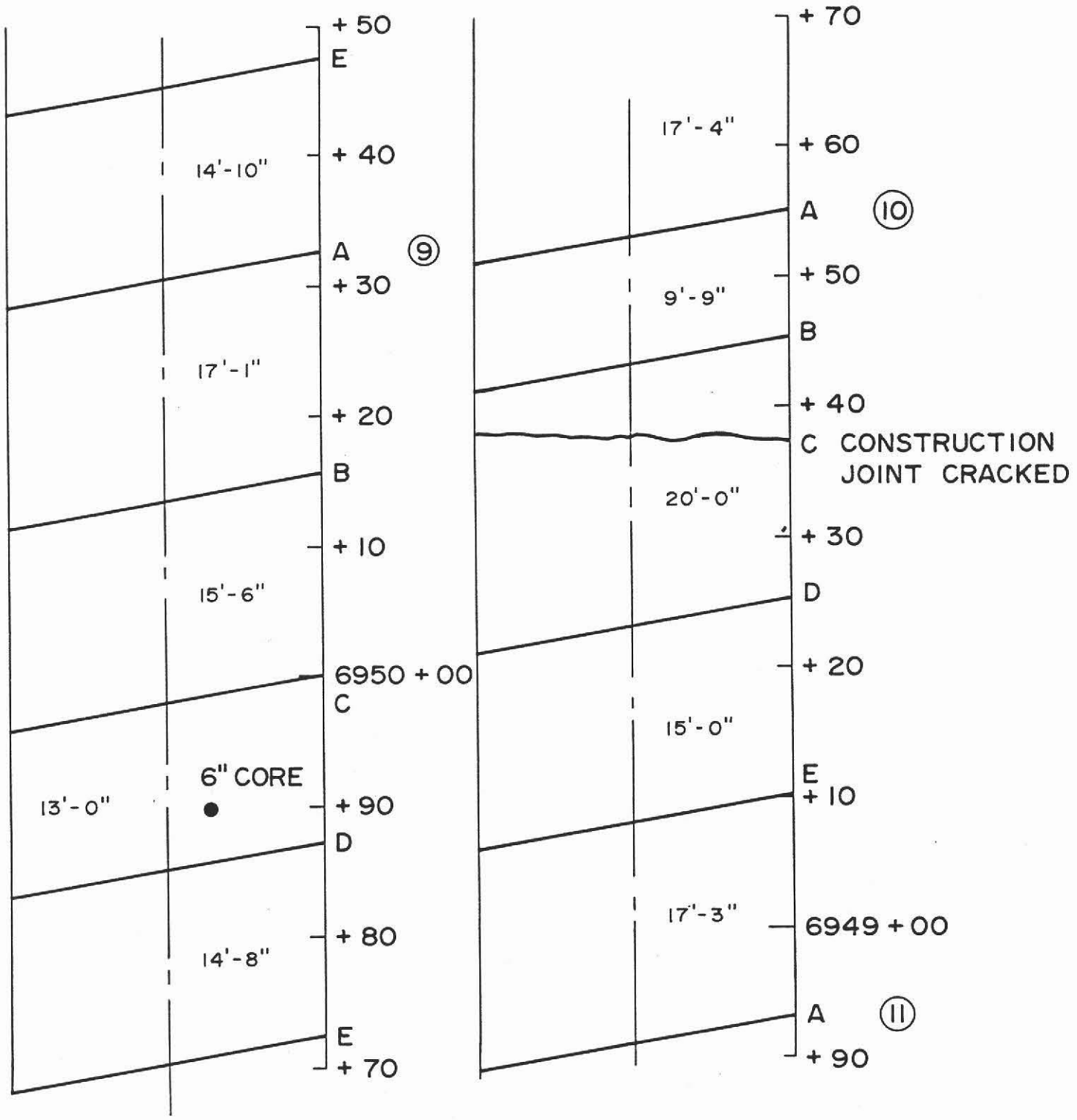

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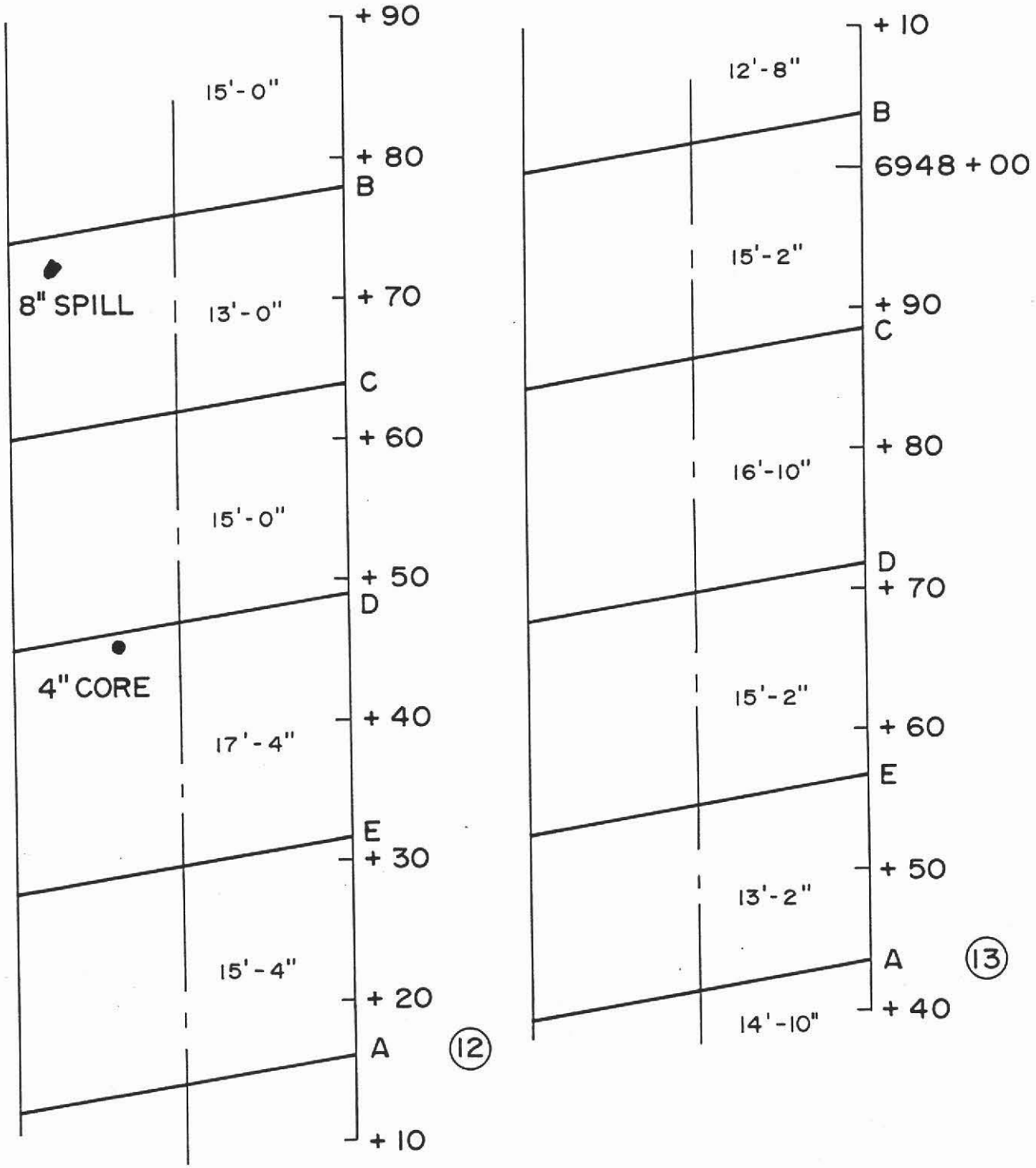

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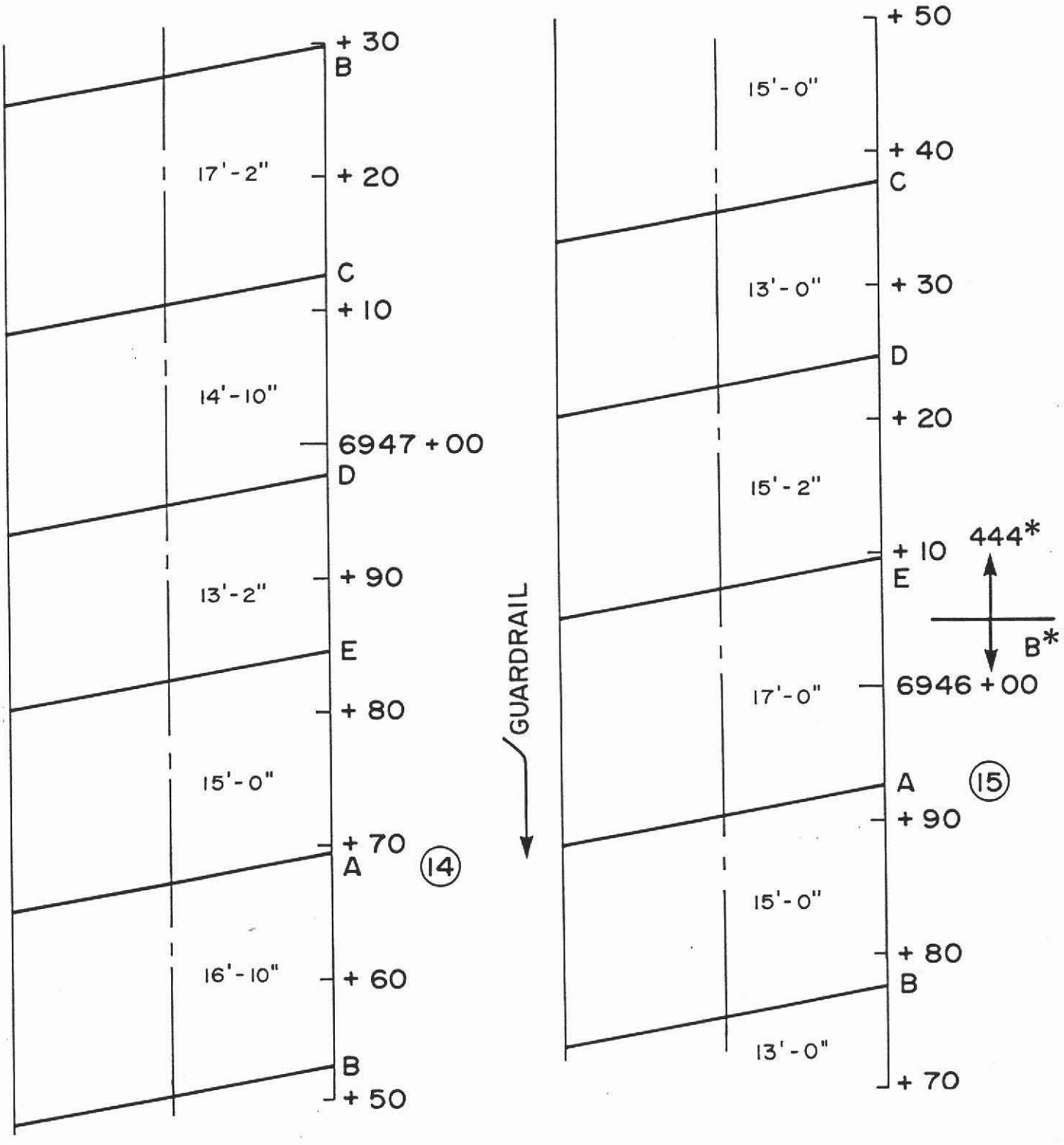

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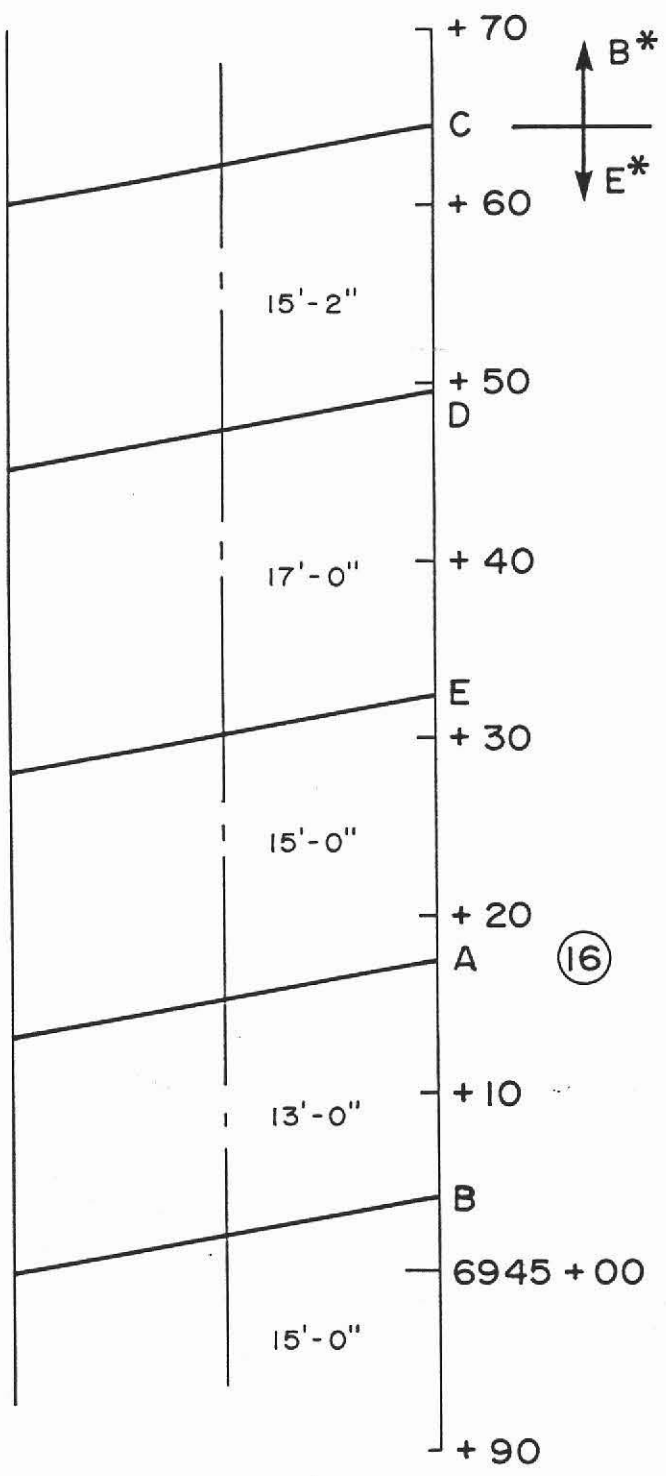

