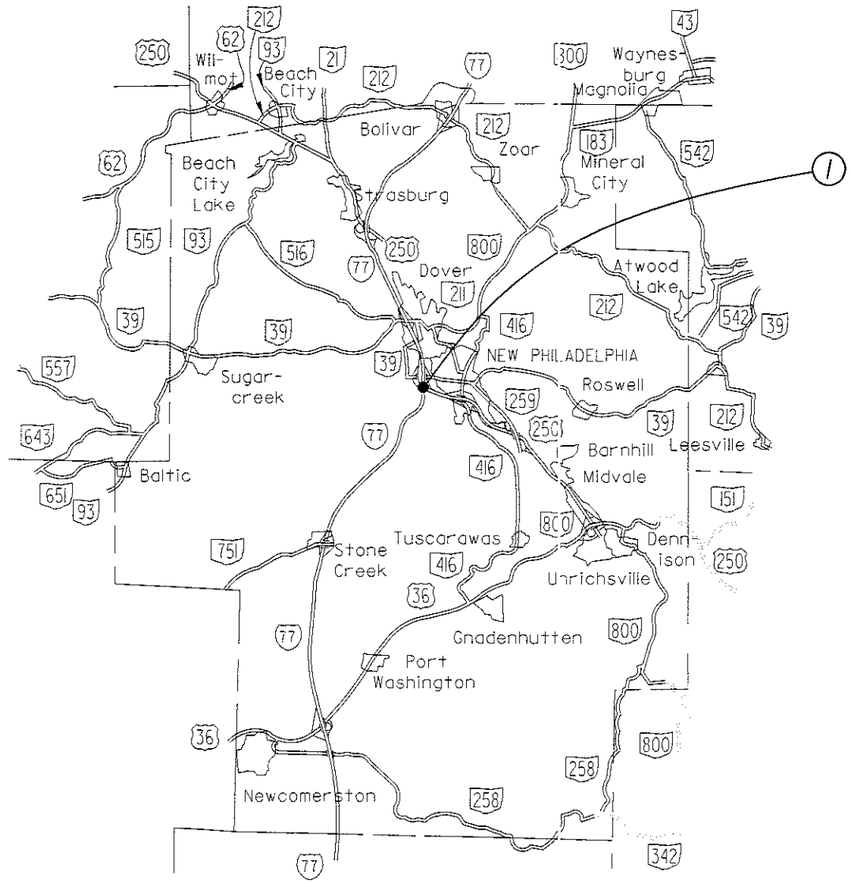
TUS-250-12.32
025006 PID #23583
DIST 11 03-27-02

OHIO DEPARTMENT OF TRANSPORTATION

LOCATION MAP



(1) BRIDGE NO. TUS-250-1232R

● PORTIONS TO BE IMPROVED

BRIDGE REPAIR

TUS-250-12.32

TUSCARAWAS COUNTY

THE 1997 STANDARD SPECIFICATIONS OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, INCLUDING CHANGES AND SUPPLEMENTAL SPECIFICATIONS LISTED IN THE PROPOSAL SHALL GOVERN THIS IMPROVEMENT.

I HEREBY APPROVE THESE PLANS AND DECLARE THAT THE MAKING OF THESE IMPROVEMENTS WILL NOT REQUIRE THE CLOSING OF THE HIGHWAYS TO TRAFFIC. PROVISIONS FOR THE MAINTENANCE AND SAFETY OF TRAFFIC WILL BE AS INDICATED IN THE PLANS.

UNDER AUTHORITY OF SECTION 4511.21, DIVISION (I) OF THE REVISED CODE OF OHIO, THE REVISED PRIMA FACIE SPEED LIMITS AS INDICATED HEREIN ARE DETERMINED TO BE REASONABLE AND SAFE, AND ARE HEREBY ESTABLISHED FOR THE DURATION OF THIS PROJECT. THE PRIMA FACIE SPEED LIMIT OR LIMITS HEREBY ESTABLISHED SHALL BECOME EFFECTIVE FOR U.S. 250 WHEN APPROPRIATE SIGNS GIVING NOTICE THEREOF ARE ERECTED.

