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WAR DEPARTMENT
CORPS OF ENGINEERS
U. S. ARMY

0038

SUPERSEDED BY SAC128

OPERATION AND MAINTENANCE MANUAL

EAST LEVEE OF THE SACRAMENTO RIVER, AT MISSOURI BEND,

FROM MILE 96.4 TO MILE 97.5,

APPROXIMATELY 37 MILES UPSTREAM FROM SACRAMENTO, CALIFORNIA.

Manual No. 1

U. S. ENGINEER OFFICE
P. O. BOX 1739, WRIGHT BUILDING, 1209 - 8TH. ST.
SACRAMENTO 8, CALIFORNIA

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OPERATION AND MAINTENANCE MANUAL

East Levee of the Sacramento River, at Missouri Bend, from Mile 96.4 to Mile 97.5, approximately 37 miles upstream from Sacramento, California.

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Exhibits

"A" Regulations

"B" Drawing, File No. 50-4-2226 (in 2 sheets)

"C" Specification No. 956

"D" Specification No. 938

OPERATION AND MAINTENANCE MANUAL

Section I - Introduction

1. Authorization. This section of levee forms a part of the existing project, known as the Sacramento River Flood Control Project, adopted by the Flood Control Act of 1 March 1917, Public 367 - 64th Cong., (H. Doc. 81, 62nd Congress, 1st Session, as modified by Rivers and Harbors Committee Doc. No. 5, 63rd Congress, 1st Session), and modified by the Flood Control Act of 15 May 1928, Public No. 391 - 70th Cong., (S. Doc. No. 23, 69th Congress, 1st Session), the River and Harbor Act of 26 August 1937, Public 392 - 75th Cong., 1st Session, (Senate Committee Print, 75th Congress, 1st Session), and the Flood Control Act of 18 August 1941, Public 228 - 77th Cong., 1st Session, (H. Doc. No. 205, 77th Congress, 1st Session).

2. Location. The levee is located along the east side of the Sacramento River, at Missouri Bend, from Mile 96.4 to Mile 97.5, approximately 37 miles upstream from the City of Sacramento, California, and along the westerly boundary of Reclamation District No. 1500, as shown on attached drawing file No. 50-4-2226, dated August 1944. (See exhibit B)

3. Dates of Construction. Construction was initiated on 5 August 1944, and completed on 21 September 1944.

4. Description. The levee as constructed extends for approximately 3,265 feet with slopes of 1 on 2½ on the river side and 1 on 1½ on the land side and a 30 ft. crown. Construction also included a gravel road surfacing 20' in width on top of the levee and the necessary drainage structures, road approach ramps, and appurtenances.

5. Protection provided. This section of levee, as constructed, forms an integral part of the Sacramento River Flood Control Project and primarily provides direct protection to Reclamation District No. 1500 against high water of the Sacramento River approximately up to Elevation 46.0 (U.S.E.D. Datum), with a freeboard of three feet.

SECTION II - Local Cooperation

1. Requirements.

a. The Flood Control Act of 15 May 1928, as modified by the Acts of 26 August 1937 and 18 August 1941, provides that local interests shall give assurances satisfactory to the Secretary of War that they will provide all needed lands, easements, and rights-of-way free of cost to the United States, bear the expense of necessary highway, railroad, and bridge

alterations, hold and save the United States free from claims for damages resulting from construction of the works, and maintain and operate all flood control works after completion, in accordance with regulations prescribed by the Secretary of War.

b. The duties and liabilities of districts and public agencies are also provided in Section 8370 of the Water Code of the State of California as follows:

> "It is the responsibility, liability and duty of the reclamation districts, levee districts, protection districts, drainage districts, municipalities, and other public agencies within the Sacramento River Flood Control Project limits to maintain and operate the works of the project within the boundaries or jurisdiction of such agencies, excepting only those works enumerated in Section 8361 and those for which provision for maintenance and operation is made by Federal law."

Section III

General

1. Regulations.

a. Attached hereto is a copy of Regulations for Operation and Maintenance of Local Flood Protection Works which have been approved by the Secretary of War in accordance with authority contained in Section 3 of the Flood Control Act of 22 June 1936, Public Law No. 738, 74th Congress, as amended and supplemented (See Exhibit "A").

b. The regulations contemplate that District Engineers of the War Department will prepare an operation and maintenance manual for each completed local flood protection project or for each completed useful unit of each partially completed local flood protection project to assist local interests in carrying out the provisions contained therein. It will be noted that all official requirements by which local interests will be governed are contained in the regulations approved by the Secretary of War, and that the manuals are intended to be used as a guide in complying with the regulations, in addition to the furnishing of all necessary operating, engineering, and record data.

2. Applicable Provisions. The pertinent provisions under the regulations directly applicable to local interests for the maintenance and operation of the flood protection works described in paragraph 4 of Section I of this manual are listed below:

a. Section 208.10 (a) - "General"
b. Section 208.10 (b) - "Levees"

c. Section 208.10 (d) - "Drainage Structures"
d. Section 208.10 (g) - "Channels & Floodways"
e. Section 208.10 (h) - "Miscellaneous Facilities"

Section IV

Features of Project

1. Discussion.

a. Construction was accomplished by H. Earl Parker, Contractor, under Modification No. 2, (Supplemental Agreement) to Contract No. W-04-167-eng-602 copy of which is on file in the U. S. Engineer Office, Sacramento District.

b. In general, all construction features are based on standard plans and specifications and are fully covered in the attached drawings and specifications listed below:

(1) Details and locality Map, Drawing 50-4-2226, in two sheets, entitled "Sacramento River, California, Flood Control Project, Proposed Levee Set-Back at Missouri Bend, Mile 96.4 to 97.5L" (See Exhibit "B").

(2) Specifications No. 956, issued to accompany Modification No. 2, (Supplemental Agreement) to Contract No. W-04-167-eng-602. (See Exhibit "C").

(3) Specifications No. 938, containing technical provisions for this work to which specification No. 956 is supplemental. These specifications were for similar work at four other locations which were covered in the original contract. (See Exhibit "D").

c. Operation and Maintenance features affecting this levee are in general of standard nature and consequently the provisions contained in attached Regulations (Exhibit "A") are applicable in its present form.

E X H I B I T "A"

War Department Regulations

For

Operation and Maintenance of Local Flood Protection Works

TITLE 33 - NAVIGATION AND NAVIGABLE WATERS

CHAPTER II - CORPS OF ENGINEERS, WAR DEPARTMENT.

PART 208 - FLOOD CONTROL REGULATIONS. MAINTENANCE AND OPERATION OF FLOOD CONTROL WORKS

Pursuant to the provisions of section 3 of the Act of Congress approved June 22, 1936, as amended and supplemented (49 Stat. 1571; 50 Stat. 877; and 55 Stat. 638; 33 U. S. C. 701c; 701c-1), the following regulations are hereby prescribed to govern the maintenance and operation of flood control works:

208.10 Local flood protection works; maintenance and operation of structures and facilities.

(a) GENERAL.-

(1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the War Department or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval.

Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations.

(b) LEVEES.-

(1) Maintenance. The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) The drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) Operation. During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) FLOOD WALLS.-

(1) Maintenance. Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Tco drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) Operation. Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) DRAINAGE STRUCTURES.-

(1) Maintenance. Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures.

Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once every year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) Operation. Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(e) CLOSURE STRUCTURES.-

(1) Maintenance. Closure structures for traffic openings shall be inspected by the superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order;

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made

Whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) Operation. Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) PUMPING PLANTS.-

(1) Maintenance. Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery. Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) Operation. Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equip-

ment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recessation of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) CHANNELS AND FLOODWAYS.-

(1) Maintenance. Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the information of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) Operation. Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) MISCELLANEOUS FACILITIES.-

(1) Maintenance. Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) Operation. Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designated therefor. (49 Stat. 1571, 50 Stat. 877; and 55 Stat. 638; 33 U.S.C. 701c; 701c-1) (Regs. 9 August 1944, CE SPWF)

(SEAL)

J. A. ULIO,
Major General,
The Adjutant General.

(F.R. Doc. 44-12285; Filed, August 16, 1944; 9:44 a.m.)

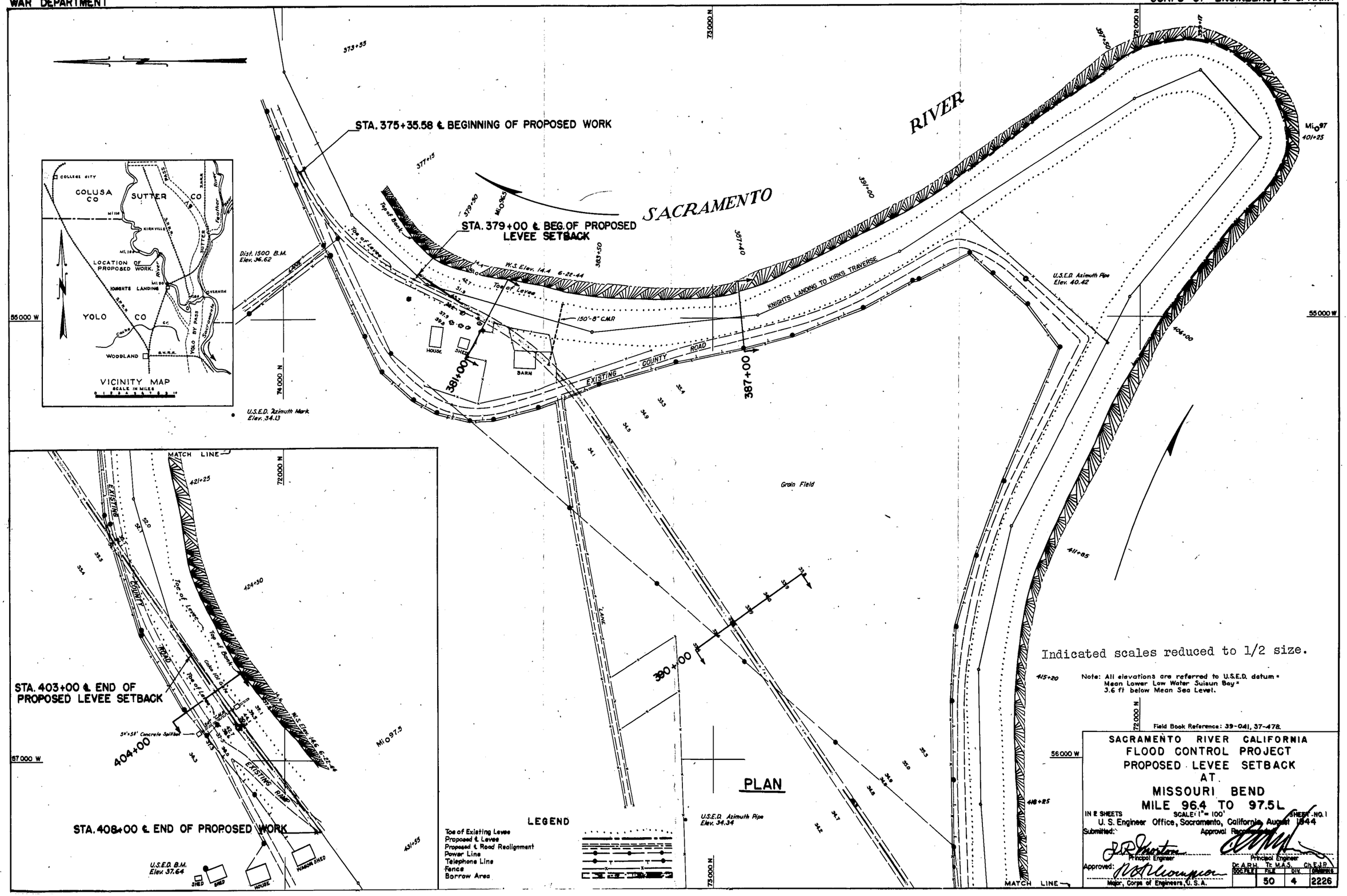
E X H I B I T "B"

Drawing, File No. 50-4-2226

(In 2 Sheets)