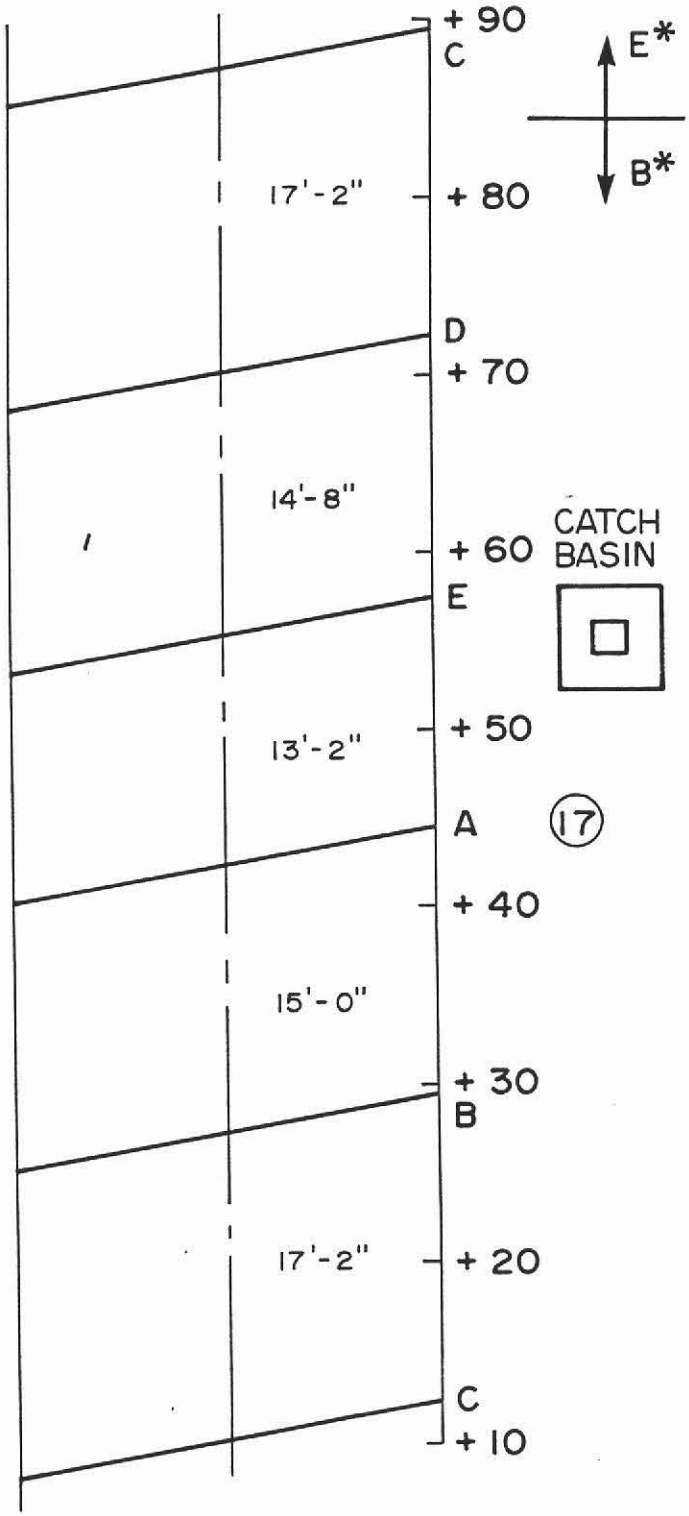

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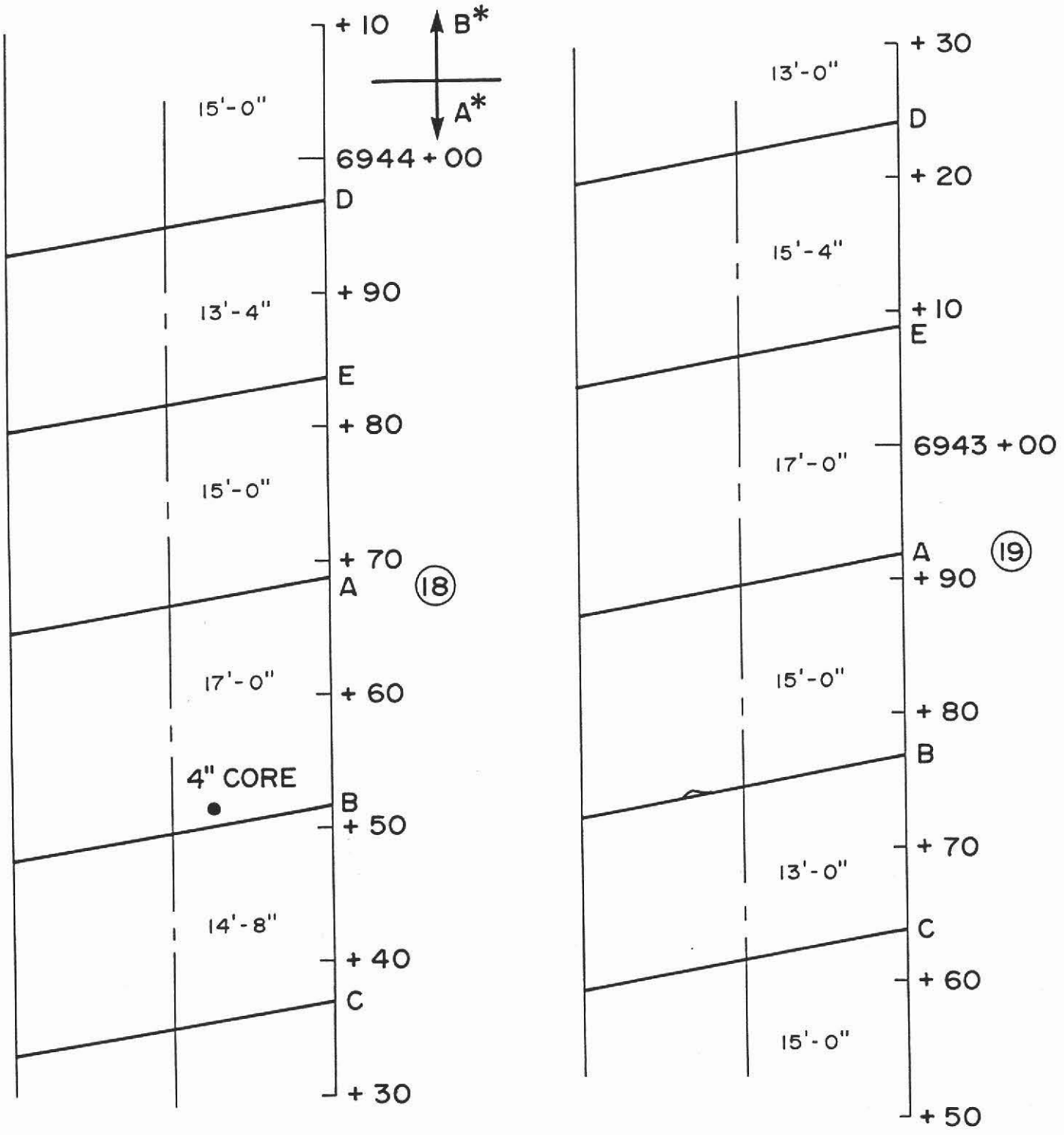

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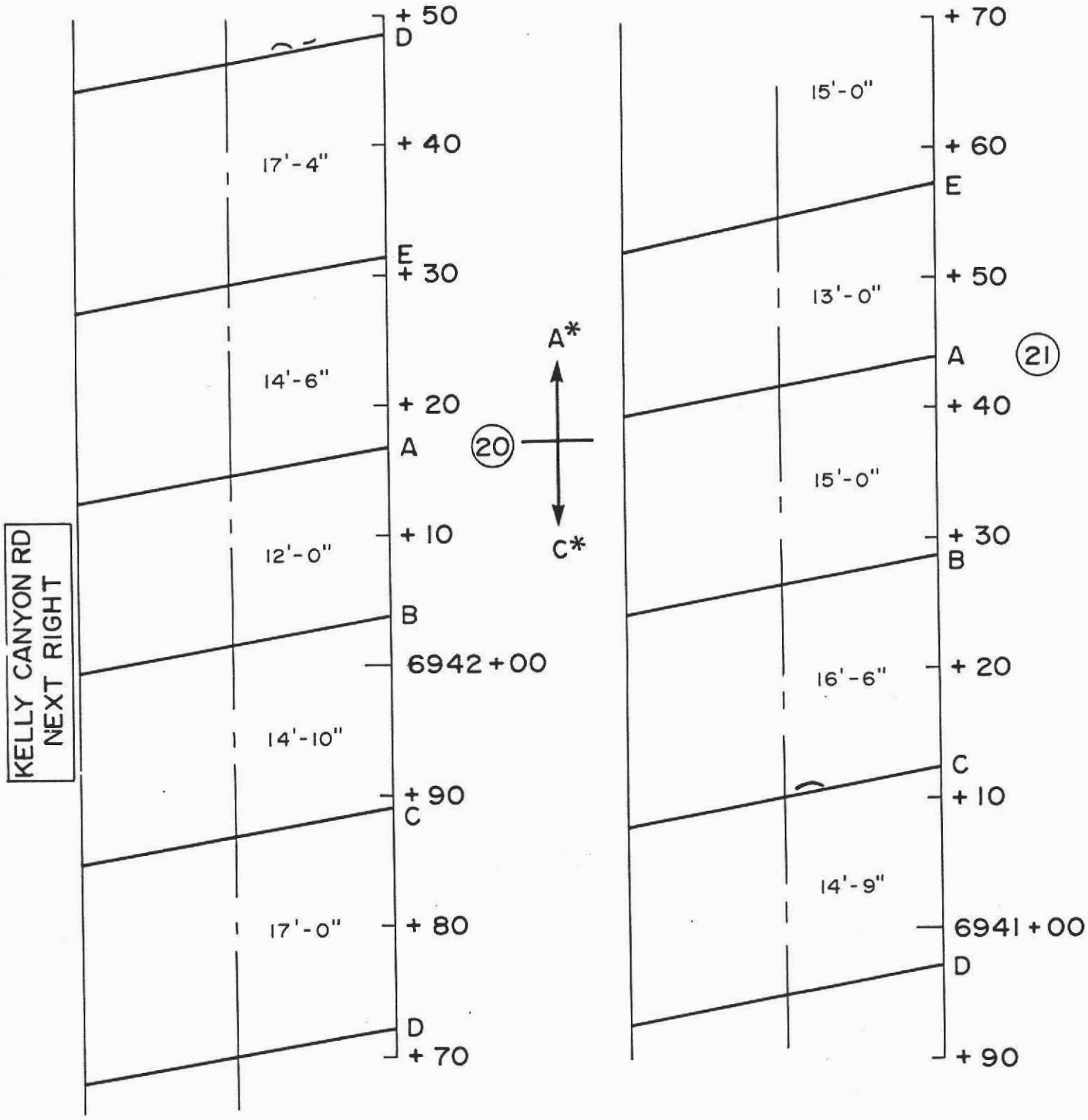

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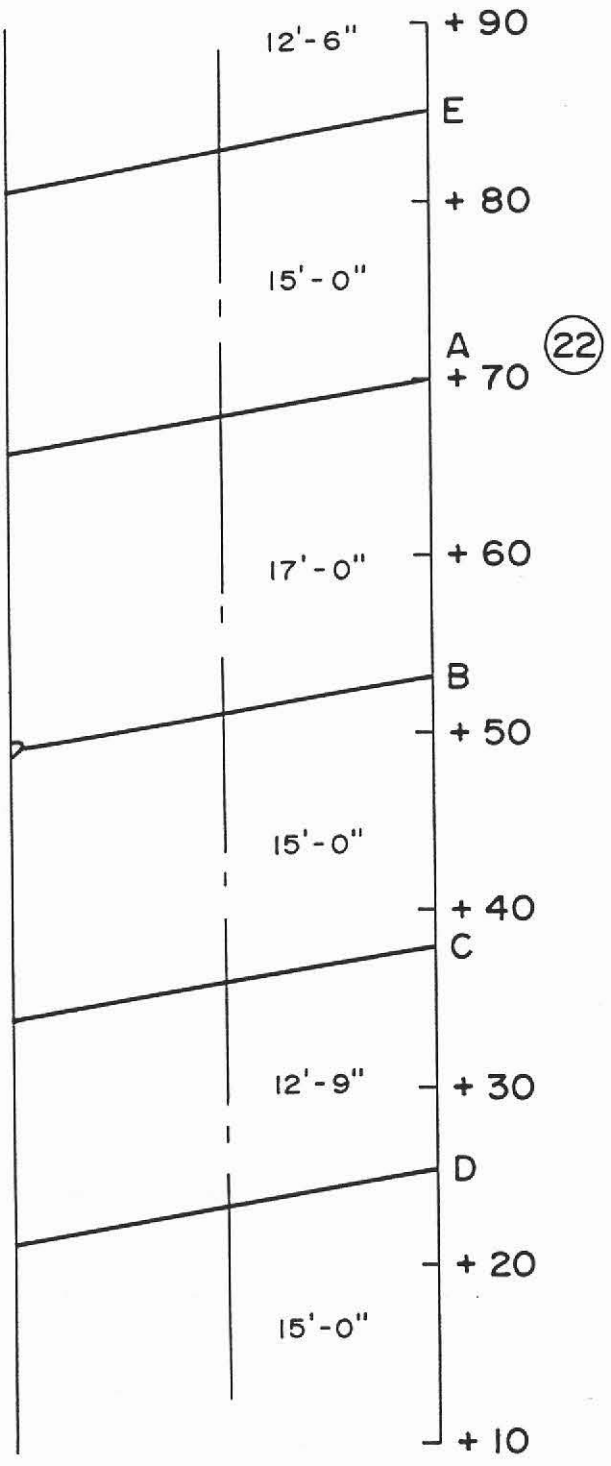

