

SPECIFICATIONS
for a
REINFORCED CONCRETE ARCH BRIDGE
over the
ST. JOSEPH RIVER at MICHIGAN STREET,
SOUTH BEND, IND.

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SPECIFICATIONS
for
MICHIGAN STREET BRIDGE OVER THE ST. JOSEPH RIVER
SOUTH BEND, INDIANA.

GENERAL.

1 The work under these specifications shall consist of constructing a Reinforced Concrete-Steel Bridge, having stone facing and stone hand-railing, over the St. Joseph River at Michigan Street, South Bend, Indiana.

2 The bridge will consist of one 116 foot arch and two 80 foot arches, having a total length of 300 feet between abutments, and a width of 70 feet between spandrel walls.

3 All bids must be made on the blank forms for proposals to be obtained at the office of the County Auditor of St. Joseph County, South Bend, Ind., and must be endorsed on the outside of the envelope: "Proposal for the Michigan Street Bridge in the City of South Bend, Indiana."

4 Bidders must examine all the provisions of the Bidders Blank and the requirements stated in the advertisement and conform strictly to the stipulations therein contained.

5 The adequacy of the bond offered, the previous experience and the responsibility, as well as the ability, of the bidders will be considered by the Board of County Commissioners in determining the lowest responsible bidder.

6 The Board of County Commissioners reserve the right to reject any and all bids.

ENGINEER.

Whenever the word "Engineer" is used in these specifications it shall mean the Engineer of the Board, Chas. W. Cole, acting either direct or through properly authorized agents, limited by their particular duties entrusted to them.

CONTRACTOR.

Whenever the word "Contractor" is used in these specifications, it shall mean the person, or persons, or co-partnership, or corporation which has entered into the contract as party of the second part, or his or their legal representatives.

PLANS.

The work shall be constructed according to the drawing on file, and with these specifications.

The specifications and drawings are intended to describe and provide for the complete work. They are to be co-operative, and what is called for by either is as binding as if called for by both.

The work herein described is to be complete in every detail, notwithstanding that every item necessarily involved is not particularly mentioned.

The contract price shall be based upon these specifications and drawings, which are made a part of the contract.

FOUNDATIONS.

The foundation for the abutments and piers shall conform to the dimensions as shown by plans.

Cofferdams made of sheeting shall be constructed for the abutments and piers.

The Contractor shall be required to make the sides and ends water-tight, and be excavated to the depth as shown on the plans.

During the placing of the concrete the water shall be kept out of the cofferdams, unless the bottom is so porous that it is impracticable, in the opinion of the Engineer, to do so, in which case the bottom may be caulked with concrete placed in position by means of shutes, under the direction of the Engineer. After the bottom is caulked, the water shall be pumped out and the remainder of the concrete placed in position.

All concrete deposited in water shall be composed of 1 part of cement to two and one-half (2-1/2) parts of sand to four (4) parts of gravel.

PILING.

~~The Contractor shall state in his proposal a price per foot for piles driven and sawed off in place.~~

The Engineer shall determine whether piling are necessary, the number, spacing and length, as soon as the Contractor has the foundations excavated to depth shown by the plans.

The piling, when used, shall be oak, yellow pine, or other wood that will stand the blow of the hammer, straight, sound, and cut off square at the butt, and all the bark taken off.

The piles shall not be less than 12 inches or more than 16 inches in diameter at the large end, nor less than 7 inches at the small end.

11/10/20
The piles shall be driven until they do not penetrate more than 1/2 inch under the blow of a hammer weighing 2000 lbs. falling 25 feet.

~~When piling are used the cofferdam shall remain in place and be sawed off below low water mark. The space between the cofferdam and the masonry shall be filled with selected portions of excavated material properly compacted up to the surface of the ground.~~

CEMENT.

Only high-grade Portland cement from mills of established reputation and having a uniform source of raw materials shall be used. All cement shall pass the tests prescribed by the American Society of Testing Materials.

Such tests are substantially as follows:

Cement when tested neat after 25 hours in air under a moist cloth shall develop tensile strength between 175 lbs. and 375 lbs. per square inch, and after one day in air and six days in water shall develop tensile strength between 400 lbs. and 800 lbs. per square inch. and after one day in air and 27 days in water shall develop tensile strength of 600 lbs. The fineness shall not be less than 75 per cent through No. 200 sieve.