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



WAR DEPARTMENT

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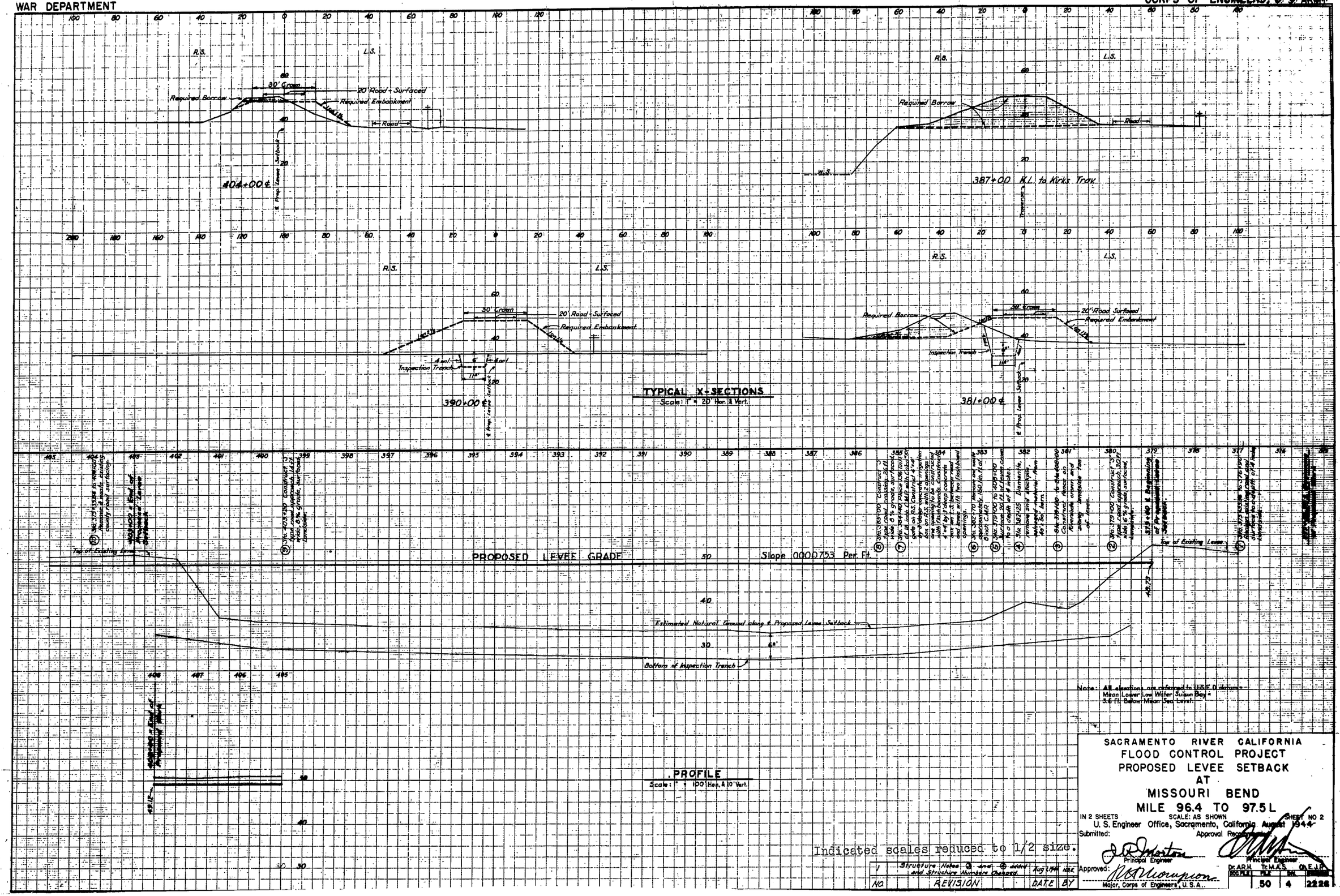

Note: All elevations are referred to U.S.E.D. datum = Mean Lower Low Water Suisun Bay = 3.6 ft. Below Mean Sea Level.

SACRAMENTO RIVER CALIFORNIA
FLOOD CONTROL PROJECT
PROPOSED LEVEE SETBACK
AT
MISSOURI BEND
MILE 96.4 TO 97.5 L

IN 2 SHEETS SCALE: AS SHOWN SHEET NO 2

U. S. Engineer Office, Sacramento, California August 1944

Submitted: Principal Engineer

Approval Recommended: Principal Engineer

Approved: Major, Corps of Engineers, U.S.A.

Dr. A.R.H. Tr. M.A.S. Ch. E.J.P.

DOC. FILE	FILE	SHT.	SHEET
	50	4	2226

Indicated scales reduced to 1/2 size.

NO	REVISION	DATE	BY
1	Structure Notes ⑤ and ⑥ added and Structure Numbers changed.	Aug 1944	HAE

E X H I B I T "C"

Specification No. 956

Specification No. 956

WAR DEPARTMENT
UNITED STATES ENGINEER OFFICE
Wright Building, 1209 Eighth Street
Sacramento (8), California

SPECIFICATIONS FOR THE LEVEE SETBACK TO BE DONE UNDER MODIFICATION NO. 2, SUPPLEMENTAL AGREEMENT TO CONTRACT NO. W-04-167-ENG-602.

The work to be performed under Modification No. 2 Supplemental Agreement to Contract No. W-04-167-eng-602, shall be done in accordance with the applicable portions of Specification No. 938 for Construction of Levee Setbacks and Bank Protection along the West and East Levees of the Sacramento River at the following four locations: Hyatt's Ranch, Below Sycamore Warehouse, Girdner Bend and Keller's Pump, attached to and made a part of said contract with the additions and/or revisions hereinafter stated, made to said specifications.

All references to specification items not found in this supplement shall be construed as referring to the sections or paragraphs of the above-mentioned specifications.

The following modifications of and additions to the specifications forming a part of Contract No. W-04-167-eng-602 are made a part thereof and apply to this Supplemental Agreement and the applicable portions shall apply to all subsequent Supplemental Agreements entered into under this contract.

SECTION I - SPECIAL PROVISIONS

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APPROPRIATION: Flood Control, General, and Flood Control, Sacramento, California

MODIFICATIONS

SECTION I - SPECIAL PROVISIONS

These Special Provisions describe and cover the particular work set forth herein. In case of discrepancy, the Special Provisions shall govern over the drawings and all other sections of these specifications.

Where the technical specifications refer to specific items which are not included in this work, and to materials applicable only to them, such references shall be disregarded.

1-01. Location. The proposed work of levee construction is along the east levee of the Sacramento River, at Missouri Bend, Mile 96.4 to 97.5.

1-02. Work to be Done consists of furnishing all necessary plant, equipment, labor and material (except material specified to be furnished by the Government) and constructing the levee setback and performing all incidental operations in connection therewith, such as constructing appurtenant works, clearing, grubbing, and preparing the foundations in conformity with the sections shown on the drawings, to the lines and grades staked in the field, and in accordance with the applicable technical sections of these specifications and the additional requirements or modifications set forth in this paragraph.

THE WORK TO BE DONE AT MISSOURI BEND SHALL BE KNOWN AS PART E.

DETAILED DESCRIPTION OF WORK

(a) Borrow for levee embankment shall be obtained from the borrow areas as shown on the drawings and in accordance with following types:

(1) Required Borrow. All material within the limits designated as required borrow, shall be excavated and removed to the grades and slopes staked in the field, unless otherwise noted on the table of borrow.

(2) Uniform Borrow. All material within the limits designated as uniform borrow shall be removed across the entire borrow area to the same elevation or to a sloping plane when specified herein. Areas from which borrow is obtained shall be left with reasonably smooth surfaces to within a tolerance of six (6) inches from a level plane extending over the entire borrow area at the specified elevation or from a specified sloping plane or from a higher plane thereto, if found unnecessary to borrow to the specified depth.

TABLE OF BORROW AREAS

From Station To Station	Borrow Requirements and Location
375+35.58 C.L. 408+00 C.L.	Borrow from an irregular shaped area within the approximate limits as shown on the drawings, from existing levees and from inspection ditch. Borrow areas are described in general as follows: (1) Required borrow from existing levee on river side between Stations 379+00 C.L. and 382+00 C.L.; and between stations 401+50 C.L. and 407+00 C.L. (2) Required borrow from existing levee to approximate natural ground between stations 379+00 C.L. and 418+00 (K.L. to K. Trav.). From this station slope to 1 on 5 to top of levee. (3) Required borrow from inspection ditch, Stations 379+50 C.L. to 402+50 C.L. (4) Riverward from and opposite Stations 392+70 (K.L. to K. Trav.) to 407+15 (K.L. to K. Trav.). Area is available for uniform borrow to the elevation determined in the field.

(b) Levee Embankment. Levee embankment shall be constructed in accordance with Paragraph 4-02 and as shown on the drawings and to the dimensions as follows:

From Station	To Station	Crown Width Ft.	Land Side Slope	River Side Slope
375+35.58 C.L.	408+00 C.L.	30	1 on 1-1/2	1 on 2-1/2

(c) Roadway and Road Approaches.

(1) Road Approaches and Road Crossings. Grades, crown width and surfacing width shall be as specified in the following table. Surfacing shall be crushed rock as specified in Paragraph 7-04, 4 inches thick.

(2) Levee Crown Surfacing shall be crushed rock as specified in Paragraph 7-04, 4 inches thick, and to a width of 20 feet. At intervals of approximately 1,000 feet the width shall be increased 3 feet on each shoulder for a distance of 50 feet to provide turnouts; the location of new turnouts shall be such that this spacing will be maintained between new and existing turnouts.

TABLE OF ROADWAY AND ROAD APPROACHES

Structure No.	Station	Type	Description
1	375+35.58 to 376+90		Realign existing road and surface to a depth of 4 inches; land side.
2	379+00	S	Road approach, 30' wide, 6% grade, surfaced 20 ft., land side.
5	379+00 to 408+00		Surface crown of levee.
8	385+00	S	Road crossing, 26 ft. wide, 8% grade, surfaced full width.
9	403+20	S	Road approach, 14 ft. wide, 8% grade, surfaced 10 ft., land side.

(d) Inspection Ditches shall be excavated to the sections and between the stations shown in the following table:

From Station	To Station	Section
379+50	402+50	11 ft. flat bottom, 6 foot minimum depth, with side slopes 4 vertical on 1 horizontal.

(e) Miscellaneous Work.

(1) General. Miscellaneous work shall be done at the locations indicated below and in accordance with the requirements specified.

(2) Concrete shall be Class "A" concrete. When reinforced concrete is specified, reinforcing steel shall be furnished by the contractor and installed in accordance with the requirements of Section VI.

(3) Redwood Lumber shall be Heart Common conforming to the grading rules of the California Redwood Association.

(4) Payment. Payment for miscellaneous work will be made at the contract price for the job complete, where so stated, which price shall include full compensation for excavation and backfill, for performing all other work necessary to remove, reinstall, or relocate, save or waste as required, all pipe, concrete and other structures as described and specified in the following table; otherwise payment will be made at the applicable unit prices.

Structure No.	Station	Description
6	382+70	Remove and waste approximately 160 ft. of 8-inch C.M.P.
7	384+40	Install 136 ft. of Government furnished 18-inch C.M.P. with Calco Gate Model 101 with 6 foot frame, on river side. Construct 4' x 4' x 3' concrete irrigation box on river side with two openings; one opening to be constructed with flashboards. Construct 4' x 4' x 3' concrete box land side between road and levee with two flashboard openings.
10	375+35.84 to 404+00	Remove and waste existing county road surfacing.
3	379+00 to 408+00	Construct fence on river side crown and along land side toe of levee. Fence shall consist of 4 strands of barbed wire with wood posts.
4	382+25	Dismantle, remove and stockpile, salvaged material, where directed from 40' x 50' barn.

1-03. Drawings. The work shall conform to the following drawings which form a part of the specifications, and are filed in the U. S. Engineer Office, Wright Building, 1209 Eighth Street, Sacramento, California.

File	Division	Drawing	Sheet No.	Rev. No.	Drawing Title
50	4	2226	1	1	Proposed Levee Setback at Missouri Bend
50	4	2226	2		Proposed Levee Setback at Missouri Bend

1-04. Quantities. The total estimated quantities necessary to complete the work described in Paragraph 1-02 are as follows:

SCHEDULE OF WORK ITEMS

Item No.	Description	Quantity	Unit
	PART "E"		
1	Excavation	110,000	Cu.Yd.
2	Water for Compaction and Sprinkling, applied as directed	3,000	Thous. Gals.
3	Crushed Rock, in place	1,600	Ton
4	Structural Concrete, Class "A", in place	10	Cu.Yd.
5	Redwood Lumber, in place	90	F.B.M.
6	Fence, 4 strand, barb wire, complete in place	6,500	Lin.Ft.
7	Corrugated Metal Pipe, 18 inch diameter, install only	140	Lin.Ft.
8	Calco gate, Model #101 with 6 foot frame, install only	1	Job
9	Remove and waste approximately 160 linear feet of 8 inch diameter corrugated metal pipe at Station 382+70	1	Job
10	Dismantle, remove and stockpile, salvaged material where directed from 40' x 50' barn at Station 382+25	1	Job

1-05. Material to be Furnished by the Government and Installed by the Contractor. The Government will furnish to the contractor as a free issue, the material listed herein, f.o.b. job site. The contractor will be required to accept delivery when made, unload and transport same to the construction site at his own expense. All material so furnished shall remain the property of the Government.

(a) All 18 inch Corrugated Metal Pipe.

(b) Calco Gate Model #101, with 6 foot frame.