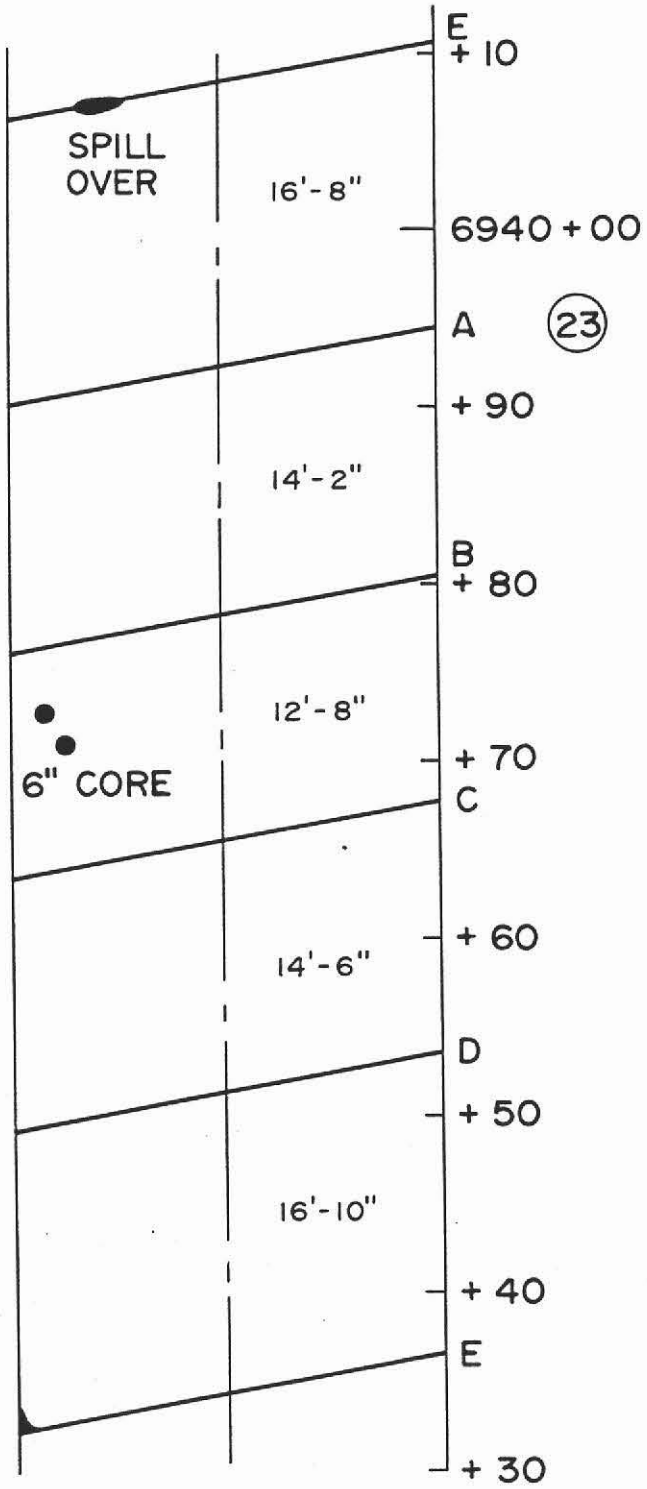

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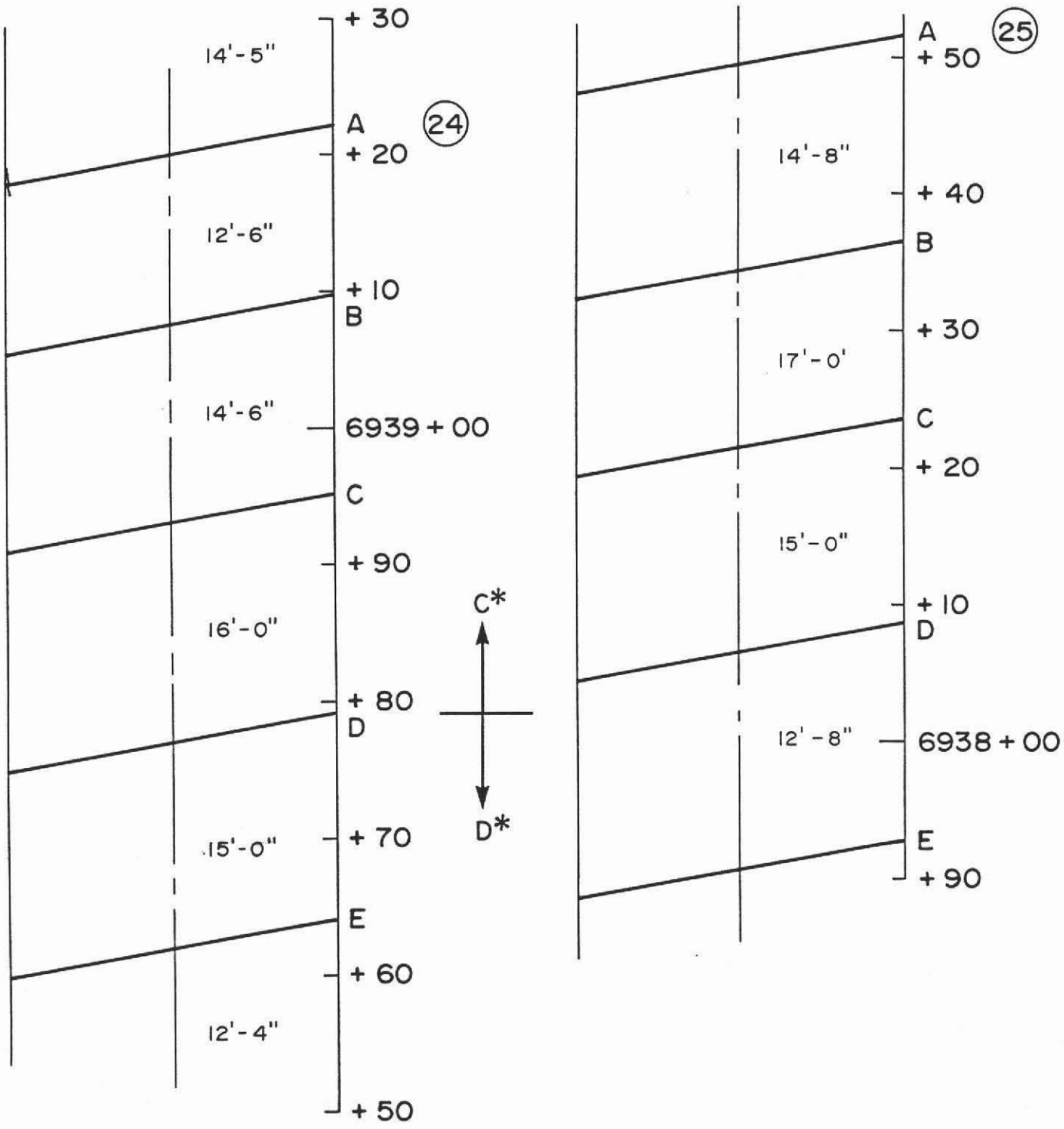

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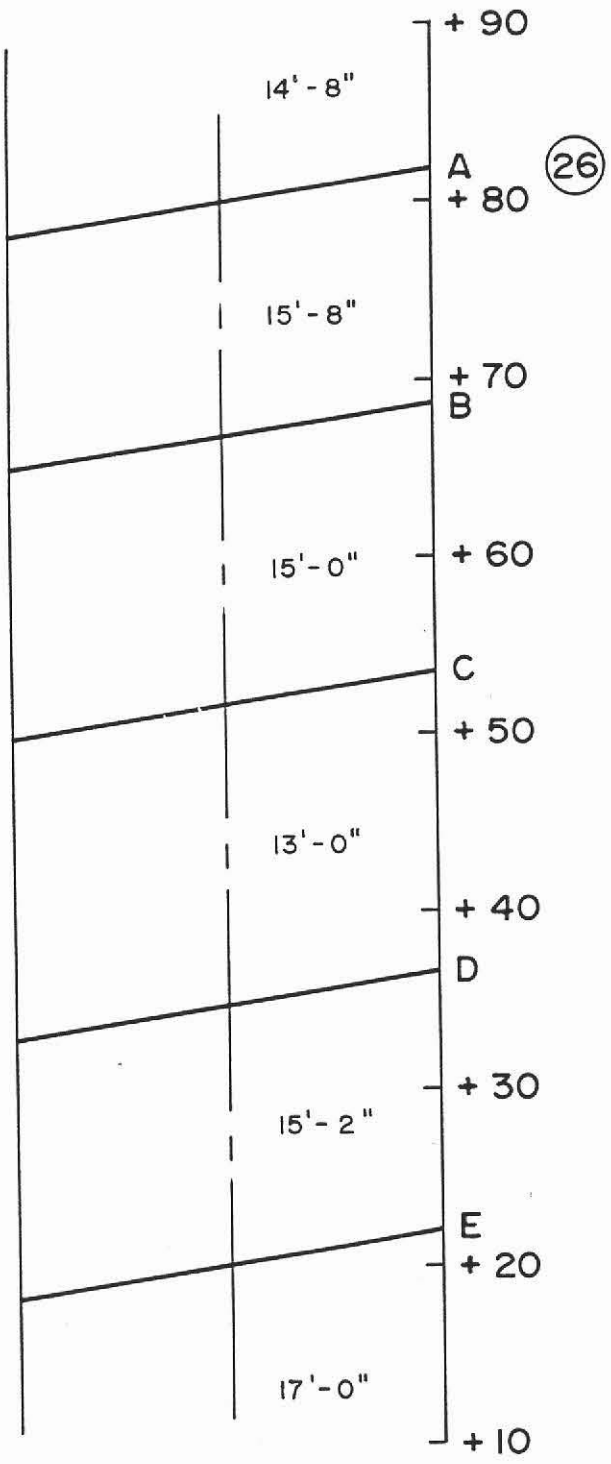

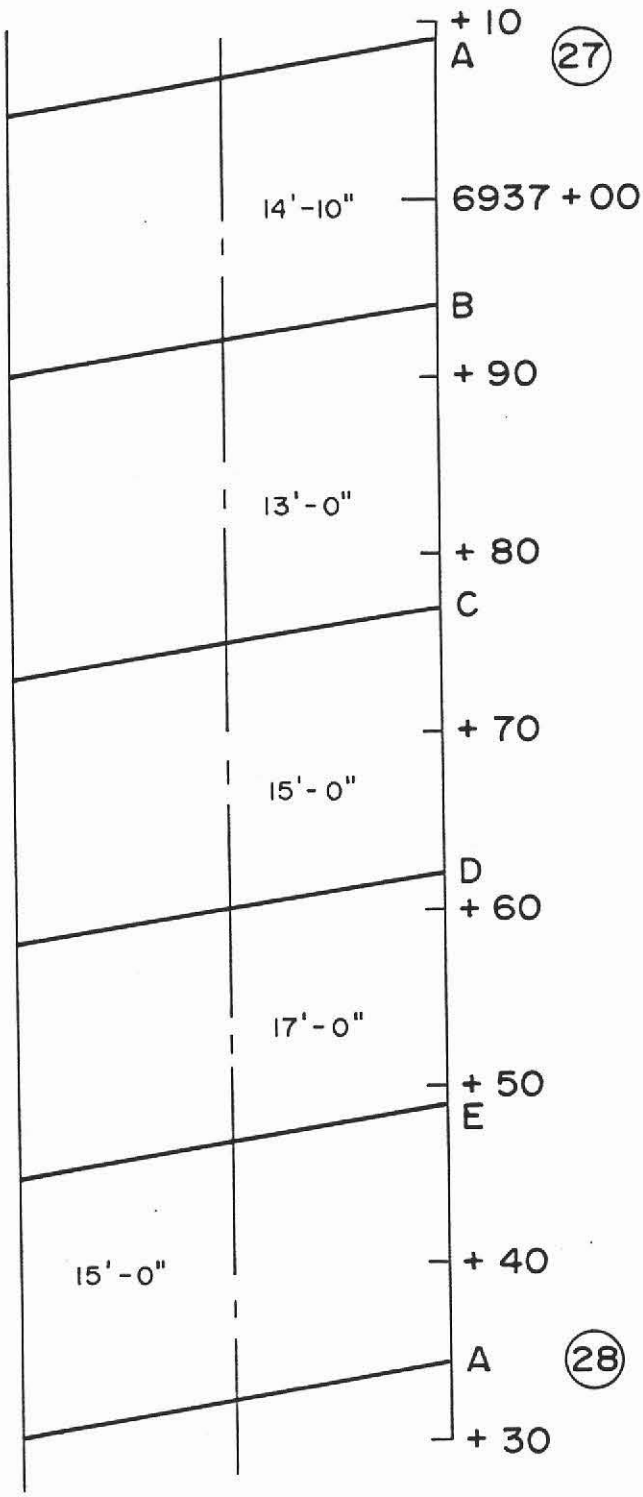

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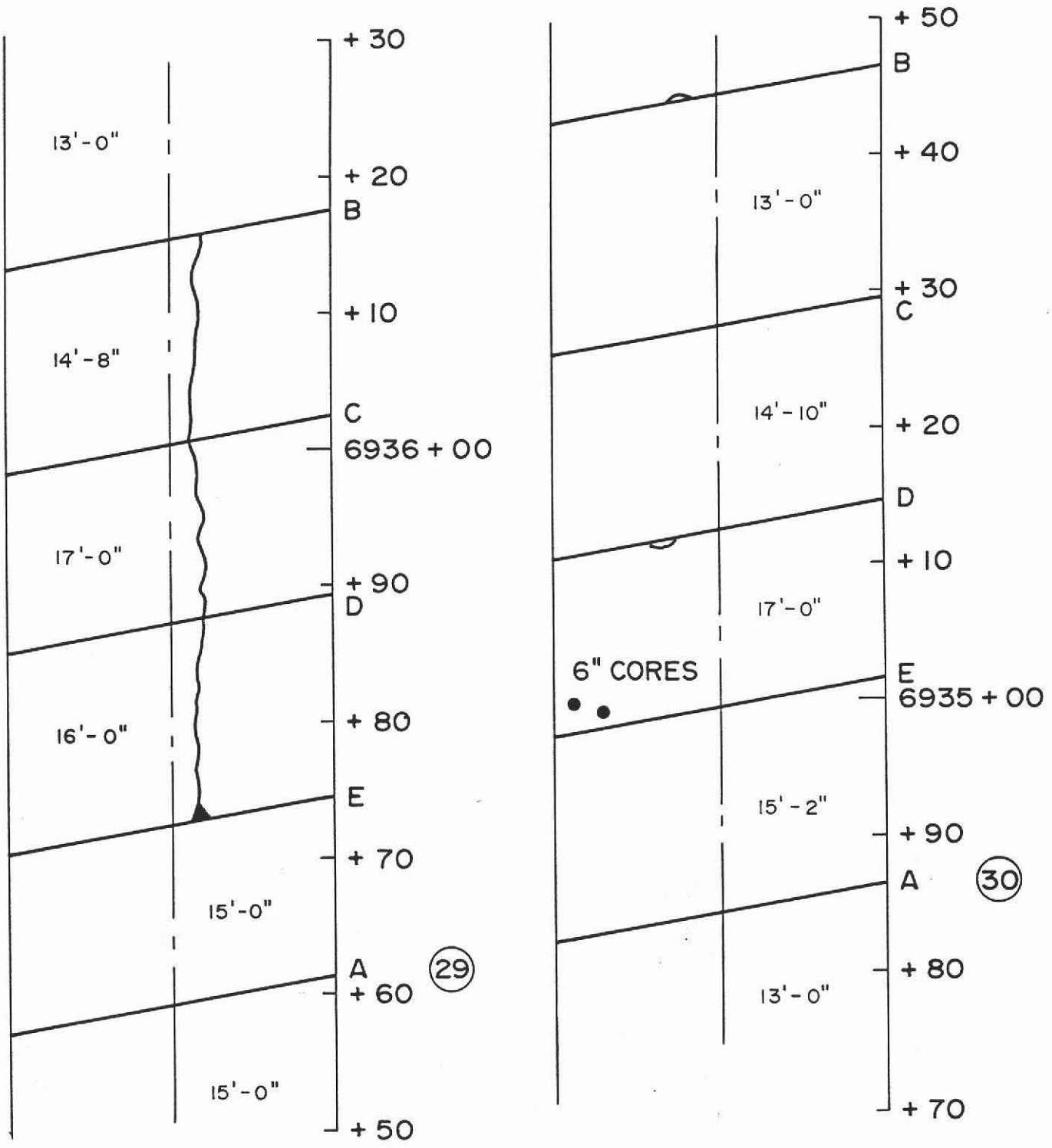