Cement made into thin pats on glass plates shall not check, scale or warp under the following treatment: Three pats will be made and allowed to harden in moist air at 60 to 70 degrees F., one of these will be placed in fresh water for 28 days, another will be placed in water which will be raised to the boiling point for six hours and then allowed to cool, and the third is to be kept in air of the prevailing out-door temperature.

SAND.

All sand used on the work for concrete or masonry shall be screened and washed and shall range in size from 1/8 inch down.

Gravel Gravel for the concrete shall be clean, sharp, washed gravel, ranging in size from 1/4 to 3/4 inches.

~~The stone in the old abutments may be used in new abutments and piers, provided the stone are clean and embedded in a rich bed of mortar.~~

PROPORTIONS.

The grades of concrete to be used are as follows:

- (a) For arches, one part Portland cement, two and one-half (2-1/2) parts of washed sand and four (4) parts of washed gravel.
- (b) For spandrel walls, piers, abutments, foundations and retaining walls, one part of Portland cement, three (3) parts washed sand and five (5) parts of washed gravel.

DRAINAGE.

Provision shall be made at each pier and each abutment for drainage, as follows: Six inch drain pipe shall be built into the concrete over the piers and abutments and projected two inches below the soffit. The surface of the concrete shall be so formed that any water that may seep through the fill above will be drained into the pipe. The line of drainage will be covered with a layer of broken stone, and the top of the pipe will be protected with a screen to prevent clogging.

CENTERING.

The Contractor shall build an unyielding falsework or centering. The lagging shall be dressed to a uniform thickness so that when laid it shall present a smooth surface, or it shall be made smooth by plastering or other efficient means.

In framing the centers allowance shall be made for the settlement of centerings, deflection of arch after removal of centerings and for permanent camber. The centers shall be framed for a rise of arch greater than the rise marked on drawings by an amount equal to one eight-hundredth part of a span, and shall not be struck until at least 28 days after the completion of the arch, and not until the fill has been put on. Great care shall be used in lowering the centers evenly and uniformly, so as not to throw undue strain upon the arches. The tendency of the centers to rise at the crown as they are loaded at the haunches must be provided for in the design, or if not, the centers must be temporarily loaded at the crown and the load so regulated as to prevent distortion of the arch as soon as work progresses.

WATER-PROOFING.

After the completion of the arches and spandrel walls, and before the fill is put on, the top surfaces of the piers, arches and abutments and the inner surface of the spandrel walls shall be given a coat of pure Portland cement grout, and after this has set hard it shall be given a heavy coating of coal tar pitch of a grade satisfactory to the Engineer.

LAMP POSTS.

The Contractor shall furnish eight lamp posts for lighting of the bridge as shown by plans. Provision shall be made in the pedestals for the wire to be connected with the electric lighting conduits.

FILL.

The space between the spandrel walls shall be filled with sand, earth, cinders or other suitable material, thoroughly compacted by rolling with a steam roller weighing at least 10 tons, and be finished to the proper grade to receive the curbing and pavement. The fill over the arches shall not be put on until at least two weeks after the arch concrete has been completed.

ROADWAY PAVEMENT. (Foundation). Upon the sub-grade shall be spread a layer of concrete six (6) inches in thickness. This concrete shall consist of one part by bulk of the best quality of American Portland Cement, three (3) parts by bulk of clean, sharp sand, and five (5) parts by bulk of gravel of such size as will pass through a ring of two inches internal diameter. The cement and sand shall be thoroughly mixed while dry and then made into a mortar by mixing with water. The gravel shall then be incorporated in this mortar in the quantities specified and shall be thoroughly mixed until each particle of gravel is completely covered with mortar. It shall then be spread on the roadway at once, and thoroughly compacted by ramming with hand tampers, until free mortar appears on the surface. The whole operation of mixing and laying shall be done as expeditiously as possible. The upper surface of the concrete shall be parallel with and two inches below the finished surface of the pavement hereinafter described.

WEARING SURFACE.