E X H I B I T "D"

Specification No. 938

WAR DEPARTMENT
CORPS OF ENGINEERS, U. S. ARMY

Specification No. 938
LEVEE SETBACK & BANK PROTECTION
at Four Locations Along
THE SACRAMENTO RIVER
Hyatt's Ranch, Girdner Bend, Below Sycamore Warehouse and Kellers Pump

U. S. Engineer Office
Sacramento, California

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APPROPRIATION: Flood Control, General, and Flood Control, Sacramento, California.

24 July 1944

WAR DEPARTMENT

SPECIFICATIONS FOR CONSTRUCTION OF LEVEE SETBACK AND BANK PROTECTION

SECTION I - SPECIAL PROVISIONS

These Special Provisions describe and cover the particular work set forth herein. In case of discrepancy, the Special Provisions shall govern over the drawings and all other specifications covering this work.

Where technical specifications refer to specific items which are not included in this work, and to materials applicable only to them, such references shall be disregarded.

1-01. Location. The proposed work of levee construction is along the west and east levees of the Sacramento River, at the following four locations:

Hyatt's Ranch, Mile 103.7 to 104.2, Left Bank;
Below Sycamore Warehouse, Mile 131.3 to 131.8, Right Bank;
Girdner Bend, Mile 126.3 to 126.5, Right Bank;
Kellers Pump, Mile 160.4 to 160.6, Right Bank.

1-02. Work to be Done consists of furnishing all necessary plant, equipment, labor and material (except material to be furnished by the Government) and constructing the levee setbacks and bank protection, and performing all incidental operations in connection therewith, such as constructing appurtenant works, clearing, grubbing, and preparing the foundations in conformity with the typical sections shown on the drawings, to the lines and grades staked in the field, and in accordance with the applicable technical specifications and the additional requirements or modifications set forth in this paragraph.

The construction and placing of the woven lumber mattresses will not be a part of this contract and will be done by others. The contractor performing the work specified herein shall prosecute his work in coordination with the contractor placing the lumber mattresses and without any interference thereto.

The work to be done shall be divided into four parts according to the location and shall be of the following nature at each location

Part A - Hyatt's Ranch - Bank Protection
Part B - Below Sycamore Warehouse - Levee Setback and Bank Protection
Part C - Girdner Bend - Levee Setback
Part D - Kellers Pump - Bank Protection.

DETAILED DESCRIPTION OF WORK

(a) Required Excavation indicates that all material within the designated limits shall be excavated and removed to the grades and slopes staked in the field. Excavated material shall be used in the construction of embankments and berm fills; excess material shall be disposed of in the spoil areas as designated on the drawings. Spoil areas shall be left reasonably leveled.

TABLE OF REQUIRED EXCAVATION

From Station	To Station	Excavation Requirements
	PART "A"	
740+00 BK	768+80 AH	Required excavation from portion of existing levee on river side.
	PARTS "B" & "C"	
		No required excavation.
	PART "D"	
2+00	19+00	Required excavation from portion of existing levee on river side.

(b) Borrow for levee embankment shall be obtained from the borrow areas as shown on the drawings and in accordance with following types:

(1) Required Borrow indicates that all material within the designated limits shall be excavated and removed to the grades and slopes staked in the field.

(2) Borrow, other than required borrow, indicates that the material may be obtained from areas designated as available for borrow.

TABLE OF BORROW AREAS

From Station	To Station	Borrow Requirements and Location
	PARTS "A" & "D"	
		No borrow.
	PART "B"	
2011+00	2033+00	Required borrow from existing levee on river side.
	PART "C"	
0+00 BK	11+10 AH	Required borrow from existing levee on river side. Also portion of existing levee available for borrow, on river side.

(c) Levee Embankment. Levee embankment shall be constructed in accordance with Paragraph 4-02 and as shown on the drawings and to the dimensions as follows:

From Station	To Station	Crown Width Ft.	Land Side Slope	River Side Slope
	PARTS "A" & "D"			
	No levee embankment			
	PART "B"			
2010+58	2038+40.72	20	1 on 2	1 on 3
	PART "C"			
0+00 BK	11+10 AH	20	1 on 2	1 on 3

(d) Road Crossings and Levee Crown Surfacing.

(1) Road Crossings. Grades for road crossings shall be 8%; crown width, 14 feet. Surfacing shall be crushed rock as specified in Paragraph 7-04, 3 inches thick. Width of surfacing shall be 10 feet.

(2) Levee Crown Surfacing shall be crushed rock as specified in Paragraph 7-04, 3 inches thick, and to a width of 12 feet. At intervals of approximately 1,000 feet the width shall be increased 3 feet on each shoulder for a distance of 50 feet to provide turnouts; the location of new turnouts shall be such that this spacing will be maintained between new and existing turnouts.

TABLE OF ROAD CROSSINGS AND LEVEE CROWN SURFACING

Structure No.	Station	Type	Description
		PARTS "A", "C" & "D"	
			No road crossings and no levee crown surfacing.
		PART "B"	
1	2010+58 to 2038+00	-	Surface crown of levee
2	2010+58	S	Road Crossings, surfaced.

(e) Berm or Depression Fills. Fills shall be constructed across existing ditches, channels, pits or other depressions to the elevations of the adjacent natural ground. Depressions where water may be pocketed in the vicinity of the berm or levee shall be filled as directed. Berm fills shall be constructed at the locations and to the lines and grades tabulated below.

Sturture No.	From Station	To Station	Description of Work
		PART "A"	
-	740+00 BK	768+80 AH	Construct berm fill, 1% slope as shown, on river side.
		PARTS "B" & "C"	
			No berms or depressions.
		PART "D"	
1	690+50	694+50	Construct berm fill as shown, on river side.

(f) Inspection Ditches shall be excavated to the sections and between the stations shown in the following table:

From Station	To Station	Section
	PARTS "A" & "D"	
		No inspection ditch.

From Station	To Station	Section
	PART "B"	
2013+00	2036+60	11' flat bottom, 6 foot minimum depth, with side slopes 4 vertical on 1 horizontal.
	PART "C"	
2+17 BK	10+00 AH	11' flat bottom, 6 foot minimum depth, with side slopes 4 vertical on 1 horizontal.

(g) Irrigation and Drainage Ditches shall be constructed at the locations shown below and in conformity with the dimensions, alignment and grades shown on the drawings or as staked in the field.

Structure No.	From Station	To Station	Description of Work
		PARTS "A" & "D"	
			No irrigation or drainage ditches.
		PART "B"	
3	2012+00	2034+90	Construct irrigation ditch at toe of levee, land side.
5	2023+80	2034+80	Construct irrigation ditch 100' from toe of levee, land side.
		PART "C"	
-	1+00 BK	11+10 AH	Construct irrigation ditch at toe of proposed levee setback, land side.

(h) Existing Irrigation Ditches. Where irrigation ditches are to be realigned, the portion of the ditches to be abandoned shall be filled and paid for as specified in Paragraph 4-12.

(i) Connecting Existing Spur Levees to New Levees. The connections of the existing spur levees to the new levees shall be made in accordance with the requirements of Paragraph 4-02, and as tabulated below:

Structure No.	Station	Description of Work
	PARTS "A", "C" & "D"	
		None
	PART "B"	
4	2013+90	Connect existing spur levee to the new levee.

(j) Miscellaneous Work.

(1) General. Miscellaneous work shall be done at the locations indicated below and in accordance with the requirements specified.

(2) Concrete shall be Class "A" Concrete. When reinforced concrete is specified, reinforcing steel shall be furnished by the contractor and installed in accordance with the requirements of Section VI.

(3) Cobble Paving. Cobbles will be furnished by the Government and installed by the contractor in accordance with the requirements of Section IX. All cobbles to be installed will pass a 12 inch ring and all be retained on a 3 inch ring, and not more than 25% will be less than 6 inches in the least dimension.

(4) Payment. Payment for miscellaneous work will be made at the contract price for the job complete, where so stated, which price shall include full compensation for excavation and backfill, for performing all other work necessary to remove, reinstall, or relocate, save or waste as required, all pipe, concrete and other structures as described and specified in the following table; otherwise payment will be made at the applicable unit prices.

Structure No.	Stations	Description of Work
	PART "A"	
-	768+80 AH to 740+00 BK	Place Government furnished cobbles on river side.
	PART "B"	
-	2033+00 to 2011+00	Place Government furnished cobbles on river side.
	PART "C"	
-		No cobble paving.

Structure No.	Stations	Description of Work
	PART "D"	
-	2+00 to 19+00	Place Government furnished cobbles on river side.
2	691+50	Remove and replace approximately 75' of 18" diameter steel pipe. Construct reinforced concrete saddle at water surface and cable and deadman anchorage to pipe below water. One job complete, Item No. 4 (Part "D").

1-03. Drawings.

(a) The work shall conform to the following drawings which form a part of the specifications, and are filed in the U. S. Engineer Office, Wright Building, 1209 Eighth Street, Sacramento, California.

File	Division	Drawing	Sheet No.	Drawing Title
50	4	2211	1	Standard Bank Protection at Hyatt's Ranch.
50	4	2210	1	Proposed Levee Setback and Standard Bank Protection below Sycamore Warehouse.
50	4	2208	1	Proposed Levee Setback at Girdner Bend.
50	4	2207	1	Proposed Bank Protection at Kellers Pump.
50	4	1717	1	Typical Road Approaches.

(b) The work shall also conform to such other drawings relating thereto as may be exhibited in the office of the contracting officer prior to the opening of proposals and to such additional drawings in explanation of details or minor modifications as may be furnished by the contracting officer from time to time during construction, including such changes as he may consider necessary because of special conditions encountered during prosecution of the work.

(c) Prior to execution of the work, the contractor shall check all drawings and specifications, and shall immediately report all errors, discrepancies, conflicts and omissions discovered therein to the contracting officer. All such errors, discrepancies, conflicts and omissions

will be adjusted by the contracting officer. Any adjustments made by the contractor without prior approval, shall be at his own risk, and the settlement of any complications arising from such adjustment shall be made by the contractor at his own expense, and to the satisfaction of the contracting officer.

(d) Ownership of Drawings. All drawings, specifications and memoranda relating to the work are the property of the Government and are to be carefully used and returned to the contracting officer at completion or cessation of the work for any cause.

(e) Contract Drawings to be Furnished. Ten (10) sets of drawings and specifications will be furnished the contractor without charge. Additional prints can be secured upon request at cost of reproduction.

1-04. Quantities. The total estimated quantities necessary to complete the work described in Paragraph 1-02 are as follows:

SCHEDULE OF WORK ITEMS

Item No.	Description	Quantity	Unit
	PART "A"		
1	Excavation	60,000	Cu. Yd.
2	Water for Compaction and Sprinkling, applied as directed	1,000	M. Gals.
3	Place Government furnished Cobbles	10,000	Ton
	PART "B"		
1	Excavation	160,000	Cu. Yd.
2	Water for Compaction and Sprinkling, applied as directed	3,000	M. Gals.
3	Place Government furnished Cobbles	10,000	Ton
4	Crushed Rock, in place	550	Ton
	PART "C"		
1	Excavation	60,000	Cu. Yd.
2	Water for Compaction and Sprinkling, applied as directed	2,000	M. Gals.

SCHEDULE OF WORK ITEMS (Cont'd.)

Item No.	Description	Quantity	Unit
	PART "D"		
1	Excavation	55,000	Cu. Yd.
2	Water for Compaction and Sprinkling, applied as directed	1,000	M. Gals.
3	Place Government furnished Cobbles	11,000	Ton
4	Remove and replace approximately 75' of 18" diameter steel pipe. Construct reinforced concrete saddle, and cable and deadman anchorage	1	Job

1-05. Commencement, Prosecution and Completion.

(a) The contractor will be required to commence work under the contract within three (3) calendar days after date of receipt by him of notice to proceed.

(b) The work shall be prosecuted with faithfulness and energy, at a uniform rate, so that the entire work shall be completed within 120 calendar days after receipt by him of notice to proceed or after date of acceptance of a letter order, except as provided for in Paragraphs 2-05 and 4-10(c) of these specifications, provided that should the total quantity of the excavation to be paid for under Item 1 of the contract exceed the quantity used in canvassing bids as stated in Paragraph 1-04 of the specifications, additional time will be allowed at the rate of one calendar day for each 3,000 cubic yards in excess of such estimated quantity.

(c) Delays Due to National Defense Priorities. If the completion of the undertaking to be performed under the terms of this contract be delayed by reason of delay in the delivery of materials or supplies essential to such performance because of national defense priorities and without the fault or negligence of the contractor, the time of performance will be extended for a period equal to such delay, as determined by the contracting officer and subject to appeal, as provided in Article 9 of the contract.

1-06. Approved Wage Rates.