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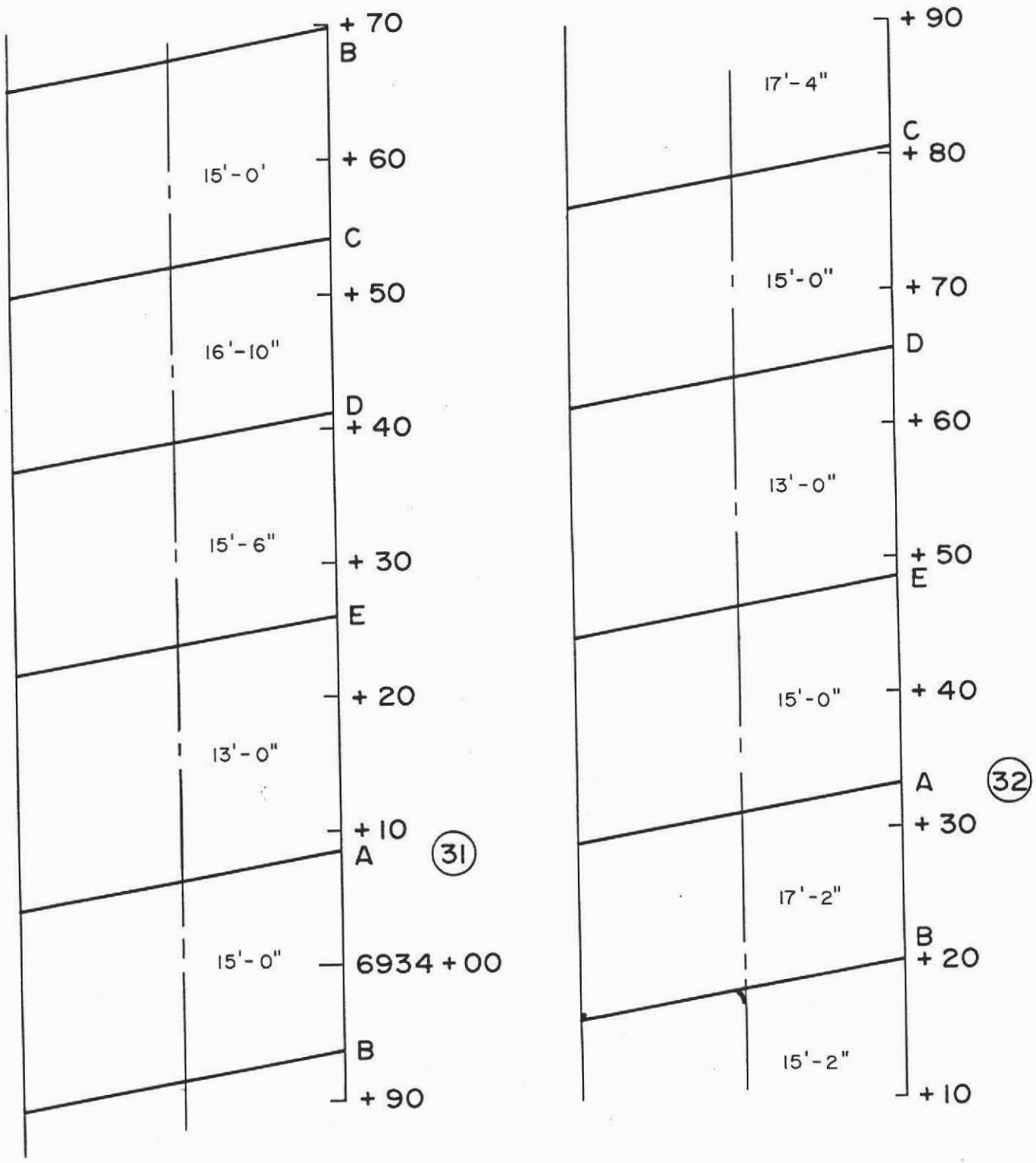

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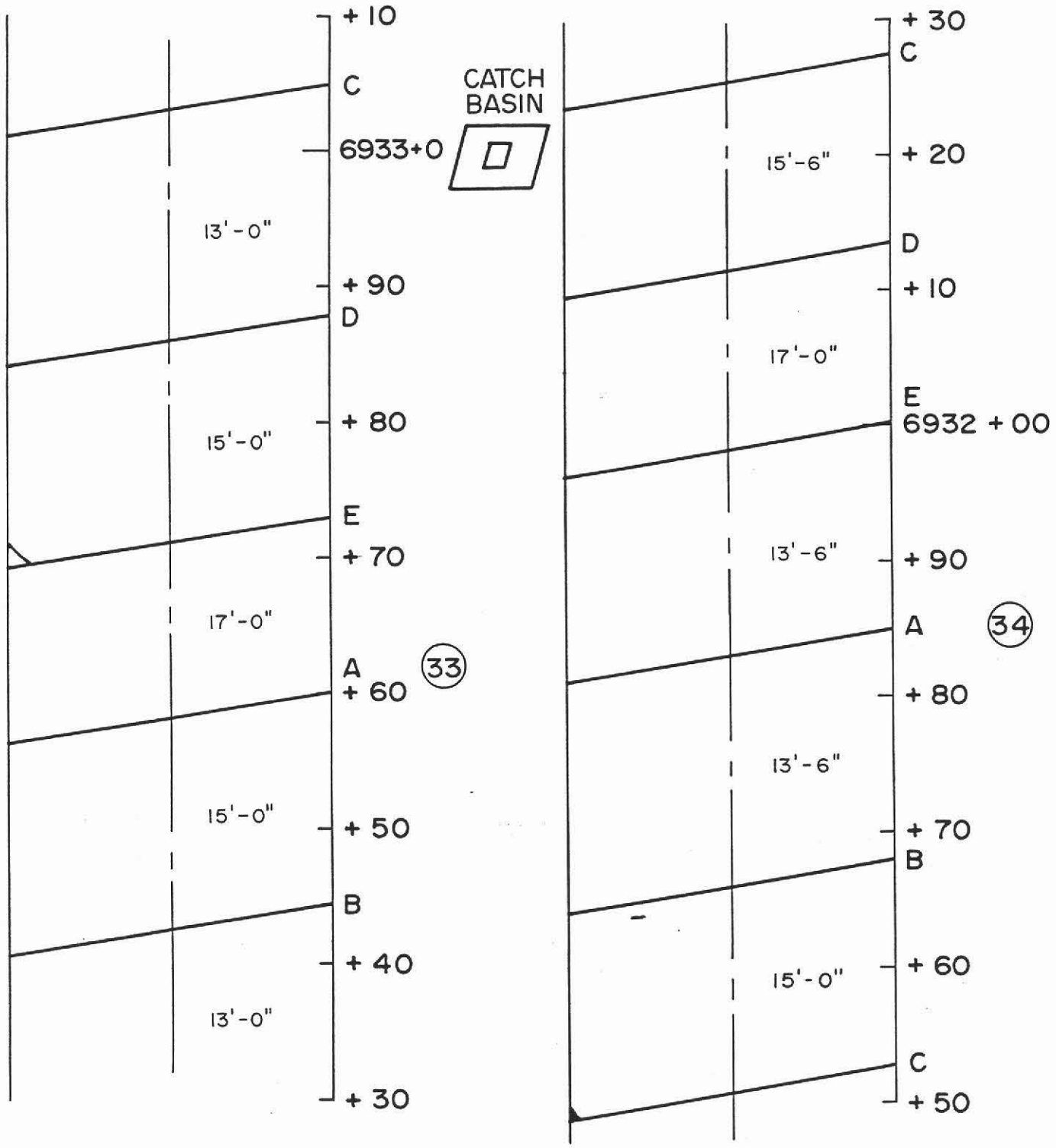

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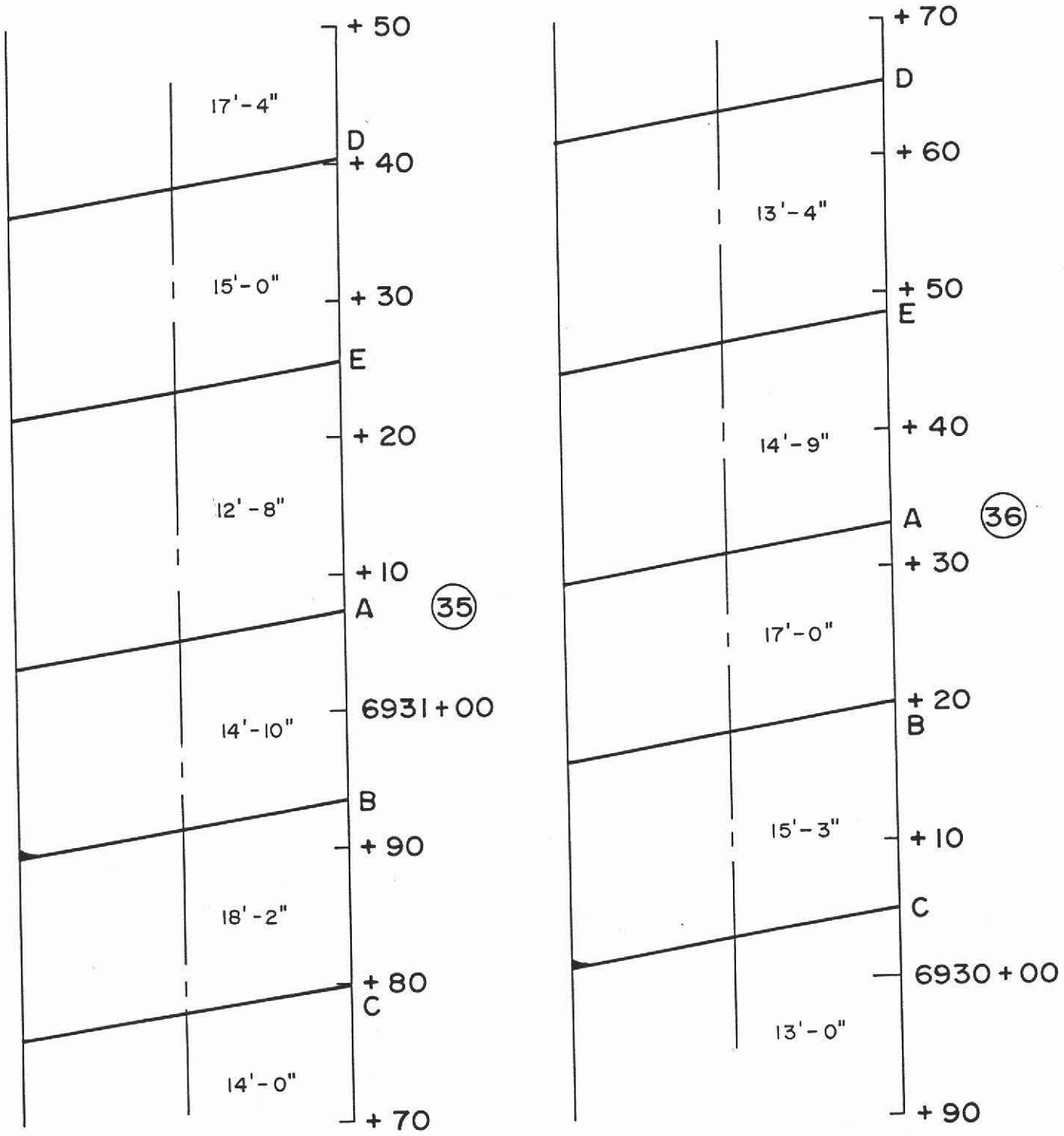

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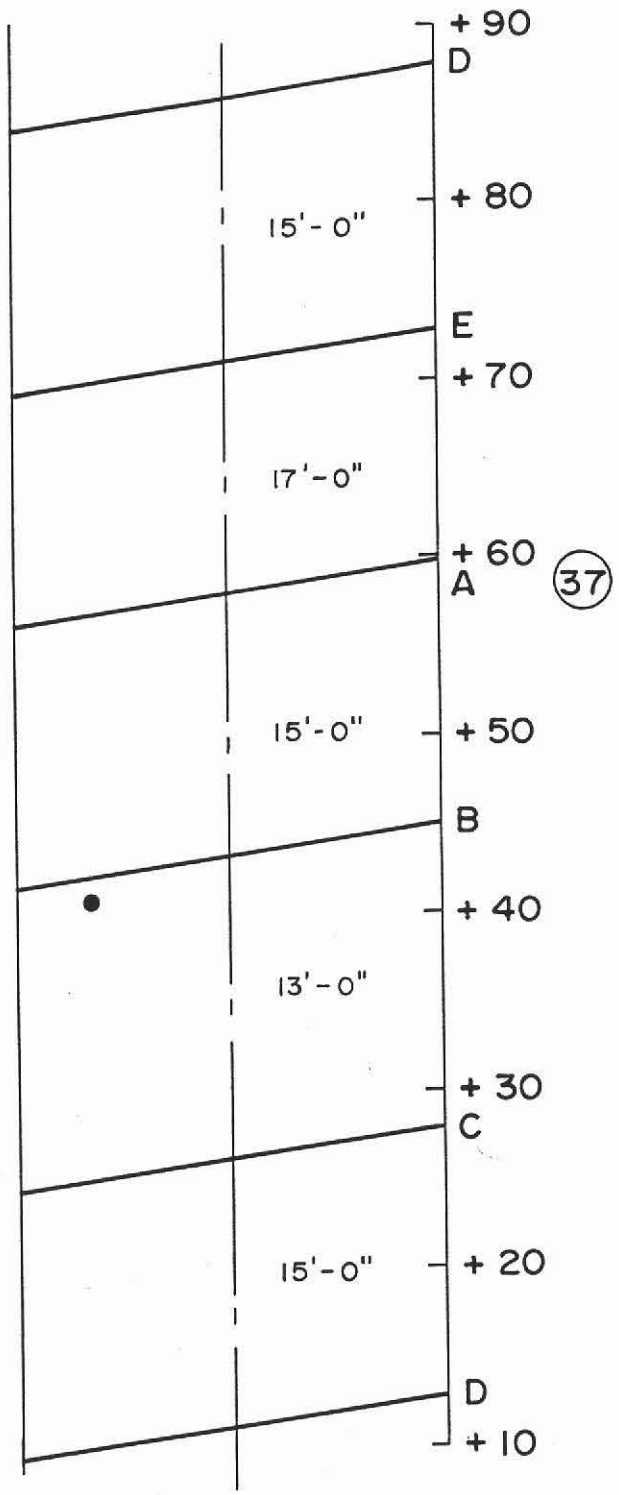