On the foundation as above specified, shall be laid bituminous concrete surface, which shall consist of a mineral aggregate mixed with bituminous cement and laid as hereinafter specified.

This wearing surface shall have a thickness of two (2) inches after thorough compression with roller.

MINERAL AGGREGATE.

The mineral aggregate shall consist of a mixture of broken stone and sand, to which in some cases may be added a small quantity of stone dust or Portland cement.

Any sound, durable stone, either trap rock, limestone or granite, usually considered suitable for macadam, may be used. It shall be broken as nearly cubical as possible. It should not show distinct planes or cleavage or crystalline faces and should not readily crush or split under the roller when being rolled in the pavement. Between two kinds of stone, choice will generally be made of the one showing the greater toughness rather than hardness. A certain percentage of absorption, such as shown by the better grades of limestone, is a desirable quality, as the bonding strength of the cement is somewhat improved thereby.

The stone shall vary in size from a maximum of about half the thickness of the wearing surface to the smallest particle retained on the finest mesh screen commonly used on crushing plants, that is, the minimum screen should be one-fourth ($1/4$) inch for dry stone and one-half ($1/2$) inch for wet stone. The dust or fine screenings shall be removed from the stone.

The sand shall be similar in character to that commonly used in sheet asphalt mixtures. It shall be hard grained, moderately sharp, free from loam or other foreign material and varying in size from that passing a one-quarter ($1/4$) inch screen to dust passing a 200 mesh screen. There shall not be over 5 per cent passing the 200 mesh screen and there should not be over thirty (30) per cent held on the ten (10) mesh screen.

The dust which may be added to the mixture shall be ground limestone. Not over four per cent by weight shall be added to any bituminous concrete mixture and a screening of the combined aggregate shall not show over 6 per cent of 200 mesh material. If an asphaltic cement is used having finely divided mineral matter self contained, this should be taken into consideration in the determination of the total dust.

ASPHALTIC DUST.

The asphaltic cement may be prepared from the following asphalts combined with flux as hereinafter specified, if flux is necessary: (1) from refined natural asphalt; (2) from the residue obtained in the careful distillation either with or without oxidation of asphaltic or semi-asphaltic petroleum; (3) from any uniform combination of the preceding materials together with a suitable flux, if flux be necessary, such combination being subject to the approval of the Engineer.

Each bidder must state the nature and origin of the bitumen to be used by him, and further, shall submit samples of the bituminous cement with his proposal.

The asphaltic cement shall pass the requirements designated below: (1) It shall have a penetration from 50 to 65 at 77 degrees F. depending upon the traffic conditions and hardness of the pavement desired.

The above penetrations are measured in hundredths centimeters with a No. 2 needle weighted with 100 grams acting for 5 seconds.

(2) When 20 grams of the cement are maintained at a temperature of 325 degrees F. for five hours in a tin box 2-1/2 inches in diameter there must not be volatilization of more than 3 per cent by weight of the bitumen present nor shall the original penetration be reduced thereby over one-half.

(3) The bitumen of the asphaltic cement shall yield upon ignition not more than 15 per cent of fixed carbon for asphaltic cement of penetration between 65 and 80 and not more than 16-1/2 per cent for the asphaltic cement between 40 and 65.

(4) Of the bitumen of the asphaltic cement which is soluble in carbon disulphide 98-1/2 per cent shall be soluble in carbon tetrachloride. In this test for carbons the asphaltic cement to be tested should be allowed to stand over night, covered with purified carbon tetrachloride. The test to be performed in subdued light.

(5) At 32 degrees F. the bitumen of the cement shall have a penetration of not less than 8 when tested one minute with the needle weighted to 200 grams.

(6) The cement shall not flash at a less temperature than 350 degrees F., New York State Closed Oil Tester.

FLUX.

The fluxing material may be paraffine, a semi-asphaltic, or an asphaltic residuum which shall be tested with and found suitable to the asphalt to be used.

The residuum must have a penetration greater than 350 degrees with a No. 2 needle at 77 degrees F. under 50 grams weight for one second.

A natural maltha may be used if it passes the heat and flash tests specified under "a".