(a) The minimum wages to be paid laborers and mechanics on this project as determined by the Secretary of Labor to be prevailing for the corresponding classes of laborers and mechanics employed in projects of a character similar to the contract work in the pertinent locality, are as follows:

Labor Classification	Minimum Rate Per Hour
SUTTER COUNTY	
Blacksmiths	$ 1.10
Blacksmiths helpers	.80
Carpenters, journeymen	1.375
Cement finisher	1.50
Firemen and oilers (shovels)	1.10
Firemen and oilers (piledrivers)	1.20
Iron workers, reinforcing	1.50
Laborers, unskilled	.90
Piledrivermen	1.54
Powdermen	1.0625
Power equipment operators:	
Mixers, under 1 yard	1.25
Mixers, 1 yard and over paving	1.50
Motor graders	1.625
Piledrivers	1.75
Pumps	1.25
Rollers	1.50
Shovels and draglines (1 yard and under)	1.60
Shovels and draglines (over 1 yard)	1.75
Tractors	1.50
Tractors tandem or with boom	1.75
Truck drivers, dump, less than 4 yards (water level)	.90
Truck drivers, dump, 4 yards and less than 8 yds.	1.0625
Truck drivers, dump, 8 yds. and less than 14 yds.	1.25
Truck drivers, dump, 14 yds. and less than 18 yds.	1.3125
Truck drivers, dump, 18 yds. and over	1.4375
Truck drivers, pickup, carrying under 1000 lbs.	.875
Truck drivers, flat rack, carrying between 1000 and 4500 pounds	1.00
Truck driver, flat rack, carrying over 4500 pounds	1.00
Welders - receive rate prescribed for craft performing operation to which welding is incidental.	
COLUSA COUNTY	
Boilermaker	1.65
Boilermaker, helpers	1.40
Carpenters, journeymen	1.375
Cement Finishers	1.50
Electricians	1.70
Electricians apprentices:	
1st 6 months $3.00 per day	
2nd 6 months $3.50 per day	
3rd 6 months $4.00 per day	
4th 6 months $4.50 per day	
5th 6 months $5.00 per day	
6th 6 months $6.00 per day	
7th 6 months $7.00 per day	
8th 6 months $8.00 per day	

Labor Classification (Cont'd)	Minimum Rate Per Hour
Firemen and oilers	1.10
Iron workers, structural	1.75
Iron workers, reinforcing	1.50
Laborers, unskilled	.90
Painters, brush	1.43
Power equipment operators:	
Air compressors	1.25
Cranes, derricks	1.75
Mixers (less than 1 yard)	1.25
Mixers (1 yard and over, paving type)	1.50
Motor graders	1.625
Power graders	1.625
Shovels and draglines, less than 1 yd.	1.60
Shovels and draglines, 1 yd. and over	1.75
Tractors	1.50
Tractors tandem	1.75
Truck Cranes	1.60
Sheet metal workers	1.50
Sheet metal workers apprentices:	
1st 6 months 35% of journeymen's rate	
2nd 6 months 40% of journeymen's rate	
3rd 6 months 45% of journeymen's rate	
4th 6 months 50% of journeymen's rate	
5th 6 months 55% of journeymen's rate	
6th 6 months 60% of journeymen's rate	
7th 6 months 70% of journeymen's rate	
8th 6 months 80% of journeymen's rate	
Teamsters	.875
Truck drivers, dump - under 4 yards	.90
Truck drivers, dump - 4 yds. and under 8 yds.	1.0625
Truck drivers, dump - 8 yds. and under 14 yds.	1.25
Truck drivers, dump - 14 yds. and under 18 yds.	1.3125
Truck drivers, dump - 18 yds. and over	1.4375
Truck drivers, flat rack, under 1000 lbs.	.875
Truck drivers, flat rack, carrying 1000 lbs. and over	1.00

(b) Any class of laborers and mechanics not listed in the preceding paragraph, which will be employed on this contract, shall be classified or reclassified conformably to the foregoing schedule by mutual agreement between the contractor and class of labor concerned, subject to the prior approval of the contracting officer. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question accompanied by the recommendation of the contracting officer, shall be referred to the Secretary of Labor for final determination. The wages specified in this Schedule shall be the maximum wages to be paid, subject, however, to Executive Order No. 9250, and the General Orders and Regulations issued thereunder.

1-07. Material to be Furnished by the Government and Installed by the Contractor. The Government will furnish to the contractor as a free issue, the material listed herein, f.o.b. job sites. The contractor will be required to accept delivery when made, unload and transport same to the construction site at his own expense. All material so furnished shall remain the property of the Government.

(a) All cobble stones.

SECTION II - GENERAL PROVISIONS

2-01. Definitions. Wherever in the specifications or upon the drawings the words directed, required, permitted, ordered, designated, prescribed, or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the contracting officer is intended, and similarly the words approved, acceptable to or satisfactory to the contracting officer, unless otherwise expressly stated.

2-02. Work Covered by Prices Bid. The unit contract prices shall include all costs of furnishing all labor, plant and equipment and material (except earth for levee construction and material which these specifications specifically provide will be furnished by the Government), and performing all operations called for by the contract and the specifications.

2-03. Order and Conduct of Work. The right is reserved to designate the exact locality at which the work shall be prosecuted and the proportion of the force that shall be worked at such designated locality; and at the time when incidental work shall be done.

2-04. Quantities. The quantities are approximate and are given only to provide a basis for canvassing bids and for determining the amounts for bonds and may be increased or decreased by not more than twenty-five (25) percent. This variation will apply to each applicable item individually except as otherwise specified.

2-05. Right-of-Way and Material. The right-of-way and earth for constructing the levee will be furnished without cost to the contractor, at the locations shown on the drawings and as specified.

Days upon which work is prevented by failure to provide necessary right-of-way or earth will not be counted against the contractor as delay in completion of contract or in computing the time stipulated in Paragraph 1-05 for commencement of work; but no claim is to be made by the contractor for damage or expense occasioned by delay for failure to provide right-of-way or earth. If right-of-way or earth for any portion of the work is not available by the time construction has progressed thereto, the contracting officer will have the right to omit such portion of the work from the contract.

2-06. Existing Fences. All fences which are disturbed by the operations of the contractor shall be maintained and restored to as good condition as they were when the work was begun. Fence materials removed may be used in restoring fences provided they are not broken or damaged. Any materials which are rendered unsatisfactory by their removal or method of preservation, whether due to the condition of the materials before removal or to the methods used by the contractor, shall be replaced with new material. All new material required for reconstruction of fences shall be furnished by the contractor at his own expense and no specific payment will be made therefor.

2-07. Line, Location and Dimension Notes. The center line and toes of the levee will be staked out by an agent of the United States. All stakes or other survey marks, shall be preserved by the contractor until he is authorized to remove them. The right is reserved to make such changes in the location of the line as may be found necessary before the completion of the work, but if it becomes necessary, through no fault of the contractor, to abandon any line of location on which work has been done, all yardage placed, or other required work done, will be included in the estimate for payment. Notes will be made available to the contractor showing in detail all information as to grades, cross sections, and dimensions.

2-08. Modification of Specifications. The right is reserved to make such changes in the work contemplated under these specifications as may be necessary or expedient to carry out the intent of the contract or to meet conditions not now anticipated, but no such modification shall be made the basis of a claim for extra compensation, except as provided in the regular form of contract to be entered into. (See Article 3 of contract.)

2-09. Inspection. Proper inspection will be maintained on the work to make the necessary measurements and to insure compliance with the terms of the contract and with the orders of the contracting officer. No instructions of an inspector or lack thereof will at any time relieve the contractor from the responsibility of complying fully with all the requirements of the contract. In case of difference of opinion arising between the inspector and the contractor or his agents, appeal may be made to the contracting officer. Inspectors are not authorized to waive or alter in any respect any of the terms or requirements of the contract, nor to make additional requirements, nor to grant extensions of time limit, nor to waive damages. The contractor will not be entitled to payment for any improper work accepted or allowed by an inspector.

2-10. Liability of the Contractor and Safety Requirements.

(a) The contractor will be held liable until final acceptance as specified under Paragraph 2-16 for any damage to or destruction of work due to faulty construction; and until his liability terminates as provided in the following subparagraph, he will be held liable for and shall promptly repair, at his own expense, all damage sustained by the work from any cause whatever except foundation failure not due to faulty construction or damage by enemy operations.

(b) When the contractor has completed a continuous length of five or more full stations of levee, (including structures, dressing, gravelling, timber felling, fencing, cleanup and all other incidental work applicable), his liability with respect thereto for damage or destruction not due to faulty construction, after inspection and approval of the same, shall terminate.

(c) The contractor shall be responsible that his employees strictly observe the laws of the United States affecting all operations at the site under contract. He shall comply with all applicable Federal and State

laws under which he is operating, including those concerning the inspection of boilers; and other equipment, the licensing of engineers, masters and other employees.

(d) The contractor shall conduct the work with due regard to adequate safety and sanitary requirements and shall maintain his plant and equipment in safe condition. He shall conform to current safety engineering practices as set forth in Safety Requirements in Excavation-Building-Construction approved by the Chief of Engineers, as amended 12 February 1944 to include Chapter 8318 entitled "Motor Vehicles"; and with all applicable State or local sanitary laws, regulations and ordinances.

(e) When the use of explosives is necessary for the prosecution of the work, the contractor shall take the utmost care not to endanger life or property. Caps or other exploders or fuses shall in no case be stored, transported or kept in the same place in which dynamite or other explosives are stored, transported, or kept. All exploders and explosives shall be stored in a secure manner in compliance with local laws and ordinances and all such storage places shall be marked clearly "DANGEROUS - EXPLOSIVES." The contractor shall comply with all Federal, State and Local regulations governing transportation, storage and use of explosives.

(f) The contracting officer will require such safety and sanitary measures to be taken as the nature of the work and the conditions under which it is to be performed demand. Such measures will include the providing of:

(1) Adequate extinguishers or fire-fighting apparatus in and about all buildings and plant erected or used at the site of the work;

(2) Adequate life-saving equipment;

(3) Adequate illumination during night operations;

(4) Watchman service at railroad crossings in the proximity of the project used by the contractor's equipment in transporting materials to the site and by employees for access to the site;

(5) Warning lights between sunset and sunrise and during fogs, on all cofferdams, vessels, range pilots and other obstructions placed in navigable waters during the progress of the work;

(6) Instructions in accident prevention to reach all employees;

(7) Such machinery guards, safe walkways, scaffolds, ladders, bridges, gang planks and other safety devices, equipment and apparel as are necessary to prevent accidents or injuries.

(g) The contractor shall promptly report to the contracting officer in form prescribed by him all accidents occurring at the site of the work.

(h) The contracting officer will notify the contractor in writing of any non-compliance with the foregoing provisions and the corrective action to be taken. If the contractor fails or refuses to promptly comply, the contracting officer may issue a stop order suspending all or any part of the work. Such stop order shall be sent by registered mail to the contractor at the site of the work and shall be accepted by him as a sufficient notice thereof. Work will thereupon be suspended as directed. When satisfactory corrective action is taken, a resumption order will be issued. No part of the time lost due to any such stop order shall be made the subject of a claim by the contractor for extension of time or for excess costs or damages.

2-11. Public Utilities and Private Improvements. It is anticipated that buildings, pole lines, signs and other public utilities and private improvements that would interfere with or be replaced by new construction, will be removed to new locations by the owners or by the State of California, or its agents, or removed and disposed of in advance of construction operations. The contractor shall notify the contracting officer at least 30 days in advance of the date on which work will be started requiring the removal of such utilities or improvements. The contractor's attention is directed to the possible existence of pipe lines or other public utilities or private improvements which may be buried within the limits of the work or adjacent thereto and which may or may not be shown on the plans. Care shall be taken to preserve and protect any such improvements from injury or damage during construction operations and the contractor shall assume full responsibility for reimbursing the owners for any damage or injury to their properties or interference with their service, which may be caused by his operation.

2-12. Highway and Railway Facilities. The contractor shall conduct his operations at highway crossings so as to offer the least possible obstruction and inconvenience to public traffic, and all traffic shall be permitted to pass through the work.

The contractor shall furnish, erect and maintain such fences, barriers, lights and signs as are necessary to give adequate warning to the public at all times of any dangerous condition to be encountered as a result of his operations. At any and all points along the work where the nature of construction operations in progress and the equipment and machinery in use are of such character as to endanger passing traffic, the contractor shall provide such lights and signs and station such guards as may be necessary to insure against accidents and avoid damage or injury to passing traffic.

The contractor shall conduct the levee work in the vicinity of all railroad facilities in such manner that no damage or injury will be caused to said properties and also that no delay shall be caused to traffic on said railway, and shall indemnify and save harmless said railway company from and against any and all loss, damage, claims, demands or causes of action caused directly or indirectly by any such damage, injury or delay, whether to person or property.