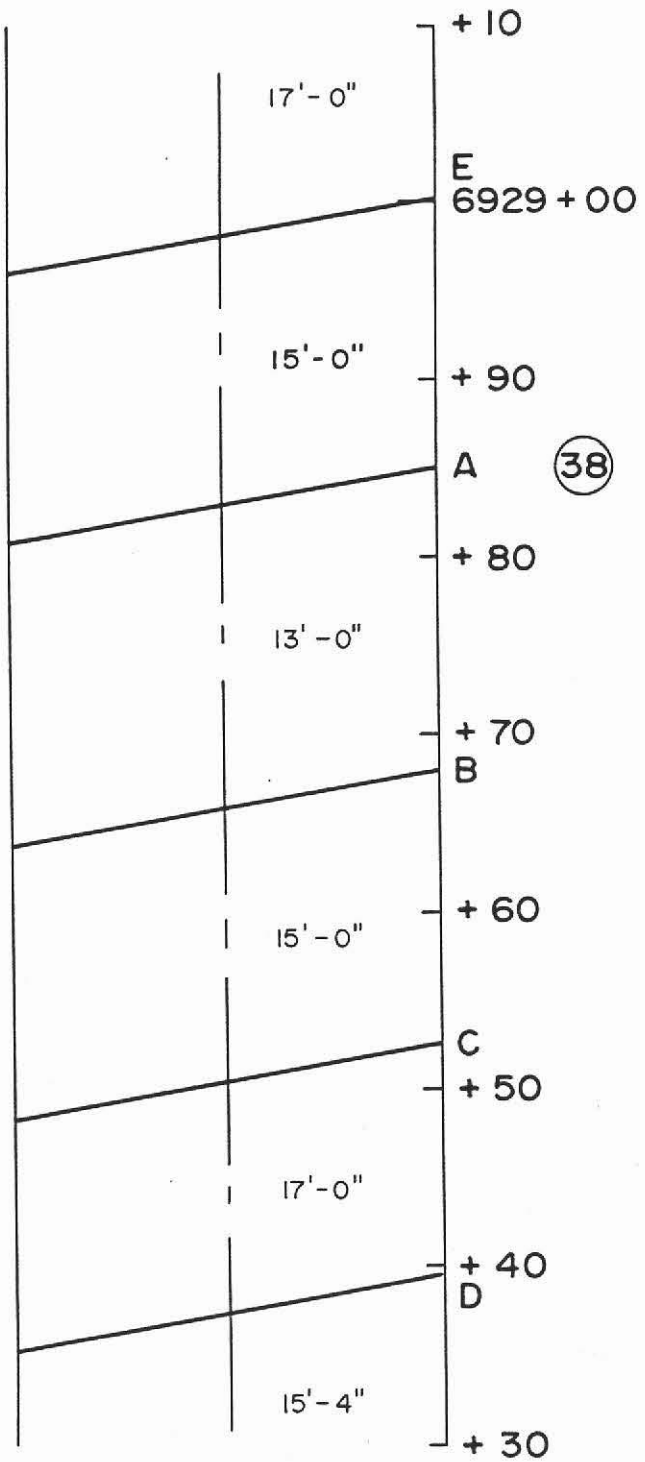

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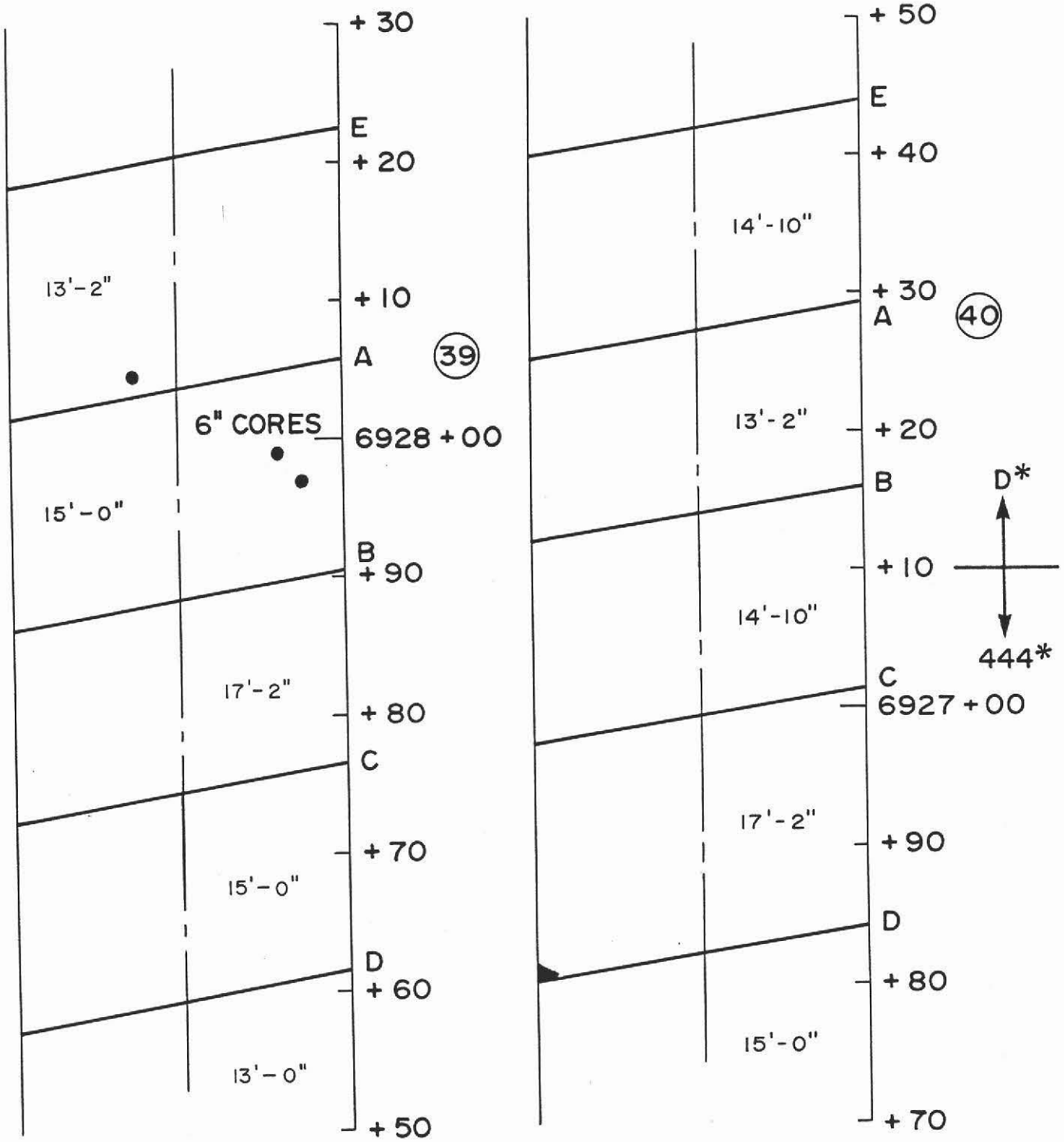

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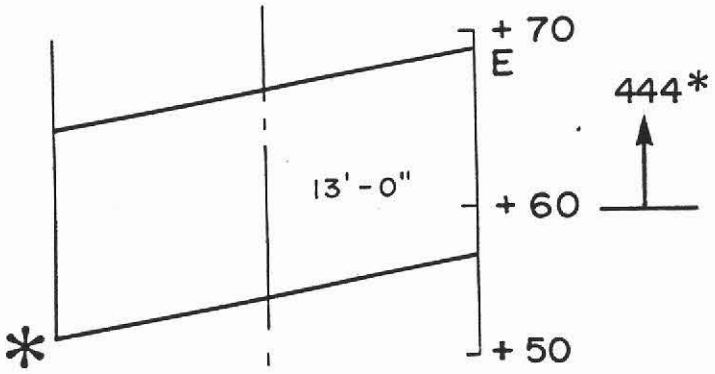

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Information about Silicone Sealants

DOW CORNING

DESCRIPTION

Dow Corning® 888 silicone highway joint sealant is a one-part silicone material that readily extrudes over a wide temperature range and cures to produce a durable, flexible, low-modulus silicone rubber highway joint seal.

Because of its low modulus characteristics and good extension/compression recovery (+100 percent/-50 percent of original joint width), Dow Corning 888 silicone highway joint sealant gives outstanding performance in highway joints in which extreme movement occurs.

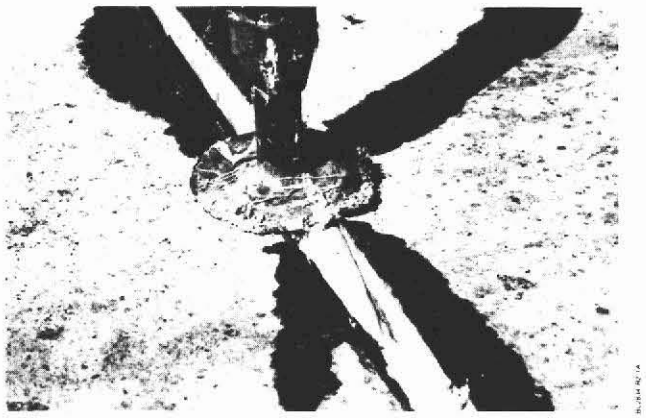
Highway concrete contraction/expansion joints are generally sealed to prevent concrete "slab growth" and/or "blow-up," erosion of sub-base, or corrosion of metal tie bars embedded in the concrete, resulting from incompressibles (dirt and stones), water and deicing chemicals entering the joints at the joint surface.

Dow Corning 888 silicone highway joint sealant features:

- *Ease of application* — one-part, ready to use as supplied; no mixing required; dispensed directly from bulk container into joint with air-powered pump.
- *All-temperature gunnability* — consistency is relatively unchanged over normal installation temperature range.
- *Unprimed adhesion* — primer is not required for bonding to concrete; surface must be clean, dry, and frost-free.
- *Seals irregular surfaces* — can be used to seal joints where spalls have occurred, provided adequate

DOW CORNING® 888 SILICONE HIGHWAY JOINT SEALANT

Type	Low-modulus silicone
Cure	One part; cures at room temperature by reaction with moisture in air
Special Properties	Easy to use; bonds to concrete without use of primer; good recovery from extension/compression
Primary Use	Sealing highway concrete contraction joints, especially those exposed to extreme movement



TYPICAL PROPERTIES

These values are not intended for use in preparing specifications or joint designs, but for comparison of rubber properties.

As Supplied

Color	Gray
Flow, Sag or Slump	Nil
Working Time, minutes	10
Tack-Free Time, at 77 F (25 C), hours	1
Cure Time, at 77 F (25 C), days	7-14
Full Adhesion, days	14-21

As Cured — after 7 days at 77 F (25 C) and 50% RH

Elongation, percent minimum	1200
Durometer Hardness, Shore A, points	15
Joint Movement Capability, percent	+100/-50
Tensile Strength, maximum elongation, psi	100
Peel Strength, ppi	25

Specification Writers: Please contact Dow Corning Corporation, Midland, Michigan, before writing specifications on this product.

TABLE I: RECOMMENDED BACKER ROD INSTALLATION (SHALLOW CUT)*

Joint Width	*1/4"*	*3/8"*	*1/2"*	*3/4"*	*1"*
Recessed Below Surface	1/4"	1/4"	1/4"	1/4"	1/2"
Sealant Thickness	1/4"	1/4"	1/4"	3/8"	1/2"
Backer Rod Diameter	3/8"	1/2"	5/8"	7/8"	1-1/4"
Total Joint Depth	7/8 - 1"	1 - 1/8"	1-1/8 - 1-1/4"	1-1/2 - 1-5/8"	2-1/4 - 2-3/8"

*On road surfaces where grinding is planned at a later date, the sealant and backer should be installed so that it is approximately 1/4 inch below the road surface after grinding is complete.

contact is made between sealant and substrate.

- *High movement capability* — the sealant will perform in a continuous joint movement of +100 percent and -50 percent. In new construction, it will take the 25-percent movement of each of 2 or 3 slab lengths working in unison before all the "shrink" or contraction cracks occur.
- *Low modulus* — the sealant stretches 100 percent in the joint with very little force. This places very little strain on the bond line or joint walls. This, in turn, maximizes the probability of a successful seal with continuous joint movement. Movement of highway joints caused by temperature, traffic and faulting requires a sealant that does not strongly resist stress and/or shear.
- *Fully elastic* — the sealant can be stretched to 100 percent or compressed 50 percent of the bond width and held there. When released, it will recover 95 percent or greater of the original dimension. This extension and/or compression can be repeated many times and the sealant will resume its original shape without splits or cracks. Thus, when properly installed in a highway contraction joint, it does not "pump" out of the joint during compression or split or crack during extension.
- *Resilient* — once cured, the sealant rejects or prevents stones and other noncompressibles from entering the joint by "squeezing" them out as soon as force pushing these noncompressibles into the sealant is removed.
- *Good weatherability* — a 100-percent silicone rubber that is virtually unaffected by sunlight, rain, snow, ozone, or temperature extremes.
- *Fast cure* — typically, the sealant will have a tack-free surface in one hour or less. With this fast cure and recessed joint design, the road can be opened almost immediately after sealing in most applications.
- *Long-life reliability* — under normal conditions, cured sealant stays rubbery from -80 to 300 F (-56 to 149 C) without tearing, cracking, or becoming brittle.
- *Compliance with performance requirements* — meets and exceeds both Federal Specifications TT-S-001543A Class A (one-part silicone sealants) and TT-S-00230C Class A (one-component sealants). Also meets Canadian Specification 19GP9 Type I.

USES

Dow Corning 888 silicone highway joint sealant is especially effective for sealing transverse contraction and expansion joints, longitudal, center line and shoulder joints. These concrete expansion/ contraction joints can be on a roadway or a bridge. It can be used as the original sealant in new concrete construction or as a remedial or repair sealant in old construction.

In new construction, Dow Corning 888 silicone highway joint sealant provides the *extra* insurance needed if all the "shrink" or contraction cracks do not occur during the initial "weakening" step. Thus, two or three concrete lengths will act in unison, stressing a sealant two or three times the design dimensions or movement.

For use in repair or remedial applications where other joint sealing materials have failed because of excessive movement or poor weatherability, Dow Corning 888 silicone highway joint sealant can be used to seal irregularly shaped and/or spalled joints.

Thus, the joints do not need reforming before sealing. These joints should be dry and free of all old sealing compounds.

Limitations

Dow Corning 888 silicone highway joint sealant is not recommended for continuous water immersion. It should not be applied in totally confined spaces where the sealant is not exposed to atmospheric moisture. The sealant bead should be recessed below the highway surface to minimize abrasion from traffic and snow removal equipment. The sealant should never be applied to wet or damp concrete or installed during inclement weather.

The adhesion to joints that are formed with noncement-based products should be checked before performing full-scale sealing.