(a) The paraffine residuum shall have a specified gravity of .92 to .94 at 77 degrees F. It shall not flash below 350 degrees F. when tested in the New York State Closed Oil Tester, and shall not volatilize more than 5 per cent of the material when heated five hours at 325 degrees F. in a tin box 2-1/2 inches in diameter, as officially prescribed.

(b) Semi-asphaltic residuum shall have the same general characteristics as paraffine residuum except that it shall have a specific gravity of .94 to .98 at 77 degrees F.

(c) Asphaltic residuum shall have the same general characteristics as paraffine residuum except that the specific gravity shall not be less than .98 nor more than 1.04 at 77 degrees F.

STONE WORK.

~~The exterior facing of the bridge, soping, pedestals, hand-railing, trimmings and other ornamental work, shall be first quality Buff Bedford lime stone as shown on plans and detail drawings.~~

All stone shall be of uniform color and hardness; free from seams, sand holes, stains or other imperfections.

All beds and joints shall be cut true and level with uniform thickness of bed and joint.

The exposed surface of all stone shall be cut tooth chiseled.

All stone work shall be anchored to the concrete as shown by plans.

All carvings and enrichments to be done in a perfect manner from model to be furnished by the Contractor and approved by the Engineer.

All cut stone shall be worked in strict accordance with elevations and details, the Contractor shall submit to the Engineer working drawings for approval before proceeding with any of the work.

All joints to be $1/4$ " in thickness, all stone shall be carefully fitted together, no patching of any stone will be allowed.

All stone shall be set in mortar composed of equal parts of lime putty and Best's Keen cement and due amount of sand. When the bridge is completed all stone work shall be cleaned down and joints raked out and point up with Best's Keen cement and fine white sand. ~~As soon as all stone are set they shall be thoroughly water-proofed with hot pitch before backing up.~~

Any stone work that is broken or damaged shall be replaced with perfect stone.

INLETS.

On each side of the roadway, at the center of the 80 feet arches and at both ends of this bridge, inlets shall be provided for draining the surface water from the roadway. Eight inch (8") pipe shall be extended through the center of the arches and carried up through the pavement and provided with inlets. There is a sewer in the center of Michigan Street on the south side of the river which may be tapped with a ten inch (10") pipe and carried up near the surface and an 8" branch extended to each side of the roadway and provided with inlets. There is also a sewer on the north side of the river near the east side of the present truss bridge which may be tapped in the same manner as the south side. Both these sewers shall be protected by the Contractor during the construction of the bridge and shall be run through the new abutments and into the river. There will be eight (8) inlets requires. These inlets shall be South Bend Box inlets or their equal and subject to the approval of the Engineer.

STREET CAR TRACK.

There will be a single car track in the center of the new bridge. As soon as the arches have been completed and the fill made, the Engineer will notify the Railway Company to lay their track to line and grade and block same ready for the concrete foundation. All of the above expense will be borne by the Railway Company.

The space between the rails and the ends of the ties shall be paved with brick laid on a concrete foundation and an asphalt filler. The space between the ties and for a depth of six inches (6") under the ties shall be concrete of the same grade as specified for the asphaltic concrete roadway foundation.

The brick shall be hard burned vitrefied paving blocks; free from flaws, cracks or breaks and equal in all respects to the samples submitted with the bid. All brick shall be subject to the standard rattler test and shall not lose more than 20% by weight when so tested. The brick shall be laid upon a two inch (2") sand cushion. All the above paving shall be done by the Bridge Contractor, it being understood that the Railway Company is to lay, line and block their track, at their expense.

CONCRETE SIDEWALK.

The ground upon which the concrete sidewalk is to be laid shall be rammed or rolled to a hard bearing surface four inches below the finished grade. On this shall be deposited a layer of dry concrete 3-3/4 inches thick after ramming, consisting of one part Portland cement, two parts sand, and four parts broken stone or gravel that will pass through a one and one-half inch ring. On the concrete shall then be laid a wearing surface 3/4 of an inch thick, composed of one part Portland cement and one and one-half parts of coarse sharp sand or of broken granite or other acceptable stone in size from 3/8" downward. The mortar for the wearing surface shall not be too wet; it must be spread before the concrete base has had time to partially set, shall be pressed down hard into the latter, and shall be troweled to a smooth and even surface. All concrete sidewalks shall be divided into blocks of not more than 36 square feet. All blocks shall be separated from those adjoining to prevent adhesion of the blocks.