2-13. Patents. The contractor shall hold and save the Government, its officers and agents, servants and employees, harmless from liability of any nature or kind, including costs and expenses, for or on account

of any patented invention, article or appliance manufactured or used in the performance of this contract, including their use by the Government, except for any invention pertaining to item _ None_ _ of Article 1 of the contract. The Government shall hold and save the contractor harmless from liability of any nature or kind, including costs and expenses for infringement of patent rights pertaining to item _ None_ _ of Article 1 of the contract.

2-14. Rates of Wages. Pursuant to the provision of Article 17 of the contract, the wage rates have been determined by the Department of Labor and are set forth in Section I.

2-15. Accommodations for United States Employees. If the contractor maintains on the work an establishment for the lodging and subsistance of his own employees, he shall, when required, provide lodging and subsistence of suitable quality for the Government employees required to remain on the work, for which the contractor will be paid by the United States at the rate of $1.00 per day for each Government employee lodged and 50 cents per meal for each Government employee subsisted.

2-16. Payment and Acceptance.-

(a) Payment will be made monthly on estimates covering levee material placed; other materials furnished and placed; and/or other items of work done, and not included in prior estimates.

(b) Ten percent will be reserved from each payment upon each item until all the work under the contract is fully completed and accepted; provided, however, that after 50 percent of the work has been completed and paid for, the contracting officer may, as they become due, make any of the remaining partial payments in full.

(c) When all the requirements of the contract and specifications have been fully met, the work will be accepted and final payment made therefor including the retained percentage.

SECTION III - CLEARING AND GRUBBING

3-01. General. The work covered by this section of the specifications shall consist of furnishing all labor, equipment and materials necessary to perform the clearing of the areas designated on the drawings, or herein specified, of all trees, down timber, snags, brush, rubbish and all other objectionable material and vegetation; the grubbing of stumps, roots, and matted roots; and the removal or disposal of all spoil material in areas indicated on the drawings or designated by the contracting officer.

3-02. Clearing.

(a) Areas to be cleared shall include:

(1) The area within the limits of the levee foundation, together with strips five (5) feet wide beyond and contiguous to the toe line on each side of the levee, except where the toe of levee is less than five (5) feet from the right-of-way line, in which case the clearing shall extend to the right-of-way line.

(2) All borrow areas.

(3) Any other area designated on the drawings or required by the Special Provisions.

(b) The areas specified shall be cleared of all vegetable growth, such as trees, logs, upturned stumps, roots of down trees, brush, heavy growth of grass and weeds, and all other objectionable material. Trees shall be felled in such manner as to avoid damage to trees to be left standing, to existing structures and installations and those under construction, and with due regard for the safety of employees and others.

(c) Each borrow area shall be cleared of trees and brush at least seven (7) days prior to the commencement of excavation in that area. When any borrow area has been cleared of trees and brush as specified, and before the commencement of grubbing operations, the Government will cross-section the borrow area for the determination of excavation quantities for payment purposes. Excavation incurred in grubbing after cross sections are taken will be included in the payment quantities.

3-03. Grubbing. The areas to be grubbed are those for which clearing is required.

All such areas shall be thoroughly grubbed of all stumps, roots, buried logs, and other objectionable matter. Tap roots and projections over 1-1/2 inches in diameter within the limits of construction shall be grubbed out to a depth of four (4) feet below the natural surface of the ground, unless otherwise directed.

Except in borrow areas, all grubbed holes shall be refilled with suitable material and compacted to a unit weight at least equal to that of the adjacent natural ground. Payment for refilling grubbed holes will be made as specified in Paragraph 3-05(b)(1).

3-04. Disposal of Cleared and Grubbed Materials. All timber, except such timber as may be ordered used or saved, all logs, brush, stumps, roots, rotten wood, and other refuse from the clearing and grubbing operations shall be burned, provided, however, that when permitted in writing, logs and large stumps may be otherwise disposed of as directed. Such permit will state the conditions covering disposal of such logs and stumps, including designation of the areas in which they may be placed. Timber to be disposed of by burning shall be burned at designated locations to avoid all hazards to the work, including existing structures, trees and construction in progress. The contractor shall be responsible for compliance with all Federal and State laws and regulations relative to the building of fires. Disposal by burning shall be in a safe manner and all burning shall be done under constant attendance until fires have burned out or have been extinguished.

3-05. Payment for the work specified and required in this section will be made as follows:

(a) Clearing. No separate payment will be made for clearing, and all costs in connection therewith, including the disposal of cleared material, shall be included in the contract unit price for Excavation.

(b) Grubbing. No separate payment will be made for grubbing and disposal of grubbed materials and except as noted in Paragraph 3-02(c), all costs in connection therewith shall be included in the contract unit price for Excavation.

(1) In all areas, except borrow areas, the material required and authorized for filling grubbed holes and the water required to compact it, will be paid for at the contract unit prices for Excavation and Water for Compaction and Sprinkling, applied as directed, respectively.

SECTION IV - EARTHWORK

4-01. General. The contractor shall place, grade and consolidate materials required for the levee embankment to the elevations, lines grades and cross-sections shown on the drawings and staked in the field, with sufficient additional material so that after shrinkage the required net levee section will be obtained. The contractor shall use suitable materials obtained from approved borrow areas as shown on the drawings.

(a) Levee Section. Unless otherwise shown or specified, the net levee section shall have a crown width of twenty (20) feet, a land side slope of 1 vertical on 2 horizontal and a river side slope of 1 vertical on 3 horizontal. The levee crown shall be sloped from the center line each way toward the crown edges on a five percent (5%) slope downward. The levee grade line shall be considered to be the edges of the net levee crown. Material shall be placed and compacted to the gross levee section which will be staked in the field in accordance with the drawings or as otherwise specified. The gross sections, as staked, will include the applicable shrinkage percentages necessary to obtain the specified net section after full shrinkage has taken place.

(b) Shrinkage Percentages. For estimating purposes the percentages of shrinkage may be taken as follows:

(1) Five percent (5%) vertical increase in grade, when levees are constructed with hauling or dragline equipment or by hydraulic dredge equipment.

(2) Seven and one-half percent (7-1/2%) vertical increase in grade, when embankments are constructed with clamshell dredge equipment.

(3) The right is reserved to increase the above shrinkage percentages for the various methods of construction when, the nature of the material or the conditions of placement require an increase to obtain the specified net cross-section after shrinkage.

4-02. Embankment. The embankment shall be constructed of earth free from brush, roots, sod or other perishable or unsuitable matter. The earth used shall produce a well-compacted embankment that in the absence of serious foundation failure is stable both during construction and after completion. Fills shall be started fully out to the slope stakes. The inspection ditch backfill, the portion of the levee directly above the inspection ditch, and the riverward slab portion of the levee embankment, shall be constructed of the most impervious material obtainable. The right is reserved to require that borrow material be obtained from selected portions of the borrow areas or inspection ditch excavations for placement in the portions of the proposed levee embankment specified above.

The contractor shall be responsible for the stability of all embankments and shall replace, at his own expense, any portions which become displaced due to carelessness or negligence on the part of the contractor.

(a) Preparation of Foundation. After the surface between the slope stakes has been cleared and grubbed as specified in Section III, it shall be thoroughly broken and turned to a depth of six (6) inches. If, for any cause, this broken surface becomes compacted, it shall again be thoroughly broken before the depositing of any material thereon.

(b) Inspection Ditch. When required in the Special Provisions, an inspection ditch of the dimensions specified and shown on the drawings shall be excavated in the levee base. The ditch excavation shall precede the embankment construction by not less than 200 feet. After inspection and approval, the ditch shall be backfilled with approved impervious material compacted to a unit weight at least equal to that of the adjacent undisturbed natural ground. The excavated material, if satisfactory for the purpose shall be replaced in the inspection ditch or otherwise placed within the limits of the levee section as directed. Excavated material which is unsuitable for backfilling inspection ditch or for levee embankment shall be disposed of in an approved manner.

Payment for inspection ditch, including the portion of the existing levee required to be excavated, will be made at the contract unit price for Excavation.

(c) Placing, Watering and Compacting. (Layer Method).

(1) Placing. Embankments constructed with hauling or dragline equipment shall be constructed in approximately horizontal layers to gross section and each successive layer compacted as specified herein. The contractor may use any suitable method of placing the borrow pit material in the embankment in an approved condition. After dumping, the material shall be spread on the prepared foundation area or on the embankment, in layers not to exceed six (6) inches in thickness before compaction. The top surface of the embankment during construction shall be kept sloped with a grade not to exceed 5 percent so that the top will drain freely toward the riverward slope. If the compacted surface of any layer is too smooth to bond properly with the succeeding layer, it shall be roughened or loosened by scarifying, as directed, before the succeeding layer is placed thereon.

(2) Moisture Control. Each layer of material shall contain the proper amount of moisture during compaction, with the moisture uniformly distributed throughout the layer. The application of water to the material shall be at the site of the excavation insofar as practicable, and shall be supplemented by sprinkling the layers of embankment during compaction, as directed. The contractor shall be responsible for any application of water in excess of the amounts ordered to be applied on the material in the borrow pits or on the embankment and no compensation will be allowed for such excess. The contractor shall provide the water and facilities for measuring and applying it at all points of the work. The contracting officer shall determine the amount of water to be applied to any particular material in order that the required compaction will be obtained by the specified methods. When water is added to the material by approved sprinkling in place on the embankment, the uniform distribution of moisture throughout the layer which is being placed shall be attained in the following manner:

When using tractor down scrapers, Le Tourneau type or equal, of not less than 12 cubic yard capacity, scrapers shall be turned on the embankment after dumping and routed empty over the sprinkled area with the scraper lip dragging, as directed.

For all other methods and equipment, or when directed for certain types of embankment material, the material shall be harrowed, disced or otherwise satisfactorily mixed prior to compaction by rolling.

(3) Compacting. Embankment material shall be compacted as follows:

a. When the material is deposited and spread with tractor drawn scrapers, Le Tourneau type or equal, of not less than 12 cubic yard capacity, compaction shall be obtained by routing the loaded hauling and/or spreading equipment over the entire width of each layer of material.

b. When approved equipment of less than 12 cubic yards capacity is used, compaction shall be obtained by twelve (12) passes of a sheepsfoot roller, as directed. The roller shall be pulled by a crawler type tractor at a uniform speed of approximately 2-1/2 miles per hour. Each successive path of rolling shall overlap the preceding or adjacent path by not less than 2 feet. If the moisture content is greater or less than that required for compacting, the rolling shall be delayed until the proper moisture content has been obtained.

The roller shall be water ballasted or sand ballasted, having tamping feet uniformly staggered over its cylindrical surface, and equipped with cleaners. Each tamping foot shall project approximately 7 inches from the roller's cylindrical surface and shall have a face area of not less than 5 and not more than 7 square inches. The spacing shall provide one tamping foot for each square foot of cylindrical surface. Provision shall be made for reduction in the number of tamping feet, if required. The total weight of the roller in pounds when ballasted, divided by the total area of the maximum number of tamping feet in one row parrallel to the axis of the roller shall be not less than 250 pounds per square inch. The design and operation of the tamping roller shall be subject to approval.

(d) Placing by Other Methods. When the embankment is to be constructed entirely of sand or naturally wet material not adapted to the layer and rolling method, and where specifically directed, the material may be placed and compacted by any approved method, provided that proper compaction is obtained and all other applicable conditions of the specifications are complied with.

4-03. Slab Construction. In cases of slab construction, where the hauling equipment is too wide to properly place and compact the required fill, the contractor may excavate the existing embankment slopes only in an amount sufficient to provide necessary width for operation of the equipment. Such excavated portions shall be backfilled with the removed material and compacted as specified for levee embankment at the contractor's expense and no payment will be made therefor.

4-04. Unsuitable Embankment Material. When directed, the contractor shall excavate from the ground to be occupied by the levee or from the old levee being enlarged, or from the borrow pits designated herein, any material which is considered unsuitable for levee embankment and shall dispose of it in an approved manner and in such areas which have been designated by the contracting officer. Payment for such work, when authorized, will be made at the contract unit price for Excavation.

4-05. Slides. In case of the sliding of any part of the levee during its construction, or after its completion, but prior to its acceptance, the contractor shall, upon written order, remove all slide material and reconstruct all slide portions of the levee, as directed. If the slide is caused through fault of the contractor, the foregoing operations shall be performed by the contractor at his expense. If the slide is caused through no fault of the contractor, both the yardage ordered removed and the yardage replaced will be paid for at the contract unit price for Excavation, and at the contract unit price for Water for Compaction and Sprinkling, applied as directed.