HOW TO USE

Low-modulus Dow Corning 888 silicone highway joint sealant easily withstands extreme joint movement when properly applied. The sealant will withstand 100-percent

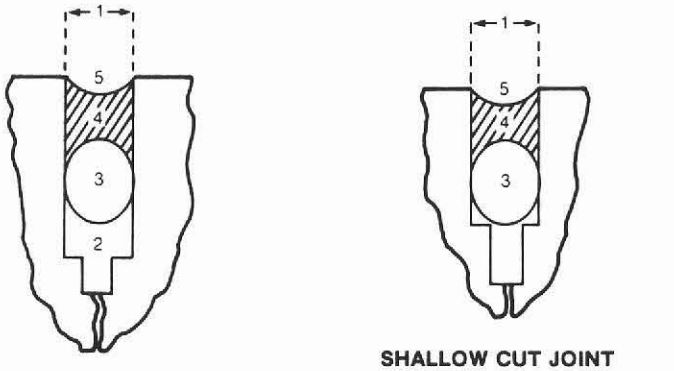
TABLE II: ESTIMATING REQUIREMENTS*

Linear feet per gallon of Dow Corning 888 silicone highway joint sealant for various joint widths.

Joint Width, Inches	Sealant Bead Thickness, Inches	Backer Rod Diameter, Inches	Minimum Joint Depth, Inches	Backer Rod Placement Depth, Inches	Estimated Linear Feet/Gallon
1/4	1/4	3/8	1	1/2	246
3/8	1/4	1/2	1-1/4	1/2	149
1/2	1/4	5/8	1-1/4	1/2	103
5/8	5/16	3/4	1-1/2	9/16	66
3/4	3/8	7/8	1-3/4	7/8	46
7/8	7/16	1	1-3/4	11/16	33
1	1/2	1-1/8	2	3/4	26
>1	1/2	1-1/4+	2+	3/4	—

*Volumes will vary depending on joint design, tooling, backer rod placement and waste.

FIGURE 1: GOOD JOINT DESIGNS



STANDARD JOINT

SHALLOW CUT JOINT FOR NEW CONSTRUCTION

1. Joint width wide enough to accommodate movement.
2. Joint sawed deep enough to allow backer rod/sealant placement and space for pumping of old sealing compounds. *NOTE:* This applies to standard joints only; void space beneath backer rod in new construction is not needed.
3. Proper backer rod placement.
4. Sealant installed to proper depth and width.
5. Sealant tooled 1/4" to 1/2" below pavement surface.

extension and 50-percent compression of the original joint width. But the recommended joint movement design is for ±25 percent (50 percent total) and not at the sealant limits. This difference provides the insurance for successful seal when job site joint widths are different than designed widths. Therefore, the joint design dimensions should be less than the ultimate sealant capability.

A thin bead of silicone sealant will accommodate more movement than a thick bead. Dow Corning 888 silicone highway joint sealant should be no thicker than 1/2 inch (12.7mm) and no thinner than 1/4 inch (6.4mm). Within these limits, the sealant width-to-depth ratio should be 2:1. In all cases, it is recommended that the sealant be recessed below the road surface at least 1/4 inch with 1/2-inch recess being acceptable in wider joints (see Table I).

Dow Corning 888 silicone highway joint sealant is a nonsag sealant, which allows its use in vertical curb joints as well as horizontal joints. Being a nonself-leveling sealant, it must be "tooled" to insure good contact and adhesion. An expanded closed cell polyethylene foam aids in sealant tooling, controlling sealant depth and providing a recessed nonbonding tooling surface. In new construction where the joint is a new cut, a shallow cut is recommended where the backer rod is placed on the "shelf" or bottom of the joint (see Figure 1). The recommended depths are shown in Table I. This design provides a firm support for sealant tooling, making the sealant easier to install, and provides more insurance of good sealant/concrete contact. The shallow cut also saves blades and time and is recommended when the roadway will see foot traffic, as in urban areas.

In repair work where previous sealing materials have been of a joint filling sealing type or the joint is not broadened by sawing, the standard joint design is advocated where the backer rod is slightly above the shelf. Enough space between the bottom of the backer rod and the shelf should be provided for possible "pumping" of old joint sealing — filling from the bottom of the joint. It is recommended that care be given to selection of the proper oversized backer, so that a firm tooling support is obtained (generally 1/4 inch larger than the joint works quite well).

The Dow Corning 888 silicone highway joint sealant is part of a system which must include the proper backer rod and proper installation procedures. The backer rod must be expanded closed cell polyethylene foam. Several other back-up materials (paper rope and open cell foam) are available, but have proven to be unacceptable. There are several manufacturers of closed cell polyethylene foam and any may be used.

INSTALLATION

When using Dow Corning 888 silicone highway joint sealant, the

following procedure is recommended:

1. Clean all joints of contaminants and impurities to the depth at which the sealant and backer rod are to be installed, by grinding, saw cutting, blast cleaning (sand or water), mechanical abrading or a combination of these methods. This will provide a sound, clean, and frost-free surface for sealant application.

2. Blow out dust, loose particles and other debris from joints with oil-free compressed air.* Surfaces must be *clean, dry, frost-free and dust-free.*

3. Install expanded closed cell polyethylene foam rod back-up material in joints. This material permits application of a thin bead and acts as a bond breaker, which allows the silicone sealant to stretch freely with the joint movement (refer to Table I).

4. Apply Dow Corning 888 silicone highway joint sealant in a continuous operation to properly fill and seal the joint width. For maximum performance, the sealant should be applied above 40 F (4.4 C).

5. Using a blunt instrument, tool the joint so that it is slightly concave and approximately 1/4 inch below the roadway surface. Tooling should be done before a "skin" forms, usually within 10 minutes of application. Do not use a soap or oil as a tooling aid (see Figure 1).

*OSHA Regulation, General Rules, Part 1, R-408.10036 Paragraph 1.

6. Excess sealant may be cleaned off tools and equipment while in uncured state with a commercial solvent such as xylol.

7. Keep traffic off sealed lane for 30 minutes.

NOTE: For complete installation instructions see Installation Guide for Dow Corning 888 silicone highway joint sealant, Form No. 61-507-79.

CAUTION

On direct contact, uncured Dow Corning 888 silicone highway joint sealant may cause skin irritation. Avoid prolonged or repeated skin contact.

SHIPPING LIMITATIONS

None.

STORAGE AND SHELF LIFE

When stored in original, unopened containers at or below 90 F (32 C), Dow Corning 888 silicone highway joint sealant has a shelf life of 6 months from date of shipment. Keep containers tightly closed.

PACKAGING

Dow Corning 888 silicone highway joint sealant is available in 4.5-gal (17-l) bulk pails, and 40-gal (151.4-l) bulk drums. All weights, net.

USERS PLEASE READ

The information and data contained herein are believed to be accurate and reliable; however, it is the user's responsibility to determine suitability of use. Since Dow Corning cannot know all of the uses to which its products may be put or the conditions of use, it makes no warranties concerning the fitness or suitability of its products for a particular use or purpose.

You should thoroughly test any proposed use of our products and independently conclude satisfactory performance in your application. Likewise, if the manner in which our products are used requires governmental approval or clearance, you must obtain it.

Dow Corning warrants only that its products will meet its specifications. There is no warranty of merchantability or fitness for use, nor any other express or implied warranty. The user's exclusive remedy and Dow Corning's sole liability is limited to refund of the purchase price or replacement of any product shown to be otherwise than as warranted. Dow Corning will not be liable for incidental or consequential damages of any kind.

Suggestions of uses should not be taken as inducements to infringe any patents.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN 48640

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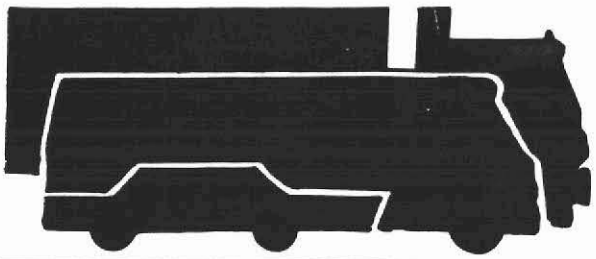
DOW CORNING



SUPERSEAL® 888

Low Modulus Silicone Highway Sealant

Exceeds Federal Specification SS-S-00230C and SS-S-001543A

EXCLUSIVE FEATURES

- Excellent weatherability - Virtually unaffected by temperature extremes, ozone, rain, snow or sunlight.
- Outstanding long life servicability - cured sealant remains flexible from −58 °F to +302 °F (−50 °C to +150 °C).
- Good extension / compression recovery - up to ±50% movement of original joint width.
- Unprimed adhesion - to most porous surfaces, such as concrete.
- Quick and easily applied - one part, ready to use as supplied, no mixing required.
- All temperature gunnability - no heating or cooling, consistently gunable from 0 °F to 100 °F (−18 °C to +38 °C).
- Low modulus - does not resist stress and shear movement common to highway pavement joints.
- Expedient reture to traffic servicability - pavement movement prior to total sealant cure does not affect development of an effective joint seal.

DESCRIPTION: Superseal 888 Silicone Highway Sealant is a one-part, low modulus sealant which reacts with moisture at ambient temperatures to form a durable, highly flexible rubber seal with excellent weatherability. Superseal 888 has good unprimed adhesion to most porous substrates such as sound concrete, stone, brick, wood and metal surfaces. It offers good extension/compression capabilities up to ±50% of original joint width, providing excellent performance in highway joints where extreme movement due to wide temperature variations, traffic and faulting occur. Superseal 888's additional features include: quick and easy application, supplied ready to use, no required mixing, easily dispensed from bulk container, non-shrinking when cured, and it remains flexible without becoming brittle, cracking or tearing under normal conditions.

SUPERIOR

SUPERIOR PRODUCTS COMPANY, INC.

445 Coney Island Drive So., Sparks, Nevada 89431 (702) 358-7870 1 (800) 222-4440 Telex: 354484 Superior, Spks.

SUPERSEAL® 888

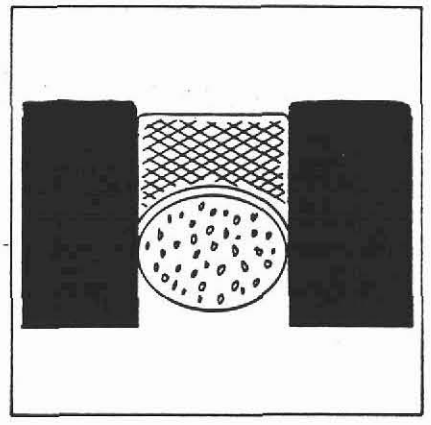
JOINT PREPARATION: • Joints must be cleaned of all contaminants and impurities to the depth at which the sealant and backer rod are to be installed, by saw cutting, grinding, water or sand blasting, mechanical abrading or any combination of these methods to provide a sound, clean, dust and frost-free surface for sealant application. Existing joints must be free of all previous sealant residue. • Loose particles and other debris must be blown out with oil-free compressed air, leaving joint surfaces clean dry, frost-free and dust-free.

APPLICATION: • Install a dry back-up material (not impregnated with any wax, oil or solvent). Sealant should not be installed where it will adhere to the substrate on three sides. If a moveable backer material (polyurethane foam or expanded polyethylene foam rod) is not used, a bond breaker tape of polyethylene should be applied in the bottom of the joint to prevent three-sided bond as shown below. • Superseal 888 Silicone highway Sealant may be applied directly from the container without mixing, heating or other preparation at outdoor temperatures as low as 0 °F (– 18 °C), or even lower if the joint surfaces can be kept completely dry and frost-free. The material is gunnable in high temperatures of + 100 °F (+ 38 °C) or greater. • The joints should be properly designed in relation to field conditions, particularly considering the movement related to the thermal expansion and contraction of the substrate materials. The desirable joint width may be determined by calculating the maximum change in the joint width between high and low temperatures encounted. • The depth of the sealant in the joint should not be less than 1/8″ and not more than 3/8″. It should be as nearly as possible equal to one-half the normal width of the unexpanded joint. • Tool joint so that it is slightly concave and approximately 1/8″ below the road surface. Tooling should be done before a skin forms, usually 10 minutes after the installation of sealant in the joint. Do not use soap, oil or waxes as a tooling aid.

BACKER ROD SIZE RECOMMENDATION: • Joint width = Backer rod diameter as follows:
5/16″ = 3/8″ – 3/8″ = 1/2″ – 1/2″ = 5/8″ – 3/4″ = 7/8″ – 1″ = 1-1/8″

INSTALLATION REQUIREMENTS

Joints shall have proper shape factor depending on spacing and ambient temperature, be throughly cleaned by sand or water blasting, bondbreaker, and installed with recommended application equipment into clean, dry joint, at a depth no greater than one half the width of the unxpanded joint and a minimum of 1/8″ recessed below the pavement surface.



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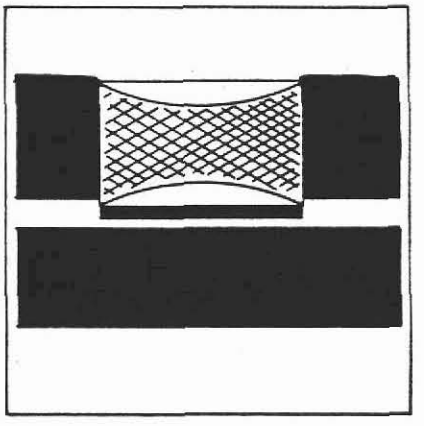

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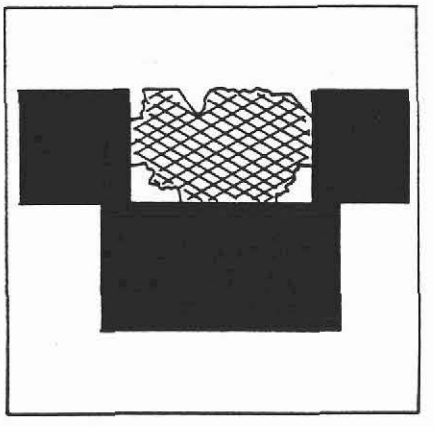


NOT CORRECT

USE RECOMMENDATIONS: Superseal 888 Silicone Highway Sealant is well suited for use in sealing transverse expansion and contraction joints and longitudinal joints in portland concrete cement pavements where excellent movement and weatherability is essential.

USE LIMITATIONS: Superseal 888 Silicone Highway Sealant is not recommended for use in applications where hydrostatic pressure is present. It should not be applied in totally confined spaces where the sealant is not exposed to atmospheric moisture. The sealant bead should be recessed below the pavement surface to minimize abrasion from traffic and other road equipment wear. It should not be applied on surfaces containing oil, solvent or other petroleum derivatives. When special coatings or sealers have been applied to a substrate material, pre-application tests should be made of the adhesion of Superseal 888 Silicone Highway Sealant to the special coating.

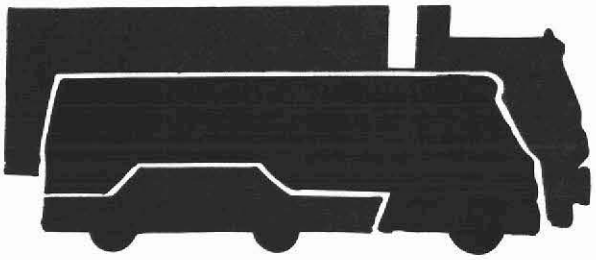
PACKAGING: Superseal 888 is available in 5-gal. pails (4.5gal) and 55-gal. drums (45gal) with plastic liners.