The division between the blocks shall reach entirely through the concrete and wearing surface, and shall be neatly finished on top with a jointing tool. As soon as the wearing surface has well set a two inch layer of sand shall be carefully spread over it and kept moist for one week by frequent sprinkling.

CONDUITS.

As soon as the arches are completed and the fill made the Engineer will notify the different companies that are to have conduits and gas mains on the bridge, and they will proceed to construct the same without delay and with as little inconvenience to the Contractor as possible.

CURB AND GUTTER.

A combined curb and gutter shall be constructed on each side of the roadway in accordance with the drawings for same and the following specifications:

The curbing shall be set to a true line and grade and at a variation in height of same, between grade points and catch-basins. At both ends of the bridge the curb to be made on a curve of such radius as the Engineer may direct with true and even joints. Whenever possible the curbing shall be tamped up the back to within four (4) inches of the top with six (6) inches of coarse sand or gravel.

The material to be used shall be approved Portland cement, clean, sharp sand, gravel or crushed rock and with no stone with any dimensions over one and one-fourth ~~1 1/4~~ (1-1/4) inches.

The combined curb and gutter shall consist of a curb six (6) inches wide at the top as per plan, and generally six (6) inches high above the gutter where it joins the curb and gutter eighteen (18) inches wide and six (6) inches deep, so constructed that the curb and gutter shall be monolithic. It shall be composed of a concrete core or backing, faced with three-fourths (3/4) inch in thickness of facing or finishing mortar as shown by the drawings. The core or backing shall be constructed of concrete composed of

Approved Portland cement---- 1 part
Clean sharp sand----- 2 parts
Crushed rock or gravel----- 4 parts

The crushed rock shall be clean and sound, broken so that every fragment will pass through a screen with meshes one and one-fourth (1-1/4) inches square, and all dust and particles smaller than a grain of corn shall be screened out. The cement and sand and stone or gravel shall be first well mixed dry and then sufficient water added, and the mixing continued until satisfactory to the Engineer. The concrete shall then be put in place and well compacted by ramming. The whole operation must be completed before the mortar begins to set. The facing or finishing mortar shall be composed of

Approved Portland cement-----1 part
Clean sharp coarse sand----- 2 parts.

The facing shall be mixed in the same manner as the concrete described above.

Concrete, immediately after being mixed as above described, shall be placed in the necessary forms or molds as rapidly as it can be thoroughly compacted by ramming with a twenty-pound rammer until the molds are full and the curb ready for facing.

The entire exposed surface of the curb and gutter shall be faced by brushing, floating or troweling a coat of neat cement so as to give it a uniform color throughout. The work shall be carried on uniformly and the whole curb and gutter completed while in a soft and plastic state so that it will become a homogeneous solid when set.

Section of the curb shall not be less than eight (8) feet long. The curbing must be well braced in the back with suitable material and satisfactory to the Engineer.

EDGES.

Of concrete piers, walls, and abutments, both vertical and horizontal, which shall be exposed, shall be beveled off by placing in the forms 1-3/4 inch square strips sawed cornerwise.

78 cover
Neat intersections of the horizontal and vertical bevel planes must be made, only skilled workmen shall be employed in the finishing concrete.

ARCHES.

The concrete shall be started simultaneously from both ends of the arch, and built in longitudinal sections at least five and one-half feet in width, and wide enough to constitute a day's work.

The concrete shall be of such a consistency as to be easily worked around the reinforcement.

4
The work shall proceed continuously day and night if necessary to complete each longitudinal section. These sections while being built shall be held in place by substantial vertical forms, parallel to the face of the arch and to each other and these forms shall be removed when the section has set sufficiently to admit of it. Each longitudinal section shall be dovetailed to the adjoining section and in connecting concrete already set with the new, the surface shall be cleaned, roughened and mopped with a mortar composed of one part of cement to one part of sand.

REMOVAL OF FORMS.