4-06. Dressing. The embankment shall be brought to not less than the gross cross-section at all points. Excess material shall be evenly distributed over the section so that no pronounced irregularities remain on crowns or slopes. Material placed in excess of two-tenths of one foot (0.2') above the gross grade and section will not be paid for. Such excess material measured in place plus 25% increase will be deducted from borrow pit measurements for Excavation payment. All levee faces which are constructed to obtain, after shrinkage, slopes of 1 vertical on 3 horizontal or flatter, shall be dressed by traversing the entire slope surface with a track type tractor equipped with street pads and dragging a bulldozer blade or by other equipment and methods, when approved. The crown edges shall be finished by slightly rounding. No separate payment will be made for dressing levee slopes and all costs in connection therewith shall be included in the contract unit price for Excavation.

4-07. Borrow Pits. The location of borrow pits shall be as designated on the drawings and the detailed method of excavation shall be as specified in the Special Provisions. Where required, traverses and access ramps shall be constructed across the borrow pits as specified in Paragraph 4-08.

No borrow material shall be obtained within forty (40) feet of the base of the levee on the river side, nor within one hundred (100) feet on the land side. Slide slopes of pits next to the embankment shall be one (1) vertical on three (3) horizontal both on the river side and on the land side. Other side slopes of pits shall be as specified or shown.

In determining permissible depth of borrow, the original natural ground surface at the site of the work shall be used instead of the surface of existing borrow pits. Any excavation below the specified borrow pit slopes and elevations shall be immediately refilled to the specified slope and elevations plus twenty-five percent (25%) additional material for shrinkage, by and at the expense of the contractor.

All areas from which borrow is obtained shall be left reasonably smooth in accordance with the requirements of the Special Provisions.

4-08. Access Ramps Across Existing Borrow Pits. The contractor will be permitted to construct, at approved locations, access ramps across the existing borrow pits. These ramps shall have a maximum top width of 15 feet, side slopes of 1 vertical on 2 horizontal and constructed to a height above water as determined in the field, unless otherwise specified in the Special Provisions. Ramps for which payment will be made shall be constructed to the dimensions specified above and at a minimum spacing of 500 feet apart. The contractor may construct additional ramps or enlarge proposed ramps at approved locations, at his own expense, and for which no payment will be made. The contractor shall investigate local conditions to determine the required flowage through all ramps, and install pipes of adequate size to maintain this flow. No payment will be made for installing pipes for maintaining flow. At the termination of their usefulness to the contractor all ramps shall be cut at the end farthest from the levee in such a manner as to leave an opening 20 feet wide at the maximum depth of the old borrow pit, with end slopes of 1 vertical on 2 horizontal.

Payment for constructing authorized ramps across existing borrow pits and also for excavating the 20 ft. opening as specified will be made at the contract unit price for Excavation.

4-09. Access Ramps over Existing Levees. The contractor will be permitted to construct access ramps over the existing levee, at approved locations. Material removed from the existing levee shall be replaced in such a manner as to restore the levee to its original section, and the material replaced shall be compacted as specified for levee embankment. Excess material placed outside of the gross levee section shall be removed unless otherwise directed. All work required for constructing these ramps and replacing and compacting the material removed from the existing levee and for removing excess material shall be done by the contractor at his own expense, and no payment will be made therefor.

4-10. Old Levees and Other Embankment.

(a) All existing levees, parts of levees, sub-levees, spurs or other fills must be left undisturbed unless otherwise specified or designated on the drawings.

When material is authorized to be taken from an existing levee for the construction of a new levee, the new levee is to be constructed to the gross section concurrently with the removal of the existing levee. Sufficient material shall always be left in the existing levee for the emergency construction of a tie-in levee between the existing levee and the new levee. Tie-in levees, when ordered, shall be constructed in accordance with the requirements of Paragraph 4-02, to a height, not less than flood plane elevation, and to the section as approved by the contracting officer. Material and water required for the construction of authorized tie-in levees will be paid for respectively, at the contract unit price for Excavation and at the contract unit price for Water for Compaction and Sprinkling, applied as directed.

(b) Should the contractor in an emergency, after specific notification from the contracting officer, fail to provide without delay the necessary tie-in levee and/or complete all portions of the new levee to the approved section, the contracting officer shall have the right to employ the necessary equipment and to perform such work at the contractor's expense. However, yardage of material placed by the contractor both in the new levee and in the tie-in levee will be paid for at the contract unit prices for Excavation and Water for Compaction and Sprinkling, applied as directed.

(c) The contracting officer reserves the right to suspend the contractor's operations for any period or periods of time during the flood season, when in his opinion the method of construction, the flood condition or other conditions jeopardize the safety of either the new or the existing levee and it is necessary to eliminate the danger of overflow occasioned by unseasonable construction.

No claim shall be made by the contractor for damage or expense occasioned by such suspension of operations. Intervals during which work is ordered suspended will not be counted as part of the contract period.

4-11. Irrigation and Drainage Ditches. All ditches and channels indicated on the drawings or ordered by the contracting officer shall be excavated true to lines and grades staked in the field. Suitable excavated material shall be disposed of by placing in levee embankments. Unsuitable material shall be disposed of at the locations indicated, or directed.

Payment for excavating ditches and channels will be made at the contract unit price for Excavation.

4-12. Existing Ditches and Channel Filling. All existing ditches, channels, pits, or other depressions, within 100 feet of the base of the enlarged or constructed levee on the land side and within 40 feet on the river side shall, when directed or specified in the Special Provisions, be filled to the natural surface of the ground. Payment therefor will be made at the contract unit price for Excavation.

4-13. Sprinkling Roads. All roads used for hauling, for ingress and egress to the site of the work, or for other operations by the contractor, in or adjacent to hop fields, orchards, or any field crop or in the vicinity of residences, shall be suitably sprinkled as often as required to control dust nuisance. The contractor shall provide the water and facilities for measuring and applying the required amounts thereof. Payment therefor will be made at the contract unit price for Water for Compaction and Sprinkling, applied as directed.

4-14. Measurements for payment of earth work specified in this section will be made on the following basis:

(a) The volume of excavated material shall be the number of cubic yards of material measured in its original position, of the following:

(1) Excavation of borrow material for embankment, including unsuitable material and excavation incurred in grubbing within borrow areas after cross-sectioning.

(2) Excavation for inspection ditches, including portions of existing levee required to be excavated.

(3) Excavation of slides and for replacing the material thereof (when slide is not caused by fault of the contractor).

(4) Excavation for road approach and authorized access ramp embankments.

(5) Excavation for irrigation and drainage ditches.

(6) Excavation required for filling existing ditches, channels, berms and depressions, and for filling grubbed holes in other than borrow areas.

(7) Excavation required for ordered tie-in levees.

(b) Water for compaction and for sprinkling will be measured in thousands of gallons of water actually used.

4-15. Payment for the items of earthwork specified above will be made as follows:

(a) Excavation will be paid for at the contract unit price for Excavation.

(b) Water for compaction and for sprinkling will be paid for at the contract unit price for Water for Compaction and Sprinkling, applied as directed.

(c) No separate payment will be made for compacting embankment materials and all costs in connection therewith shall be included in the contract unit price for Excavation.

These prices and payment will constitute full compensation for furnishing all equipment; for preparing the foundation; for all placing, compacting, finishing embankments; for all watering and for all materials, labor, tools and incidentals necessary to complete the work as specified.

SECTION V - STRUCTURAL CONCRETE (Class A)
For Hydraulic Structures

5-01. General. Concrete shall be composed of cement, fine aggregate, coarse aggregate and water so proportioned and mixed as to produce a plastic, workable mixture in accordance with all requirements under this section and suitable to the specific conditions of placement. The contractor shall furnish all material including joint materials, anchors and other embedded items (except reinforcing steel) and shall perform all work incidental to the construction of concrete structures as shown and herein specified. Reinforcing steel shall be furnished and installed in accordance with Section VI.

Concrete mixes will be designed to produce a minimum average compressive strength at 28 days of 3400 lbs. per sq. in. for any 5 consecutive cylinders and of 2600 lbs. per sq. in. for any one cylinder. Cylinders shall be 6 inches in diameter by 12 inches in height or 8 inches in diameter by 16 inches in height. Tests will be made in accordance with A.S.T.M. Designation C 39-42 and during the progress of the work. In the event the compressive strength falls below the minimum requirements, the contracting officer shall have the right to change the proportioning of the mix to obtain the required strength.

MATERIALS

5-02. Concrete Aggregate.

(a) Fine Aggregate. The fine aggregate for concrete shall consist either of sand, or of approved inert materials having similar characteristics or of a combination thereof. The material used shall consist of hard, strong, durable particles.

When subjected to five cycles of the sodium sulphate soundness test, using A.S.T.M. Test, Designation C 88-41T, the fine aggregate shall have a total loss not greater than six (6) percent by weight, unless otherwise directed.

Fine aggregate shall contain not more than three (3) percent of material removable by a decantation test, using A.S.T.M. Test, Designation C 117-37, nor more than one (1) percent of clay lumps as determined by A.S.T.M. Test Designation C 142-39, or one (1) percent of shale as determined by A.A.S.H.O. Method T-10-35. The total of coal, clay lumps, shale, soft fragments and other deleterious substances shall not be more than five (5) percent. The percentage of clay lumps shall be determined by examining the various fractions that remain after the material has been tested for grading. Any particles that can be broken up with the fingers shall be classified as clay lumps and the total percentage by weight of all clay lumps shall be determined on the basis of the total original weight of the sample.

All fine aggregate shall be free from injurious amounts of organic impurities. Aggregates subjected to the colorimetric test for organic impurities, A.S.T.M. Test, Designation C 40-33, shall not indicate a color darker than that shown on Figure 2, accompanying the A.S.T.M. Specifications for the above test. The fine aggregate shall be well graded from fine to coarse and shall meet the specified grading requirements, using A.S.T.M. Test, Designation C 136-39.

Blending will be permitted if necessary, in order to meet the gradation requirements for fine aggregate.

Mortar specimens made with fine aggregate shall have a compressive and tensile strength using A.A.S.H.O. Method T-35-35, at 28 days, of not less than 95% of the strength of similar specimens made with standard Ottawa sand mortar of the same proportion and consistency and with the same cement.

For the purpose of controlling the grading of fine aggregate from any one source, the contractor shall submit, prior to actual deliveries, a preliminary sample which shall be representative of the material which he proposes to furnish. Any shipment of fine aggregate made during the progress of the work that varies in fineness modulus more than 0.20 from the fineness modulus of the preliminary sample shall be rejected or, at the discretion of the contracting officer may be accepted, subject to such changes in the proportions used as he may direct.

The fineness-molulus of fine aggregate shall be determined by adding the total percentages by weight retained on U. S. Standard Sieves Nos. 4, 8, 16, 30, 50, 100, and dividing by 100.

(b) Coarse Aggregate shall consist of clean, hard, dense, tough, durable and uncoated particles of natural gravel or crushed gravel or crushed rock, reasonably free from thin or flat pieces.

The coarse aggregate shall be free from oil, organic matter or other deleterious substances and shall not contain more than one (1) percent of material removable by the decantation test, using A.S.T.M. Designation C 117-37, nor more than one (1) percent of shale using A.A.S.H.O. Method T-10-35. The quantities of shale, coal, mica or other deleterious substances contained in the material shall not exceed one (1) percent each by weight except clay lumps which shall not exceed one-quarter (1/4) of one (1) percent. The percentage of clay lumps shall be determined by A.S.T.M. Test Designation C 142-39. The total of all such substances shall not exceed five (5) percent.

Coarse aggregate when tested for soundness by the sodium sulfate test of the A.S.T.M. Designation C 88-41T, shall not show a loss exceeding six percent (6%) at the end of five (5) cycles, unless otherwise directed.

The coarse aggregate shall have a percentage of wear of not more than fifty (50) at five hundred (500) revolutions as determined by A.S.T.M. Test, Designation C 131-39, (Los Angeles Rattler Test).

(c) Combined Grading Requirements. The aggregate shall be uniformly graded between the following limits for each type of concrete.

(1) For Class "A-1" Concrete.

Percentage Passing Sieves

U.S. Standard Sieve Size (Sq. Opening)	3/4" x 1/4"	Sand	Combined
1"	100		100
3/4"	90-100		94-100
3/8"	20-55	100	40-55
#4	0-15	95-100	30-44
#8		75-90	25-36
#16		55-75	18-30
#30		37-55	14-27
#50		10-22	6-15
#100		2-8	2-5
#200		0-4	0-2

(2) For Class "A-2" Concrete.

Percentage Passing Sieves

U. S. Standard Sieve Size (Sq. Opening)	1" x 1/4"	Sand	Combined
1-1/2"	100		100
1"	90-100		96-100
3/4"	65-85		75-86
3/8"	20-45	100	40-55
#4	0-10	95-100	28-42
#8		75-90	24-34
#16		55-75	18-28
#30		37-55	12-22
#50		10-22	8-16
#100		2-8	2-5
#200		0-4	0-1

(3) For Class "A-3" Concrete.