APPROVED DATE 02/21/02

DISTRICT DEPUTY DIRECTOR

APPROVED DATE 3-5-02

DIRECTOR, DEPARTMENT OF TRANSPORTATION

UNDERGROUND UTILITIES

TWO WORKING DAYS
BEFORE YOU DIG
CALL **1-800-362-2764** *(TOLL FREE)*
OHIO UTILITIES PROTECTION SERVICE
NON-MEMBERS
MUST BE CALLED DIRECTLY

PLAN PREPARED BY:

O.D.O.T.
DISTRICT 11
NEW PHILADELPHIA, OHIO

STANDARD CONSTRUCTION DRAWINGS

MT-35.10	4-20-01	GSD-1-96	4-20-01	815	2-22-00
MT-95.30M	4-25-94			843	5-5-98
MT-105.10M	4-25-94			863	10-12-99
MT-105.11M	4-25-94			910	7-11-00

SPECIAL PROVISIONS

SUPPLEMENTAL SPECIFICATIONS

ENGINEERS SEAL:

STATE OF OHIO
JAMES L. OLSAVSKY
E-43088
REGISTERED PROFESSIONAL ENGINEER

SIGNED: James L. Olsavsky

DATE: 2/21/02

INDEX OF SHEETS

TITLE SHEET	1
MAINTENANCE OF TRAFFIC	2-3
GENERAL SUMMARY	4
STRUCTURES OVER 20' SPAN	5-10

FEDERAL PROJECT NO. NON-FEDERAL

PID NO. 23583

CONSTRUCTION PROJECT NO.

RAILROAD INVOLVEMENT NONE

TUS-250-12.32

1/10

PROJECT START DATE

The work for this project will not begin until April 1, 2002.

ITEM 614, MAINTAINING TRAFFIC

The Contractor shall maintain one lane of traffic at all times in accordance with the requirements of Item 614 and the Ohio Manual of Uniform Traffic Control Devices. Traffic shall be maintained at all times by use of the existing pavement.

Prior to commencing work on the damaged bridge girder the passing lane (left lane) of U.S. 250 eastbound shall be closed to traffic and remain closed while structural steel repairs are in progress. The Contractor may close one lane of I.R. 77 southbound daily between the hours of 8am and 6pm to repair the girder. See sketch on sheet 3 for additional signing details and notes. The hours and days of lane closures on I.R. 77 and U.S. 250 shall be subject to approval by the Engineer at all times.

Traffic control will be maintained using, but not limited to, Std. Consi. Dwgs. MT-95.30M, MT-105.10M, MT-105.11M and MT-35.10 as per the Ohio Manual of Uniform Traffic Control Devices.

Traffic shall be separated from the work area by means of construction drums. Cones will not be permitted for this project.

No work shall be performed over an open lane of traffic.

The Contractor shall submit a work schedule of proposed daily work and corresponding maintenance of traffic plan for approval by the Engineer. This schedule must be submitted a minimum of 7 calendar days prior to beginning the work. The intent of the progress of this project is that once the Contractor commences work he will work in a continuous manner and complete all work that requires lane closures by May 22, 2002 (Memorial Day Weekend. If the work cannot be completed prior to May 22nd, the Contractor shall make provisions to have all lanes for I.R. 77 and U.S. 250 traffic open between May 22 - May 28, 2002. The Contractor will be assessed liquidated damages per specification 108.07 if he fails to meet this interim completion date.

The Contractor shall remove their equipment from the pavement limits daily. It must be removed to a site 6.0' behind guardrail or 30 feet from the nearest edge of pavement. Portable concrete barrier may also be used by the Contractor for his operational need. The cost for the portable concrete barrier shall be included in the bid items for beam painting and/or heat straightening.

All work and traffic control devices shall be in acordance with 614 and other applicable portions of the specifications, as well as the Ohio Manual of Uniform Traffic Control Devices. Payment for all labor, equipment and materials shall be included in the Lump Sum contract price for 614, Maintaining Traffic, unless separately itemized in the plan.

ITEM 614, LAW ENFORCEMENT OFFICER WITH PATROL CAR

In addition to the requirements of 614 and the latest edition of the Ohio Manual of Uniform Traffic Control Devices (OMUTCD), a uniformed law enforcement officer and an official patrol car with working top-mounted emergency flashing lights shall be provided for controlling traffic for the following tasks:

1) For lane closures: during initial set-up periods, or when new lane closures are initiated.

2.) As directed by the Engineer.

Law enforcement officers (LEO's) should not be used where the OMUTCD intends that flaggers be used. The LEO's are considered to be employed by the Contractor, and the Contractor shall be responsible for their actions. Although they are employed by the Contractor, the Project Engineer shall have control over their placement. The official patrol car shall be a public safety vehicle as required by the Ohio Revised Code.