32
Shall not take place until work is well set, and not within 48 hours in summer and longer in cold weather. All exposed surfaces of walls, piers and abutments must present a smooth uniform surface of concrete mortar, and all disfigurements must be effaced, and if there are open or porous places they must be neatly filled with 1 to 4 cement mortar. All finishing of surfaces must immediately follow the removal of the form, and in dry and hot weather such repairs shall be protected and kept moist for several days. Do not remove forms or supports under arches until authorized by the Engineer.

MIXERS.

21
Suitable type of concrete mixer satisfactory to the Engineer must be provided. Nearly all of the batch type of mixers using some form of cube or other shape, drum or box, such as the "Chicago", "Smith", "Columbus", "Ransome", or the like, will be satisfactory. Mixers of the so-called continuous type, consisting of a trough with shafts and flights, are not recommended for mixing gravel concrete.

WATER.

32
Only fresh clean water, free from acids or strong alkalies, shall be used. Measure the water and use a spray nozzle, so that the mixture will run uniformly wet as required.

MIXING.

33
All materials shall be first mixed dry. Mix equally long after adding the water, so that no color of unmixed material appears. A competent foreman must inspect and approve every batch leaving the machine.

3 The Contractor must use every precaution and constant vigilance to see that every batch of concrete contains the specified amount of each ingredient. One man of sufficient intelligence to understand the responsibility of his work must have the sole charge of putting the cement into the mixer.

PLACING CONCRETE.

The concrete shall be placed immediately after mixing, and on such parts of the work where a comparatively dry mixture is best suited to the requirements of construction as upon the inclined surface and inclined slabs, the concrete shall be deposited in layers six inches thick. These layers carried up level or parallel with the inclined surface and thoroughly rammed as fast as deposited. The ramming of the dry concrete must be of such character as to thoroughly consolidate the mixture and flush the mortar against the forms and around the reinforcing bars.

Layers of concrete shall not be tapered off in the forms or for inclined surfaces as for sloping wall tops, but instead shall have square ends, stepped back with 10 or 12 inch threads ramming against short planks, forming the riser of such threads, secured in place across the forms.

In connecting dry mixtures of concrete to that already set, the old surface shall be first cleaned, or roughened with wire brushes, and then mopped with a mortar composed of one part of cement to two parts of sand, or in lieu thereof the first application of concrete to the old surface shall be of wet mixture 1 to 5. Also wet the old concrete thoroughly before commencing.

Whenever practicable, the concrete shall be carried up to the top of the exposed and smaller walls without cessation. Ten feet is the limit for height of wet concrete in forms tied 20 inches apart vertically with No. 8 or No. 9 wire.

Wet mixtures of concrete shall generally be used except for inclined slabs and on other surfaces necessary to finish on the same day as above noted.

The wet mixtures shall be used quite sloppy so that ramming is not feasible and instead the concrete is to be puddled and thoroughly worked around the reinforced bars and into toothings, angles, corners, and recesses of the forms.

Upon the top of the wet masses of concrete of considerable thickness or upon the top of concrete deposited in water, when the water does not cover the concrete, there will form a layer of light substance called laitance, which has little strength, and on retaining walls and other important walls, especially at horizontal joint, this material shall be thoroughly roughened up and picked off so far as possible before continuing the concrete on top of such walls.

FACING AND FINISH.

25 There will be no special facing mortar on the sides of piers walls or abutments, but smoothly dressed lumber shall be used for the forms on exposed parts of the work and the stones forced back from the forms by using a fine toothed spading fork or pene tamps, similar to track tamps.

25 The tops of exposed piers and abutments to have 1 inch of 1 to 3 sidewalk finish.

Special instructions will be given in regard to finish of handrailing, spandrel: pedestals, copings, and other ornamental work for each job.

FORMS.

The forms are to be designed

Design forms carefully for strength, convenience of access for cleaning and filling, also for ease in taking down and moving.

Forms shall be erected in a substantial manner and thoroughly braced and tied together with rods of wire. On exposed faces, on removal of the forms these wires shall be cut off at least ~~1 1/2~~ 1 1/2" beneath the surface and the hole neatly filled with 1 to 4 mortar. On the exposed surfaces of concrete work the planks for form lining shall be dressed ~~on one side and one edge to uniform widths~~, the ends cut square and closely jointed, all put up true and plumb or with true batters in strict accordance with the plans.