Percentage Passing Sieves

U.S.Standard Sieve Size (Sq.Opening)	1-1/2" x 3/4"	3/4" x 1/4"	Sand	Combined
2"	100			100
1-1/2"	90-100			95-100
1"	20-55	100		70-86
3/4"	0-15	90-100		53-73
3/8"		20-55	100	40-55
#4		0-15	95-100	30-40
#8			75-90	22-34
#16			55-75	17-27
#30			37-55	11-18
#50			10-22	4-9
#100			2-8	1-3
#200			0-4	0-2

5-03. Portland Cement. Unless otherwise specified, cement shall conform to Federal Specification SS-C-191b, Amendment #1.

5-04. Water used in mixing concrete shall be fresh, clean, potable, free from oil, acid, alkalies, salt, vegetable matter and other deleterious substances. No salt water or water containing an excessive amount of sodium sulphate, magnesium sulphate or magnesium chloride or which has an alkali coefficient of less than seven (7) shall be used.

5-05. Storage of Materials.

(a) Cement. If required by the contracting officer, immediately upon receipt at the site of the work, cement shall be stored in a thoroughly dry, weathertight and properly ventilated building or barge with adequate provisions for the prevention of absorption of moisture. Storage shall be such as to permit easy access for inspection and definite identification of each shipment.

(b) Aggregates. Fine aggregate and each size of coarse aggregate (i.e. 3/4" x 1/4", 1" x 1/4", 1-1/2" x 3/4"), shall be delivered and stored separately and in such manner to permit thorough drainage and avoid the inclusion of any foreign material in the concrete. Pre-blending of coarse or fine aggregates will not be permitted. Stockpiles shall be built in 3 ft. horizontal layers to prevent segregation and each layer shall be completely in place before beginning the next. Coning or building up of stockpiles by depositing materials in one place will not be permitted. Batching of aggregate from bins from which the water has not been thoroughly drained will not be permitted.

PROPORTIONING AND MIXING CONCRETE

5-06. Proportioning.

(a) Basis. All concrete materials will be proportioned so as to produce a workable mixture in which the water content will not exceed the maximum specified.

The exact proportions of all material entering into the concrete shall be as directed by the contracting officer.

Admixtures may be used if deficiencies in aggregate gradation or in other mix properties cannot, in the opinion of the contracting officer, be economically corrected otherwise. This shall be accomplished by the use of more fines in the fine aggregate, changes in grading of the fine aggregate, changes in the sand-cement and in the sand-gravel ratio, additional cement or some combination of these variables. The use of any admixture and the selection as to type must be approved by the contracting officer.

All mineral aggregate and cement shall be proportioned by weight, except that small quantities may, on approval, be proportioned by volume. The cement shall be weighed in a separate container, and with a separate scale, or when added from unbroken manufacturer's bags without dividing the package, the weight of each bag will be taken as 94 pounds.

The scales shall be tested and sealed at the expense of the contractor as frequently as may be necessary to insure their accuracy. The scales shall be consistently accurate to within three percent (3%) error for the mineral aggregate and two percent (2%) error for the cement and shall be capable of ready adjustment for compensating for the varying moisture content of the aggregate or for changing the proportionate batch weight.

(b) Water shall be measured so as to insure uniform proportions in the required quantiies throughout successive batches. The contractor shall provide a water measuring device capable of accurately measuring the water entering into the concrete mixture to within two percent (2%) error at all times and the operating mechanism must be such that leakage will not occur when the valves are closed. The method adopted shall permit close control over ratios of water to cement and afford ready check.

The total water content per bag of cement for each batch of concrete shall be determined by the contracting officer and unless otherwise authorized by the contracting officer shall not exceed 6.0 gallons or 49.5 pounds.

The maximum quantity stated above shall include free moisture content retained by the aggregate.

(c) Mixing and Batching Equipment. The contractor shall provide modern and dependable mechanical batch type mixers with a capacity adequate to mix batches of whole sack units. No hand mixing will be permitted. The contractor shall provide adequate facilities for the accurate measurement and control of each of the materials entering the concrete. The mixers shall be equipped with the proper locking devices and governors, including a device for accurately and automatically measuring the time required for mixing. The complete mixing and proportioning equipment, including the adequacy and dependability of each of its parts, shall be subject to approval and shall comply with the following requirements:

The mixing and batching equipment shall be of such quality and so arranged as to insure positive and uniform delivery of materials. The capacity of mixing and batching plant shall be adequate to fit the requirements of construction.

The contracting officer shall have free access to the mixing and batching equipment at all times.

The minimum time of mixing each batch, after all materials are in the mixer, shall be as follows:

1/2 cu. yd. mixer, or smaller	1-1/4 minutes
3/4 to 1-1/2 cu. yd. mixer	1-1/2 minutes
Larger than 1-1/2 cu. yd. mixer	2 minutes

Mixers shall revolve at a uniform rate with a speed which shall not exceed 200 linear feet nor be less than 175 linear feet per minute at the periphery of the drum. Neither speed nor volume capacity of the mixer shall exceed those recommended by the manufacturer.

5-07. Classes of Concrete. The concrete for the various structures shall be of the composition specified herein unless otherwise specifically required by the contracting officer for particularly difficult conditions. No additional payment will be made for change in the proportions of the various sizes of mineral aggregate or for reduction in maximum size allowable.

The classes of concrete to be used in this work shall be as follows:

(a) A-1 Structural Concrete, to be used in very thin walls and for heavily reinforced sections, decks, columns, beams, and other sections requiring optimum workability and ease of placement.

Basic Data - Class A-1

Cement Content: 6.0 sacks per cubic yard.
Maximum Size Aggregate: 3/4 inch.
Sand/Gravel Ratio: 40/60 to 50/50.
Slump: 2 to 6 inch as directed.

(b) A-2 Structural Concrete, to be used in medium thin walls, piers, small footings, floor slabs and other sections of like design.

Basic Data - Class A-2

Cement Content: 6.0 sacks per cubic yard.
Maximum Size Aggregate: 1 inch.
Sand/Gravel Ratio: 40/60 to 50/50.
Slump: 2 to 5 inch as directed.

(c) A-3 Structural Concrete, to be used in large walls, heavy columns, large footings and other sections with less reinforcement bars and greater cover between bars and forms than indicated in (a) and (b) above.

Basic Data - Class A-3

Cement Content: 5.5 sacks per cubic yard.
Maximum Size Aggregate: 1-1/2 inch.
Sand/Gravel Ratio: 35/65 to 45/55.
Slump: 2 to 4 inch as directed.

5-08. Mortar.

(a) Mortar for surface dressing, or where otherwise specified or shown on the drawings, shall be composed of equal parts of sand and cement with water sufficient to produce the consistency required. All excess mortar shall be removed to insure a neat appearing and workmanlike job with particular attention to exposed exterior and interior walls.

(b) Grout for all surfaces not otherwise specified shall be neat cement.

(c) Mortar for setting column bases, wall plates, machinery and wherever conditions require the use of mortar beds, shall be composed of sand, cement, "Embeco" or approved equal, with sufficient water to produce the strength and consistency required, as determined by the contracting officer.

5-09. Forms.

(a) General. Forms to confine the concrete and shape it to the required lines shall be used as directed. All exposed concrete surfaces having slopes steeper than 1 vertical on 1 horizontal shall be formed. Where the character of the material cut into to receive the concrete is such that it can be trimmed to the prescribed lines, the use of forms will not be required.

(b) Material. Forms shall be of wood, steel or other approved material of sufficient strength and rigidity to hold the concrete without leakage and to withstand the necessary pressure, ramming and vibration without deflection from the prescribed lines. Forms for concrete surfaces that will be exposed to view and for all other concrete surfaces that are to be finished smooth shall be lagged with beveled or matched lumber or shall be lined with metal, plywood or pressed board. Four strips to insure a level, straight joint in exposed surfaces shall be one (1) inch thick dressed lumber, tacked to the inside of the forms at the location of the construction joint. The concrete shall then be poured to a point one (1) inch above the underside of the strip. About one (1) hour after the concrete is placed, the strip shall be removed and any irregularities in the joint line be leveled off with a wood float and all laitance removed.

(c) Form Ties shall be approved bolts and/or rods. Ties shall be adjustable in lengths and shall be free of lugs, cones, washers or other devices which will leave a hole larger than seven-eighths (7/8) inch in diameter or depressions back of the exposed surfaces of the concrete, and

shall be such that when forms are removed no metal shall be within one and one-half (1-1/2) inches of finished surfaces. Ties that are to be pulled from the wall shall be coated with cup grease or other approved materials that will facilitate removal. Wire ties may be used with the approval of the contracting officer.

(d) Coating Wood Forms. Before placing reinforcement, the inside of wood forms shall be coated with an approved non-staining mineral oil or form lacquer. Pressed wood fiber board shall not be coated. Plywood, previously mill-oiled need not be re-oiled unless directed.

(e) Re-use of Form Lumber. Lumber one used in forms, and in a satisfactory condition, shall have nails withdrawn and surfaces in contact with concrete thoroughly cleaned and in an approved condition before re-use.

When form panels are used they shall be thoroughly repaired, cleaned and approved before re-use.

(f) Removal. Forms shall not be removed without approval. Removal shall be accomplished in a manner that will prevent injury to the concrete. Forms shall not be removed before the expiration of the minimum number of days indicated below, except when specifically authorized.

Arches, beams and slabs	14 days
Columns	7 days
Walls and vertical faces	2 days

When in the opinion of the contracting officer, conditions on the work are such as to justify it, forms may be required to remain in place for a longer period. However, the above schedule will in no way relieve the contractor of responsibility for the safety of the structure.

Tie rod clamps that are to be entirely removed from the wall shall be loosened twenty-four (24) hours after the concrete is placed; ties, except for a sufficient number to hold the forms in place, may be removed at that time. Ties that are wholly withdrawn from the wall shall be pulled toward the unexposed or unfinished face or as directed. Cutting ties back from the face of the wall will not be permitted. Care shall be exercised to avoid spalling the concrete surfaces.

PLACING CONCRETE

5-10. Preparation for Placing Concrete. All excavations, forms, reinforcement, electrical and mechanical inserts shall be inspected and approved before concrete is placed, and if found unsatisfactory, the work shall not proceed until all defects have been remedied. Approval will in no way relieve the contractor of his obligations to produce the finished concrete required by the drawings and specifications.

Water shall be removed from excavations before concrete is deposited. Any flow of water shall be diverted through proper side drains to a sump or be removed by approved methods which will avoid washing of freshly deposited concrete. The contractor shall keep in operation pumps of sufficient capacity to maintain the water level below the level of any fresh concrete.

All debris and loose earth shall be removed from the space to be occupied by the concrete before placing. Hardened concrete and foreign materials shall be removed from the inner surface of the mixing and conveying equipment before beginning a run of concrete. Throughout the work all concrete shall be kept free from any foreign matter.

Runways or other means must be provided to convey the concrete to the place of deposit in order not to disturb forms or reinforcement. Runways shall not be blocked up on reinforcement and barrows shall not be run directly over reinforcement.

When the temperature of the air, aggregates or water is 40° F. or below, the water or aggregates or both shall be heated, the aggregates preferably by steam, so that the concrete immediately after placing in the forms, shall have a temperature of between 65° and 85° F. The heating of the aggregate shall be done in a uniform manner which will prevent burning or otherwise damaging the same. When approved by the contracting officer, calcium chloride may be added to the concrete in lieu of heating the aggregates and water, or a combination of both methods may be permitted when authorized. The maximum amount of calcium chloride permitted in the mixture shall not exceed 4% of the cement content by weight. Suitable means shall be provided for maintaining the concrete at a temperature of at least fifty (50) degrees F. for a period of seven (7) days after placing. The method of protecting the concrete shall be approved, and any concrete showing injury or damage by freezing shall be removed and replaced by the contractor.

In no case shall concrete be deposited upon a frozen subgrade.

The contractor shall, before placing any concrete, submit to the contracting officer for his approval, a placing schedule clearly outlining his proposed operations in detail.

The contractor shall provide vibrating equipment for internal vibration in placing concrete. The type of equipment and the extent of its use shall be approved by the contracting officer.

5-11. Placing. Concrete shall be conveyed from mixer to forms as rapidly as practicable by methods which will prevent segregation of or loss of ingredients. The method of conveyance and the method of placing concrete in the structures must meet the approval of the contracting officer. The use of chutes will, in general, not be permitted except for very limited isolated sections of the work and then only when specifically approved.

Concrete shall be placed before initial set has occurred and in no event after it has contained its water content for more than 30 minutes.

All concrete surfaces upon or against which concrete is to be placed and to which the new concrete is to adhere, shall be cleaned, roughened and all laitance and loose or defective surface concrete shall be removed and the surface prepared in a manner satisfactory to the contracting officer. Before placing fresh concrete, the prepared surface shall be washed and slushed thoroughly with neat cement grout as provided in Paragraph 5-08.