STORAGE AND SHELF LIFE: Stored in original unopened containers at or below 90°F (32°C) Superseal 888 has a shelf life of 12 months. (Shelf life may decrease 50% if material is stored at temperatures over 100°F and/or humidity over 100%).

PRECAUTION: During cure the product may irritate the eyes. Avoid contact with the eyes. In case of contact with the eyes, immediately flush eyes with water for at least 15 minutes and consult a physician. Wearers of contact lenses should be certain that all silicone is removed from the hands before touching the lenses. Contact lenses can absorb the silicone and cause damage or discomfort to the eyes. The product may irritate the skin, therefore, wipe off all silicone with a dry cloth or paper towel and wash with soap and water. Keep away from children.

SHIPPING LIMITATIONS:

SUPERIOR PRODUCTS COMPANY, INC.
445 Coney Island Drive So., Sparks, Nevada 89431 (702) 358-7870 1 (800) 222-4440 Telex: 354484 Superior, Spks.



SUPERSEAL® 888

Low Modulus Silicone Highway Sealant

Exceeds Federal Specification SS-S-00230C and SS-S-001543A

EXCLUSIVE FEATURES

- Excellent weatherability - Virtually unaffected by temperature extremes, ozone, rain, snow or sunlight.
- Outstanding long life servicability - cured sealant remains flexible from −58 °F to +302 °F (−50 °C to +150 °C).
- Good extension / compression recovery - up to ±50% movement of original joint width.
- Unprimed adhesion - to most porous surfaces, such as concrete.
- Quick and easily applied - one part, ready to use as supplied, no mixing required.
- All temperature gunnability - no heating or cooling, consistently gunable from 0 °F to 100 °F (−18 °C to +38 °C).
- Low modulus - does not resist stress and shear movement common to highway pavement joints.
- Expedient reture to traffic servicability - pavement movement prior to total sealant cure does not affect development of an effective joint seal.

DESCRIPTION: Superseal 888 Silicone Highway Sealant is a one-part, low modulus sealant which reacts with moisture at ambient temperatures to form a durable, highly flexible rubber seal with excellent weatherability. Superseal 888 has good unprimed adhesion to most porous substrates such as sound concrete, stone, brick, wood and metal surfaces. It offers good extension/compression capabilities up to ±50% of original joint width, providing excellent performance in highway joints where extreme movement due to wide temperature variations, traffic and faulting occur. Superseal 888's additional features include: quick and easy application, supplied ready to use, no required mixing, easily dispensed from bulk container, non-shrinking when cured, and it remains flexible without becoming brittle, cracking or tearing under normal conditions.

SUPERIOR

SUPERIOR PRODUCTS COMPANY, INC.

445 Coney Island Drive So., Sparks, Nevada 89431 (702) 358-7870 1 (800) 222-4440 Telex: 354484 Superior, Spks.

SUPERSEAL® 888

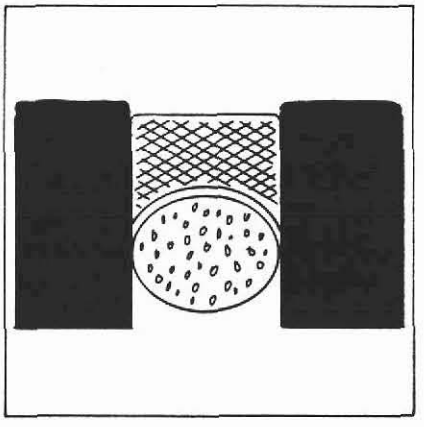
JOINT PREPARATION: • Joints must be cleaned of all contaminants and impurities to the depth at which the sealant and backer rod are to be installed, by saw cutting, grinding, water or sand blasting, mechanical abrading or any combination of these methods to provide a sound, clean, dust and frost-free surface for sealant application. Existing joints must be free of all previous sealant residue. • Loose particles and other debris must be blown out with oil-free compressed air, leaving joint surfaces clean dry, frost-free and dust-free.

APPLICATION: • Install a dry back-up material (not impregnated with any wax, oil or solvent). Sealant should not be installed where it will adhere to the substrate on three sides. If a moveable backer material (polyurethane foam or expanded polyethylene foam rod) is not used, a bond breaker tape of polyethylene should be applied in the bottom of the joint to prevent three-sided bond as shown below. • Superseal 888 Silicone highway Sealant may be applied directly from the container without mixing, heating or other preparation at outdoor temperatures as low as 0 °F (– 18 °C), or even lower if the joint surfaces can be kept completely dry and frost-free. The material is gunnable in high temperatures of + 100 °F (+ 38 °C) or greater. • The joints should be properly designed in relation to field conditions, particularly considering the movement related to the thermal expansion and contraction of the substrate materials. The desirable joint width may be determined by calculating the maximum change in the joint width between high and low temperatures encounted. • The depth of the sealant in the joint should not be less than 1/8″ and not more than 3/8″. It should be as nearly as possible equal to one-half the normal width of the unexpanded joint. • Tool joint so that it is slightly concave and approximately 1/8″ below the road surface. Tooling should be done before a skin forms, usually 10 minutes after the installation of sealant in the joint. Do not use soap, oil or waxes as a tooling aid.

BACKER ROD SIZE RECOMMENDATION: • Joint width = Backer rod diameter as follows:
5/16″ = 3/8″ – 3/8″ = 1/2″ – 1/2″ = 5/8″ – 3/4″ = 7/8″ – 1″ = 1-1/8″

INSTALLATION REQUIREMENTS

Joints shall have proper shape factor depending on spacing and ambient temperature, be throughly cleaned by sand or water blasting, bondbreaker, and installed with recommended application equipment into clean, dry joint, at a depth no greater than one half the width of the unxpanded joint and a minimum of 1/8″ recessed below the pavement surface.



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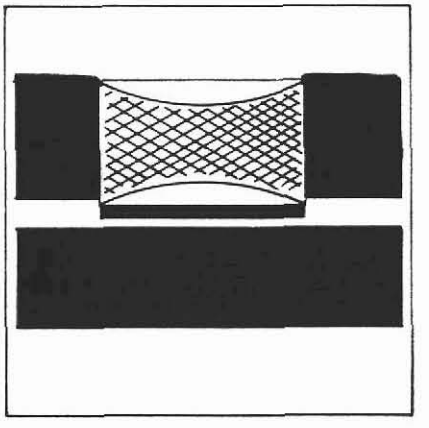

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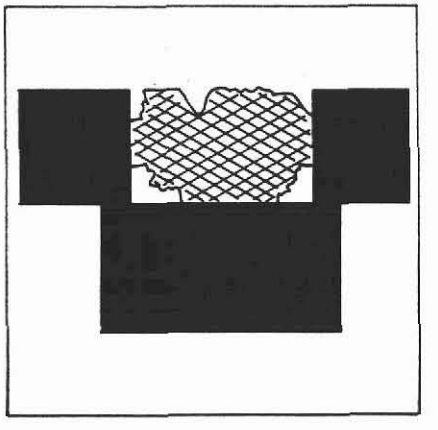


NOT CORRECT

USE RECOMMENDATIONS: Superseal 888 Silicone Highway Sealant is well suited for use in sealing transverse expansion and contraction joints and longitudinal joints in portland concrete cement pavements where excellent movement and weatherability is essential.

USE LIMITATIONS: Superseal 888 Silicone Highway Sealant is not recommended for use in applications where hydrostatic pressure is present. It should not be applied in totally confined spaces where the sealant is not exposed to atmospheric moisture. The sealant bead should be recessed below the pavement surface to minimize abrasion from traffic and other road equipment wear. It should not be applied on surfaces containing oil, solvent or other petroleum derivatives. When special coatings or sealers have been applied to a substrate material, pre-application tests should be made of the adhesion of Superseal 888 Silicone Highway Sealant to the special coating.

PACKAGING: Superseal 888 is available in 5-gal. pails (4.5gal) and 55-gal. drums (45gal) with plastic liners.

STORAGE AND SHELF LIFE: Stored in original unopened containers at or below 90 °F (32 °C) Superseal 888 has a shelf life of 12 months. (Shelf life may decrease 50% if material is stored at temperatures over 100 °F and/or humidity over 100%).

PRECAUTION: During cure the product may irritate the eyes. Avoid contact with the eyes. In case of contact with the eyes, immediately flush eyes with water for at least 15 minutes and consult a physician. Wearers of contact lenses should be certain that all silicone is removed from the hands before touching the lenses. Contact lenses can absorb the silicone and cause damage or discomfort to the eyes. The product may irritate the skin, therefore, wipe off all silicone with a dry cloth or paper towel and wash with soap and water. Keep away from children.

SHIPPING LIMITATIONS:

SUPERIOR PRODUCTS COMPANY, INC.
445 Coney Island Drive So., Sparks, Nevada 89431 (702) 358-7870 1 (800) 222-4440 Telex: 354484 Superior, Spks.

PRODUCT #9005

KOCH

HIGH QUALITY, HOT APPLIED, JOINT SEALANT

ALLIED MATERIALS • DIVISION OF KOCH ASPHALT CO.

Description

Product 9005 is a high quality, single component, hot applied, joint and crack sealant, furnished as a solid, and is self leveling at application temperatures. The sealant is composed of asphalt, rubber extender oils, reinforcing fillers, and polymers. Product 9005 is more resilient, and has greater low temperature flexibility than 9001. The in-place sealant forms a resilient, and adhesive compound that will seal joints and cracks against the infiltration of moisture, and will not flow from the joint at ambient temperature.

Applicable Specifications

ASTM D-3405
Federal Specification
SS-S-1401C
State DOT Specifications

Exceeds the requirements of:

ASTM D-1190
AASHTO M-173
Federal Specification
SS-S-164, and Amendments

Recommended Use

Product 9005 is recommended for sealing longitudinal, transverse, and shoulder joints in Portland Cement, and asphaltic concrete highway pavement, and airport runways. The sealant can also be used as a maintenance sealant for sealing cracks in Portland Cement and asphaltic concrete pavements. Product 9005 is not intended to be used in areas subjected to fuel and oil spillage.

Application Temperatures

Recommended Pouring Temp.
370° F (188° C)
Safe Heating Temperature
390° F (199° C)

Joint Preparation

On old construction, all of the joint sealant must be removed by routing, plowing, or other means. All old and new joints must be sandblasted to remove all foreign materials. The joints shall be free of water, and shall be thoroughly cleaned by blowing with oil free compressed air of at least 90 PSI immediately prior to application of sealant.

Melting and Application Equipment

The melter unit shall be of the double boiler type equipment with an agitator, and using high flash oil, 600° F (315° C) minimum, as a heat transfer medium. Material kettle and oil jacket must have thermometers that have been calibrated. Heating must be thermostatically controlled to hold the desired temperature. The melting unit shall be equipped with a pump capable of circulating the material from the bottom to the top of the kettle. The sealing compound shall be agitated continuously during the melting and pouring process.

4334 NW Expressway • Suite 281 • Oklahoma City, Oklahoma 73116-1516 • 405/848-0460

Installation of Sealant

At the time of placing the sealant, the pavement and air temperature must be 40° F (5° C) or higher. Joints should be filled 1/8 inch to 1/4 inch below the pavement surface. Joints filled in the fall or spring of the year, after the pavement has cooled, and the joints opened should be filled 1/4 inch to 3/8 inch below the pavement surface.

Packaging

Product 9005 is packaged in 50 pound pails or 60 pound boxes which contain two 30 pound polyethylene bags of sealant.

Coverage ½'' x ½' Joint Size

Weight Per Gallon	9.3 Lbs.
Sealant required for 100 lineal ft.	12.0 Lbs.

The information and data contained herein are based on information we believe to be accurate. Due to variable conditions and/or application equipment, we assume no responsibility for the use of this information. Koch shall not be responsible if the product or information should be used in a manner to infringe any patent or copyright.

September 1, 1986
Supersedes March 1, 1979

CRAFCO INC.
P.O. BOX 20133 • PHOENIX, ARIZONA 85036 • 602/276-0406
TELEX 165832

No: PD-RS231
Date: March 1984

PRODUCT DATA SHEET
ROADSAVER 231 SEALANT

General:

RoadSaver Brand Type 231 Sealant is a solid, hot-pour, low-modulus sealant formulated with polymer modified petroleum products. Its low stiffness, greatly reduced temperature susceptibility and low stress development (when extended) give the sealant the capability of remaining bonded to joint faces when other sealants will not. The sealant is self-leveling, has excellent bonding characteristics, a high degree of elasticity required for rejecting incompressibles and the capability of being highly extended with less stress development than most other sealants.

RoadSaver 231 is ideally suited for use as either a crack sealant in asphalt concrete or a joint sealant in portland cement concrete pavements.

RoadSaver 231 retains excellent flexibility and extensibility characteristics at low pavement service temperatures (from 0F to -30F) and has the capability of flexing and conforming to large crack or joint movements at low temperatures. Additionally, RoadSaver 231 has sufficient elastic characteristics at high pavement service temperatures to resist flow and tracking.

Specification Conformance:

RoadSaver 231 is specifically formulated and produced to meet requirements of the following state specifications for low-modulus modified ASTM D3405 sealant:

State	Specification
Minnesota	3720
Iowa	4136

Typical test results for RoadSaver 231 are:

Test	RoadSaver 231 Result	Specification Limits
Penetration,77F	130	110-150
Flow,140F	1mm	3mm max.
Resilience	65%	60% min.
Penetration,0F	50	40 min.
Bond,-20F,100%ext.	Pass 3 cycles	Pass 3 cycles
Tensile Adhesion,77F (1" x 1" x 2")	800%	600% min.
Tensile Adhesion,-20F (3/4" x 3/4" x 2")	300%	300% min.
Ductility	60	55cm min.

Recommended Pour Temperature	380F	----------
Safe Heating Temperature	410F	As specified

Additional properties of RoadSaver 231 are:

Test	RoadSaver 231 Result
Viscosity at 375F	25 Poise
Softening Point, R&B	190F
Unit Weight	8.9 lbs./gallon
Coverage, 1/2" x 1/2" crack	11.5 lbs. per 100 ft.

Application:

For detailed application procedures, refer to the CRAFCO Application Bulletin for RoadSaver 231 sealant (Data Sheet No. AP-RS231).

Packaging:

The sealant is packaged in 65 lb. boxes containing two polyethylene bags of sealant which weigh approximately 32 lbs. each. Boxes of sealant are palletized for shipment. Each pallet contains 36 boxes and weighs approximately 2350 lbs. The pallets are protected with a weatherproof covering. Sealant may be packaged in 5 or 6 gallon pails with a polyethylene lining on request.

Availability and Cost:

For prices and to order RoadSaver 231, contact your local CRAFCO distributor or CRAFCO, Inc.

Warranty:

CRAFCO, Inc. warrants that CRAFCO sealants meet applicable ASTM, AASHTO, Federal or state specifications at time of shipment. Techniques used for the preparation of the cracks and joints prior to sealing are beyond our control as are the use and application of the sealants, therefore, CRAFCO shall not be responsible for improperly applied or misused sealants.

There shall be no other warranties expressed or implied. For optimum performance, follow CRAFCO recommendations for sealant installation.