Form lumber must be cleaned off before used the second time. Special care must be taken to do this on the exposed faces. Spatters of concrete on the forms must be cleaned off at the end of the day's run.

Care must be exercised to keep forms plumb and true. Don't load one end of a wall or pier form, excepting no movement of form endways.

In holding bars and structural steel in position in forms it is sometimes advisable to use L's or forged braces. Such braces are also useful in supporting the over-hung back form of reinforced retaining walls.

Stop openings that would leak, with mortar, tin or wood. Use tin or galvanized iron where required to give a smooth finish.

PROTECTION OF CONCRETE.

In cold weather special instructions for laying concrete will be furnished by the Engineer.

27 During warm and dry weather all newly built concrete must be kept wet for three to six days after forms are removed, and the Engineer may require protection from the sun by boards or canvas. Walls, piers or abutments below grade shall be filled against with earth as soon as safe to do so after the removal of the forms so that the concrete may thus be protected in hot, dry and freezing weather.

EXPANSION JOINTS.

28 Expansion joints are to be located as shown on general pl so as to divide the entire work by vertical planes.

The width of such joint shall be computed on the assumption that the expansion co-efficient for concrete is the same as st

that the maximum range of temperature for any work left exposed, either permanently or during construction, will run from zero to 100 F. The change of length due to the temperature may be quickly computed with sufficient accuracy if taken at the rate of 1" in 1400 feet for each 10 degrees change in temperature.

STEEL REINFORCEMENT.

All steel rods as shown on the plans are for taking the tensile stresses in the concrete and the various dimensions of the bars and the spacing of them are to be closely adhered to; also the specifications for the distance of such reinforcing steel from the face of the concrete.

Square twisted bars, or deformed bars, shall be used.

The Cup Bar, Diamond Bar, Johnson Bar, or others having the area and dimensions as shown on the plans will be acceptable.

All of the reinforcing steel and portions of the structural steel that are to be imbedded in the concrete must be free from paint, oil or thick rust or scales. A thin coat of red rust assists in adhesion of concrete rather than otherwise.

SPLICES.

Where splices are necessary they shall be made by lapping the bars 30 diameters of the bars, and wired securely together with soft wire not smaller than No. 14.

The important splices and connections are to be made with special square shouldered U bolt clips; they shall be truned up tight with 24 inch wrenches, just before placing concrete.

ERECTION.

The Contractor shall employ suitable and competent labor for every kind of work. The Contractor shall furnish all staging, piling, cribbing, centering, casing, and material of every description required in the erection of the work; also all plant, including dredges, engines, pumps, pile drivers, derricks, mixing machines, conveyers, or other appliances necessary for the carrying on of all parts of the work.

The Contractor shall make all provisions necessary to maintain and protect conduits, sewers, and other structures, and shall repair all damage occasioned; shall provide watchmen, red lights, fences and other precautionary measures necessary to the protection of persons and property. The Contractor shall assume all risks for loss or damage incurred by ice, floods, fire or other causes during the construction of the work, and until the same is accepted.

LINES AND GRADES.

Lines and grades will be established by the Engineer, but the Contractor is also required to check all leading dimensions and clearance as a whole and in detail, and to become responsible for the exact position of all parts of the work. The Engineer will provide for the original "lay-out" inspection and checking, but all detail work must be provided for by the Contractor.

43
INSPECTION.

All material furnished by the Contractor shall be subject to the inspection of the Engineer or his duly appointed agent, and said Engineer shall have power to condemn all work which in his opinion is not done in accordance with this contract and specifications.

44
CLEANING UP.

After the completion of the work, and before the final acceptance thereof, the Contractor shall remove all temporary structures and rubbish, and leave the work and surrounding ground in a neat and satisfactory condition. The Contractor shall not allow any rubbish or stone from the piers or abutments to be left in the stream. The same must be cleaned out to the satisfaction of the Engineer.