All concrete shall be vibrated where possible. Vibration shall be supplemented by working the face of the concrete with spades or rods to insure a smooth, dense surface. Concrete shall not be allowed to drop freely more than 3'0". Where greater drops are required a tremie or other approved device shall be employed to place the concrete.

In dropping concrete through reinforcement, care shall be taken that no segregation of aggregates occurs. In heavily congested forms, the concrete shall be supplemented with the addition of sufficient mortar as specified in Paragraph 5-08 to insure complete distribution of aggregates and a smooth dense surface.

5-12. Foundations. The bottoms of all excavations shall be undisturbed soil properly leveled before receiving concrete. All footings and pedestals shall be poured monolithically unless otherwise shown or directed. Where concrete piles are shown on the drawings, they shall be driven or bored and filled with concrete as approved by the contracting officer.

5-13. Slabs on Earth. Immediately before placing reinforcement and/or pouring concrete on the ground, the surface of the ground shall be brought to a true, even plane and compacted to a solid bearing by rolling or tamping. The earth surface shall then be dampened to prevent absorption of water from the concrete. Too much water shall not be used and no pools shall form on the area to be concreted. Any unsuitable material in the base shall be removed and replaced as directed with approved materials.

5-14. Joints.

(a) Construction Joints. Construction joints shall be placed as shown on drawings, or where and as directed. At least 48 hours shall elapse between the pouring of each unit unless otherwise specified or directed. Joints not shown or specified shall be so located as to least impair the strength and appearance of the work. Vertical joints in wall footings shall be reduced to a minimum; no joining shall be done in either footings or foundation work without written approval from the contracting officer. Special provision shall be made for joining and bonding successive pours unless shown on the drawings. Concrete shall not be placed on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section. When the placing of concrete is unavoidably interrupted long enough for the concrete to take its final set, the working face shall be given shape, approved by the contracting officer by forms or other means that will secure proper union with subsequent work.

(b) Expansion Joints. Expansion joints shall be constructed of premolded bituminous fiber joint filler, meeting the requirements of A.A.S.H.O. Specification M-59-42.

(1) Joint Sealing Material. Before the surface is open to use, the groove above the filler shall be swept clean and sealed with an approved mixture consisting of approximately seventy percent (70%) air-refined asphalt and approximately thirty percent (30%) paving asphalt 200-300 penetration, having the following physical characteristics:

Penetration at 77° F., 100 g., 5 sec.	40 to 50
Viscosity, Flurol at 77° F. secs.	190 to 230
Softening Point (R&B) °F. min.	135 to 145

The application temperature for average conditions shall be 350 degrees Fahrenheit. All unsatisfactory joints shall be "spotted up" or refilled before final acceptance.

FINISHING CONCRETE

5-15. Imperfect or Damaged Work or any material damaged before final acceptance, shall be satisfactorily replaced or repaired at the contractor's expense and in accordance with all requirements of the drawings and specifications.

Removal and/or replacement of concrete work shall be done to the satisfaction of the contracting officer in such a manner that the strength of accepted work will in no way be impaired.

5-16. Dressing Concrete. All fins and rough edges shall be removed as directed.

Patches or honeycomb shall be repaired by removing all material within the affected area to a depth one (1) inch greater than the extent of the porous section and completely filling said area with gunite by means of a portable pneumatic cement gun. The gunite material shall consist of 1 part cement, three parts sand, and sufficient water for proper application according to the best practice for guniting. The portland cement, sand and water shall conform to the requirements hereinbefore specified.

Pockets to be filled shall be thoroughly cleaned, washed with water and compressed air, removing all loose material. Surface of preceding coats shall be thoroughly wetted before placing. The required thickness of gunite shall be shot in layers according to the best practice for this type of work.

Holes remaining from bolts or tie rods shall be filled solid with mortar in the approximate proportions of one part portland cement, two parts sand, one-quarter part white cement, and water. The amount of water to be used shall be that required to produce "dry-pack" consistency

that is, when the mix is squeezed in the hand, it will form a ball that will hang together and not show excess water. Actual filling of the holes shall be accomplished by forcibly ramming the mortar with suitable tools to insure complete compaction.

Excess mortar at the face of filled holes shall be struck off flush with burlap or canvas.

5-17. Curing. Freshly placed concrete shall be protected as directed, from rain, the sun, flowing water or other action detrimental to strength or finish. Concrete shall not be allowed to dry out from the time it is placed until the expiration of the curing periods specified.

Concrete shall be cured by the water curing method, consisting of keeping the concrete continuously wet with clean water for a period of seven (7) days in a manner approved by the contracting officer.

5-18. Cleaning. Upon completion of work, all forms, equipment, debris, protective coverings and any rubbish resulting therefrom shall be removed from the premises.

Finished concrete surfaces shall be left in a clean and approved condition.

5-19. Measurement. Measurement of concrete will be made on the basis of the actual volume of concrete within the neat lines of the structures as shown on the drawings or otherwise required. Unit of measurement shall be the cubic yard.

5-20. Payment for concrete will be made at the contract unit price for Class "A" Structural Concrete, in place, which price shall be full compensation for all labor, equipment, tools, materials, forms, bracing, excavation, backfill and all other incidentals required to complete the work as shown and specified.

SECTION VI - REINFORCING STEEL

6-01. General. The contractor shall furnish and install all reinforcement including rods, wire fabric and mesh. Reinforcing, fabricated to shapes and dimensions shown, shall be placed where indicated on the drawings or reasonably required to carry out the intent of the drawings and specifications. Reinforcement shall not be bent or straightened in a manner to injure the material. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement appreciably reduced in section will be rejected. All reinforcement shall be entirely free from rust, scale, grease or other coating which might destroy or reduce its bond with concrete. Following a material delay in the work, or where left for future bonding, reinforcement shall be cleaned as directed and re-inspected.

6-02. Reinforcement Bars in structures shall be furnished and placed in accordance with the sizes, shapes and spacing shown on the drawings. Reinforcement bars shall conform to Type B, Grades 2, 3, 4 or 5, of Federal Specification E-QQ-B-71a.

6-03. Construction. Except as otherwise shown or specified, construction shall conform to the following requirements:

(a) Minimum Bar Size. Bar less than one-half (1/2) inch diameter shall, unless otherwise shown, be used only for ties, distribution steel, and stirrups.

(b) Concrete Covering Over Steel, unless otherwise shown, shall be as follows:

Walls	2" outside of steel
Footings	3" outside of steel on sides
Footings	3" outside of steel on bottoms

(c) Footing Reinforcement, shall be supported on pre-cast concrete blocks.

(d) Wire Mesh Reinforcement, where shown on slabs, shall be set at the proper depth as indicated on drawings, in a manner approved by the contracting officer. Splices shall be lapped not less than five (5) inches.

6-04. Splicing. At all points where bars lap or splice, including distribution steel, a minimum lap of forty (40) bar diameters shall be provided. Reinforcement shall not be spliced at points of maximum stress and splices in adjacent bars shall be staggered.

Where splices in reinforcement, in addition to those indicated, are necessary, the lapped ends of bars shall be separated sufficiently or connected properly to develop the full strength of the bar.

6-05. Tying and Supports. Reinforcement shall be accurately placed and tied at intersections with eighteen (18) gage black annealed wire and shall be securely held in place, during the placing of concrete, by spacers, chairs or other suitable supports. These supports shall be sufficient in number and heavy enough to properly carry the steel they support in an approved manner. No wood spacer blocks shall be left in the concrete.

6-06. Payment.

(a) Reinforcing steel will be paid for at the contract unit price for Reinforcing Steel, in place.

(b) Mesh reinforcement will be paid for at the contract unit price for Mesh Reinforcement, in place.

These prices and payments shall be full compensation for all costs in connection therewith.

SECTION VII - ROADS AND ROAD SURFACING

7-01. General. The work covered by this section shall consist of furnishing all labor, equipment and materials necessary to perform all operations required for the construction of road approaches and road crossings of the types herein specified, and for the surfacing of said roads and levee crown.

7-02. Types.

(a) Road Approaches shall be known as Standard Approaches and Head-on Approaches and shall be designated by the letters (S) and (H) respectively.

(b) Road Crossings shall be known as Standard Crossings and Head-on Crossings, and shall be designated by the letters (S) and (H) respectively. A standard Crossing (S) type, shall consist of two (S) type Road Approaches, one land side and one river side. A Head-on Crossing (H) type, shall consist of two (H) type Road Approaches, one land side and one river side.

(c) Stock Approaches shall be constructed similar to the Standard (S) type Road Approaches, except that the crown shall be only ten (10) feet wide and the grade shall not exceed ten (10) percent.

(d) Levee Crown, when required, shall be surfaced as herein specified.

7-03. Construction. Road Approaches and Road Crossings shall be constructed in conformity with the typical sections shown on the drawings and to the lines and grades specified in the Special Provisions, or staked in the field. Embankment material required for the construction of Road Approaches and Road Crossings shall be of the same type used in levee embankment, placed, watered and compacted, and paid for as specified in Section IV - Earthwork.

7-04. Surfacing. Road approaches, road crossings, and levee crown, when required, shall be surfaced with either bank run gravel or crushed rock as specified in the Special Provisions.

(a) Materials.

(1) Bank Run Gravel shall be clean and free from roots, vegetable matter and other deleterious substances. The maximum size of bank run gravel shall be two (2) inches.

(2) Crushed Rock shall be uniformly graded from coarse to fine and shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will be as follows:

GRADATION

Sieve Designation	Percentage Passing Square Sieve
1"	100
3/4"	90 to 100
No. 4	35 to 55
No. 200	3 to 11

(b) Placing. Bank run gravel or crushed rock shall be spread to the depth and width specified in the Special Provisions, in an approved manner. Watering and compacting will not be required unless otherwise specified or authorized.

(c) Measurement. The unit of measurement shall be the ton (2000 pounds). When the material is hauled by truck, the weight of the material furnished and placed will be determined by scale weights officially certified, all costs of which will be borne by the contractor. When the material is hauled part of the distance by railroad, the weight of the material furnished and placed will be determined by the official railroad weights. Due care shall be taken to prevent waste in handling material from railroad cars to the job and the contracting officer will order stopped, at any time, any method of handling the material which results in a high percentage of waste. A maximum moisture content of three (3) percent by weight will be allowed in determining quantities for payment. Deduction will be made from the certified weights for moisture in excess of this amount.

(d) Payment for surfacing of roads and levee crown, as specified above, will be made at the contract unit price for Crushed Rock, in place, or Bank Run Gravel, in place, which prices shall be full compensation for all costs in connection therewith.

7-05. Detours. During the construction of levees, the contractor shall, at his own expense, provide detours, where required, and shall conduct his operations so as to offer the least possible danger, obstruction and inconvenience to public traffic at existing road crossings or approaches. Prior to the abandonment of the detour, the contractor shall repair, at his own expense, any damage which he has caused to parts of said road as lie beyond the limits of the earth crossing, but are within the limits of the right-of-way.

No separate payment will be made for detours, and all costs in connection therewith, will be included in the contract unit price for Excavation.

SECTION IX - COBBLE PAVING

Paragraph		Page
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9-04.	Measurement	9-1
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SECTION IX - COBBLE PAVING

9-01. General. The work covered by this specification section, shall consist of furnishing and installing cobblestones in conformity with the typical sections shown on the drawings, and to the lines and grades staked in the field.

9-02. Material. Cobblestones shall be round stone of the grade commonly known as "Oroville Cobbles." Stones shall be free from sand and dirt, and shall be hard and durable. The absolute weight of the material shall range from 160 to 195 pounds per cubic foot. Size of the stone shall be such that all will pass a 15-inch diameter ring and all shall be retained on a 1-1/2 inch diameter ring. Sufficient amount of the smaller sizes shall be furnished to fill the voids between the larger cobbles, but not more than 25% of the stones shall be less than 4 inches in least dimension.

9-03. Placing. Cobblestones shall be placed or spread in an approved manner at the locations indicated and to the depths and within the limits shown on the drawings and staked in the field. All voids between the larger cobbles shall be filled by means of the smaller stones.

9-04. Measurement. The unit of measurement for the cobblestones shall be the ton (2000 pounds).

If the stone is hauled by truck, the weight of the stone furnished and placed will be determined by scale weights officially certified, the cost of which shall be borne by the contractor.

If the stone is hauled part of the distance by railroad, the weight of the stone furnished and placed will be determined by the official railroad weights. Due care shall be taken to prevent waste in handling material from railroad cars to the job and the contracting officer will order stopped, at any time, any method of handling the material which results in a high percentage of waste.

9-05. Payment. The quantity of cobblestones as determined above will be paid for at the contract unit price for Oroville Cobbles, in place, which price shall be full compensation for all costs in connection therewith.