NO.: AP-RS 231
DATE: MARCH, 1984

CRAFCO INC.
P.O. BOX 20133 • PHOENIX, ARIZONA 85036 • 602/276-0406
TELEX 165832

APPLICATION BULLETIN
CRAFCO ROADSAVER TYPE 231 SEALANT

Read Before Using

General:

CRAFCO RoadSaver 231 sealant is a hot-melt material supplied in solid form which, when properly applied, will form a resilient and adhesive compound that will effectively seal cracks in both asphalt and concrete pavements, and joints in concrete pavements. RoadSaver 231 is formulated to be a low modulus sealant which has a very low degree of temperature susceptability. The sealant will meet state modified ASTM D3405 requirements for low modulus sealant. For detailed specification conformance, refer to CRAFCO Data Sheet No. PD-RS231.

Melting:

RoadSaver 231 must be melted in a jacketed double boiler type melting unit which is equipped with both agitation and recirculation systems. The temperature of the heat transfer oil in the melting unit should not exceed 475F when melting RoadSaver 231. The melting unit must be capable of safely heating the sealant to 400F. CAUTION: Do not agitate while adding new blocks of sealant.

Application:

Apply RoadSaver 231 to cracks or joints which have been cleaned using appropriate routing, brushing, sandblasting or blowing operations to provide intact bonding surfaces which are free from all dust, moisture or other contaminants. Application of sealant to damp or improperly cleaned surfaces may result in a low degree of adhesion which can cause the sealant to have a tendency to pull out of the crack or joint. Pavement surface temperatures should be at least 40F when applying sealant. Application at lower temperatures may cause reduced bonding.

RoadSaver 231 is a fluid material at application temperature (approximately 50 poise at 375F) which can be placed using either a pressure feed melter applicator unit or pour pots. The sealant is self-leveling and will penetrate narrow cracks and joints. Sealant temperature at application should be a minimum of 370F and should not exceed 400F. If sealant is placed at temperatures below 370F, adhesion to the pavement may be reduced; especially when cold or damp conditions prevail.

For best performance, RoadSaver 231 sealant should be placed in cracks only to surface level as sealant applied to the pavement surface may not adhere well due to the presence of surface contamin-

ants. The sealant may also be subjected to abrasion from vehicle tires and snowplows if placed above surface level. For concrete joints, it is best to apply sealant to within 1/8" of the surface and a bond breaker is recommended.

Since RoadSaver 231 is a hot pour sealant which stiffens as it cools, it is important that application rates through the applicator wand are sufficient to prevent the sealant from setting up in the applicator hose. If application is slow, or starts and stops intermittently, the end of the applicator wand should be placed in the kettle and the wand valve fully opened to circulate sealant through the hose.

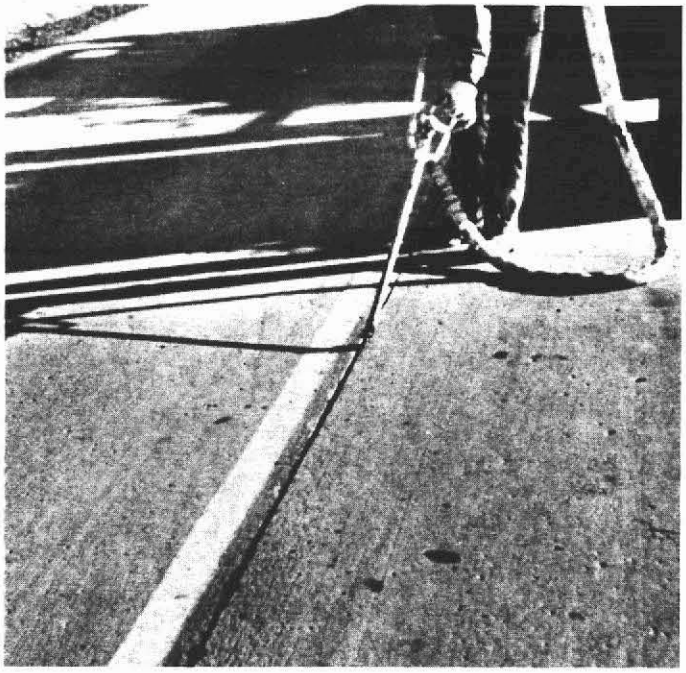
Pot life of RoadSaver 231 sealant at application temperatures is approximately 8 to 10 hours. Pot life may be extended by adding fresh blocks of sealant as sealant is applied and quantity in the kettle decreases. RoadSaver 231 should be agitated constantly while being applied. RoadSaver 231 may be reheated and applied although some degradation may occur if total time at application temperatures exceeds 8 to 10 hours. When the pot life of the sealant has been exceeded, RoadSaver 231 will begin to thicken. If this should occur, the sealant should immediately be removed from the kettle and discarded.

Clean-Out:

Clean-out of equipment lines and tanks may be done using diesel fuel or a similar petroleum based solvent. CAUTION: All flames must be extinguished before clean-out operations are begun. Be sure to remove all solvent from the melting tank prior to the next use of the kettle as sealant dilution and flash problems may occur.

Safety Precautions:

CRAFCO RoadSaver 231 sealant is non-toxic nor contains any carcinogenic materials. The sealant is a petroleum based product and is harmful if swallowed. Seek medical attention immediately if taken internally. Use precautions commensurate with any hot applied material when using. Fumes from the sealant when heated are non-toxic, however, fumes should not be directly inhaled.



No. 223

W. R. MEADOWS

SEALTIGHT

SOF-SEAL™

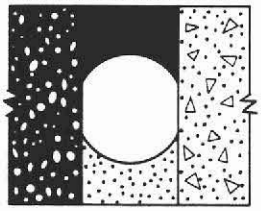
LOW-MODULUS HORIZONTAL SEALANT

SEALTIGHT SOF-SEAL is a premium quality, hot-applied, single-component, low-modulus sealant that performs equally well in either Portland Cement or Asphaltic Cement pavements. As the name implies, it is an entirely new "softer-sealer" with low-modulus properties that permit high elongation at relatively low stresses, particularly at low temperatures. In a typical joint sealer configuration, SOF-SEAL is capable of 300% extension at −20°F at less force requirement than any other hot or cold-applied sealer. SOF-SEAL was specifically developed to provide an improved, all purpose sealant for general usage and preventative maintenance service on all types of large scale crack and joint sealing projects.

SOF-SEAL is composed of a combination of polymeric compounds to produce a softer, highly flexible sealant for both random cracks and joints. In addition to low-modulus, its qualities include excellent elongation, high resiliency, tenacious bonding power and exceptional longevity. SOF-SEAL remains pliable in the joint for years . . . even in cold weather and under repeated freeze/thaw cycles. It does not become brittle and crack out in the winter . . . will not flow in warm weather.

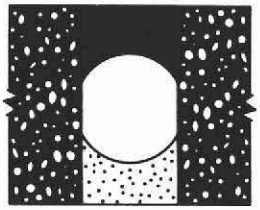
ALL NEW SOF-SEAL IS EFFECTIVE THREE WAYS

ASPHALT-TO-CONCRETE



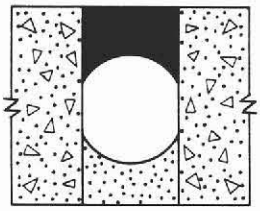
Ideal for sealing asphalt to concrete shoulder joints.

ASPHALT-TO-ASPHALT



Effectively seals random and reflective cracks in asphalt pavement and asphalt overlays.

CONCRETE-TO-CONCRETE



Seals longitudinal and transverse joints and random cracks in Portland Cement concrete pavements.

ADVANTAGES

- Reliable performance—SOF-SEAL is consistent and doesn't change, even during cold weather or after repeated freeze-thaw cycles.
- Remains pliable in the joint for years . . . a superb preventive maintenance factor.
- Low modulus sealant—SOF-SEAL has low stress development, over a wide range of temperatures, to effectively accommodate joint movement.
- Field-tested—SOF-SEAL provides exceptional elongation and longevity, high resiliency and tenacious bonding power.

W.R. MEADOWS, INC.
April 1, 1981
2
02576
PAVING & SURFACING
Pavement Sealing

W. R. MEADOWS, INC.
P.O. BOX 543 • ELGIN, IL 60120
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W. R. MEADOWS
SEALTIGHT

SOF-SEAL™

LOW-MODULUS HORIZONTAL SEALANT APPLICATION DATA

APPLICATION

Joint Preparation: New Construction . . . the joints must be clean, dry and free of moisture. Curing compound on joint interfaces must be removed by sandblasting or mechanical brushing. All loose particles of dust, dirt and laitance must be blown out of the joint with oil-free compressed air immediately preceding the sealing operation.

Maintenance Sealing: All old joint sealing materials must be routed out of the joint to a depth of 1" to 1-1/2". Joint interfaces must be cleaned by sandblasting or mechanical equipment. All loose particles should be blown out of the joint with compressed air.

Application Method: It is recommended for optimum performance, that the joint depth be a minimum of 1/2". Joint configuration shall be in accordance with the design of the specifying engineer. It is also suggested that the joint sealer should be installed flush with the surface of the paving instead of the usual 1/4" recess. Cracks and joint should be sealed at 40°F or higher temperatures. Use SEALTIGHT Backer Rope to control depth of deep cracks and joints.

Melting: SOF-SEAL should be melted in a conventional double boiler, oil-jacketed melter-applicator equipped with a mechanical agitator and separate temperature thermometers for both the oil bath and melting vat.

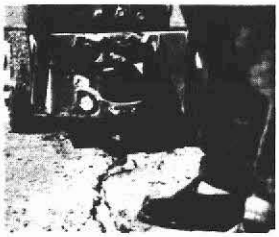
Recommended pouring temperature is 390°F. Add small quantities of SOF-SEAL while under continuous agitation. Material may be added to the melter as the sealer is withdrawn during the sealing operation.

Cracks and/or joints may be sealed at air temperature of 40°F or higher. The SOF-SEAL should be applied to fill the crack or joint flush with the asphalt or concrete surface. At the end of each day's sealing operation, all materials remaining in the lines should be drawn off. Small quantities of unused materials remaining in the melter may be remelted and used the following day.

CONTROL MATERIAL TEMPERATURE AT 390°F . . .
NEVER EXCEED 410°F.
RECOMMENDED POURING TEMPERATURE IS 390°F.

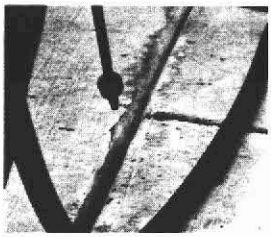
MAKES SEALING JOBS AS EASY AS 1 . . . 2 . . . 3

1. OPEN



Cracks and joints should be routed out to provide a sealant reservoir with a minimum depth of 1/2".

2. CLEAN



Clean crack or joint interfaces very carefully . . . blow out all loose particles with compressed air prior to sealing.

3. SEAL

SOF-SEAL can be quickly and easily melted and applied using a double boiler, oil-jacketed melter-applicator. Seal cracks and joints flush with surface. Recommended pouring temperature is 390°F.

TYPICAL PHYSICAL PROPERTIES

In addition to actual field tests and evaluations, SOF-SEAL has been thoroughly tested in the laboratory with currently accepted test methods for hot-pour joint sealers plus special tests to evaluate its true performance capabilities, tabulated and referenced below.

PROPERTY	TYPICAL RESULTS*	SUGGESTED SPEC.*
Penetration, $\frac{mm}{10}$		
at 77°F	128	130 ± 20
at 0°F	53	40 min.
Flow, cm	0.10	.3 max.
Resilience, %	85	75 min.
Elongation, (tensile adhesion)		
at 77°F, (1)	800%	800% min.
at -20°F, (2)	300%	300% min.
Bond Test at -20°F, 100% Ext. (3)	Pass, 3 cycles	Pass, 3 cycles

*Test methods as described in ASTM D-3407 except as noted for modifications.
(1) Test Method, ASTM D-3408; sample modified to 3/4" × 3/4" × 2".
(2) ASTM D-3407, Bond one cycle; sample modified to 1/2" × 1/2" × 2".
(3) Standard sample; extension increases to 100%.

SPECIFICATIONS

None applicable. Physical properties can be tested using established industry standards; note chart of Typical Physical Properties.

PACKAGING

Six gallons, when melted, in a 6-gallon pail. Shipping weight, approximately 52 lbs.

COVERAGE

Cracks or joint 1/2" wide by 1/2" deep require approximately 1.36 gallons per 100 lineal feet.

PRECAUTIONS

1. Control material temperature at 390°F, never exceed 410° F.
2. Recommended pouring temperature is 390°F.
3. Do not heat material above recommended pouring temperature of 390°F and avoid prolonged heating.

W. R. MEADOWS, INC.
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PHONE: 312-683-4500

Other Plants
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Atlanta, GA 30336
Phone: 404-691-5358

W. R. MEADOWS OF PA, INC.
2100 Monroe St.
P.O. Box 2284
York, PA 17405
Phone: 717-792-2627

W. R. MEADOWS OF TX, INC.
2555 N.E. 33rd St.
P.O. Box 7752
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APPENDIX D

PRODUCT EVALUATION 86-18
JOINT SEALANT STUDY

PROBLEM STATEMENT

ADOT has approximately 550 lane miles of jointed portland cement concrete pavement under its jurisdiction. The current practice is to saw and seal the joints at the time of construction and reseal the joints under a rehabilitation project. ADOT does not specify a performance criteria for joint sealants. Since the performance life of different joint sealants varies considerably a research project should be initiated to ascertain true benefits of the different sealants.*

The problem is complicated even more because sealants perform differently in the high country. ADOT has not performed an evaluation of joint sealants in the colder regions.

OBJECTIVES

The objective of this study is to compare the overall performance of different types of joint sealants in the higher elevations. The study is meant to aid the Department in developing performance criteria. Ease of placement, as well as long term performance, will be studied.

WORKPLAN

The workplan will be as follows:

1) Select joint sealants to be evaluated and locate vendors that are willing to participate in a project.

2) Develop evaluation criteria for joint sealants.

3) Construct a test section in the high country utilizing different joint sealants.

4) Observe installation methods and practices.

5) Perform semi- annual inspections during the summer and winter, for a period of four years.

6) Take cores after one, three, and four years.

REPORTING

A construction report will be written within 90 days after the completion of the sealant installation and a final report will be written within 90 days after the four year evaluation period.

APPENDIX E

The following personnel were present during the two-day placement on July 8 and July 9:

Carl Harvath Allied Koch
Lillie Sturdivan Allied Koch
Scott W. Davis W.R. Meadows
Robert Rutherford Crafco
Steven R. Rolka Dow Corning
Doug Nelke Smalley & Company
George Lewis ADOT Materials
Steven L. Tritsch ATRC
Tim Wolfe ATRC
Syl Ornelas District IV Construction

Additionally, Vern Thompson; Crafco, was present on July 8. George Lewis, Tim Wolfe, and Syl Ornelas observed the placement of Superseal 888 on July 14. Syl Ornelas and Scott Brown, District IV Materials, observed the July 25 placement.