45
TIME.

The Contractor shall state in his bid how long it will take him to finish the work and he shall begin work in time to have the contract completed on the specified date, and if he fails to complete the work therein specified in the time named, he shall be liable for the wages of the inspector from such time for the completion of the work until the final acceptance of the same, and the amount of such wages shall be deducted from any monies which may be due him from the county.

46
ORDER.

The work shall be prosecuted in such order as the Engineer may direct. He shall determine whether the conditions are favorable for working and may suspend the work or any portion of it, whenever in his opinion the conditions are such as will not insure first-class work.

47
EXTRA WORK.

The Contractor must be prepared to do extra work that may be ordered in writing by the Engineer, and for this he will be paid at current contract rates for work of similar character, or if the work should be of such a class for which no rate is fixed by current contracts, the actual reasonable cost to the Contractor shall be determined by the Engineer, plus 15 per cent of said cost. The Contractor shall have no claim for compensation for the extra work unless the same shall be ordered in writing by the Engineer.

The Contractor shall name a price complete for all of the work necessary to give a finished bridge in every detail, according to the plans and these specifications, he shall also name a price per cubic yard for concrete and excavation for any extra concrete in the foundation should it be found necessary to go deeper or to make the foundation wider than shown by the plans, in order to secure a good foundation.

48
MODIFICATIONS.

Any modifications of the prescribed lines, grades, positions, methods or materials of construction which in the judgment of the Engineer may be expedient, shall be made by the Contractor.

INTERPRETATION OF THE PLANS AND SPECIFICATIONS.

4
The decision of the Engineer shall control as to the interpretation of the plans and specifications during the execution of the work thereunder, but this shall not deprive the Contractor of his lawful rights to redress after the completion of the work for any improper orders or decisions which may have been received during the execution of the work.

TRANSFER OF CONTRACT.

5
The Contractor shall not assign or transfer or sublet the work or any part thereof, except on written recommendation of the Engineer, and with the approval of the Board. In case the Contractor sublet, or under-lets, or makes a sub-contract, contrary to this section, he shall pay to the county a sum to be assessed by the Board, and will be deemed liquidated damages.

ESTIMATES.

5
Approximate estimates of the work done and the material furnished shall be made on or about the last day of the month, and a valuation of the same in proportion to the contract prices for the complete work will be made by the Engineer. The partial estimate made by the Engineer will be paid in cash to the Contractor on or about the 10th day of the following month, less a reduction of 20 per cent upon said valuation which shall be retained until the final completion of the work.

BOARD.

5
Whenever the word "Board" is used in these specifications, it shall mean the Board of County Commissioners of St. Joseph County, Indiana.

AUTHORITY OF ENGINEER.

5
The work under this contract in its progress and with respect to all details shall be under the supervision of the Engineer. It shall be his duty to see that all material used in the work is according to the contract and specifications.

5
His acts and each and all of them shall be under the order and direction and subject to the approval of the Board, and in all general and detail specifications where he is authorized to order, direct, approve or disapprove, or do other acts or things, it is understood that his orders, directions and approval or disapproval, or other acts, are subject to review and approval or disapproval by the Board. All inspectors, also, shall be under the special supervision and direction of the Engineer in carrying out the orders of the Board, but his acts in like manner shall be subject to review, approval or disapproval of the Board. It is understood that the adoption of the general and detail specifications, the Engineer, his assistants, deputies, and the inspectors in the employ of the Board are ordered and directed by the Board to do the acts and perform the duties prescribed herein for each, but that all acts upon their part and each of them are subject to the approval or disapproval of the Board and shall not be binding upon the Board until approved by the Board.

NAME PLATES.

Two pairs of bronze name plates shall be furnished by the Contractor. They shall be of a design approved by the Engineer and built into the roadway side of the abutment pedestals or such other place as may be directed by the Engineer; one pair of each plate being inscribed with the name of the Engineer and County Officials and the year of the completion; the other to be inscribed with the name of the Contractor.

FINAL PAYMENT.

Upon the completion and final acceptance of the work, the Contractor shall be promptly paid the balance of the contract price which then remains due and unpaid.

Board -

Engineer -

I hereby certify that the above specifications are the official specifications of the Board for the _____.

Adopted _____, 19____, by the Board of County Commissioners.

Auditor.