The Contractor shall make arrangements for these services with the Ohio Highway Patrol, New Philadelphia Post, 2454 East High Ave., New Philadelphia, Ohio telephone (330) 339-1103.

Law enforcement officers with patrol car required by the traffic maintenance tasks above shall be paid for on an hourly basis under Item 614, Law Enforcement Officer With Patrol Car. The following estimated quantity has been carried to the Maintenance of Traffic General Summary:

Item 614, Law Enforcement Officer With Patrol Car - - - - - - - - - - - - 160 Hour

The hours paid shall include minimum show-up time required by the law enforcement agency involved.

If the Contractor wishes to utilize LEO's for flagging and traffic control other than that required in these plans, he may do so at his own expense. Payment for the excess above the contract requirements will be included under Item 614, Maintaining Traffic.

ITEM 614 - PORTABLE CHANGEABLE MESSAGE SIGN, BY CLASS, AS PER PLAN

The Contractor shall furnish, install, maintain and remove, when no longer needed, a changeable message sign for the duration of the project. The sign shall be of a type shown on a list of approved PCMS units maintained by the Director. The list currently contains Class III, II and I units with minimum legibility distances of 650 ft., 850 ft. and 1250 ft. respectively.

Each sign shall be trailer mounted and equipped with a functional dimming mechanism to dim the sign during darkness and a tamper and vandal proof enclosure. Each sign shall be provided with appropriate training and operation instructions to enable on-site personnel to operate and troubleshoot the unit. The sign shall also be capable of being powered by an electrical service drop from a local utility company.

The probable locations and work limits for those locations shall be detailed in the schematic provided to the Roadway Services Manager for approval. Placement, operation, maintenance and all activation of the signs by the Contractor shall be as directed by the Engineer. The PCMS shall be located in a highly visible position yet protected from traffic. The contractor shall, at the direction of the Engineer, relocate the PCMS to improve visibility or accommodate changed conditions. When not in use, the PCMS will be off, facing away from all traffic and shall display one or more high intensity yellow reflective sheeting surfaces of 9-inch by 15-inch minimum size facing traffic.

The Engineer shall be provided access to each sign unit and shall be provided with appropriate training and operation instructions to enable ODOT personnel to operate and troubleshoot the unit and to revise sign messages, if necessary.

The Contractor shall implement a system whereby changed messages will be implemented within hours following telephone notification from the project engineer to a designated phone.

All messages to be displayed on the sign will be provided by the Engineer. A list of all required preprogrammed messages will be given to the Contractor at the project preconstruction conference. The sign shall have the capability to store up to 99 messages. Message memory or pre-programmed displays shall not be lost as a result of power failures to the on board computer. The sign legend shall be capable of being changed in the field. Three-line presentation formats with up to six message phases shall be supported, but normally, not more than two messages phases should be employed, although three phases may be used in unusual conditions. PCMS format shall permit the complete message for each phase to be read at least once.

The PCMS shall contain an accurate clock and programming logic which will allow the sign to be activated, deactivated or messages changed automatically at different time of the day for different days of the week.

The PCMS shall contain a cellular telephone data link which will (in active cellular phone areas) allow remote sign activation, deactivation, message changes, message additional and revisions to time of day programs. The system shall also permit verification of current and programmed messages. One remote data input device (Laptop computer plus modem or equivalent) shall be furnished for use by the Tuscarawas County Manager and shall be insured against theft.

The PCMS unit shall be maintained in good working order by the Contractor in accordance with the provisions of 614.03 (c). The Contractor shall, prior to activating the unit make arrangements with an authorized service agent for the PCMS to assure prompt service in the event of failure. Any failure shall not result in the sign being out of service for more than 12 hours including weekends. Failure to comply may result in an order to stop work and open all traffic lanes and/or in the Department taking appropriate action to safely control traffic and the entire cost to control traffic accrued by the department will be deducted from moneys due, or to become due the Contractor on his contract.
The Contractor shall be responsible for 24 hours per day operation and maintenance of these signs on the project for the duration of the phases when the plan requires their use. The requirement to furnish, install, maintain and remove a PCMS unit on this project shall not in any way relieve the Contractor of his responsibilities as outlined in 104.04.
Payment for the above described item shall be at the contract unit price bid per sign-month for each Item 614 Portable Changeable Message Sign, as per plan and shall include all labor, materials, equipment, fuels, lubricating oils, software, hardware and incidentals to perform the above described work.

NOTIFICATION OF WORK ZONE LANE RESTRICTIONS

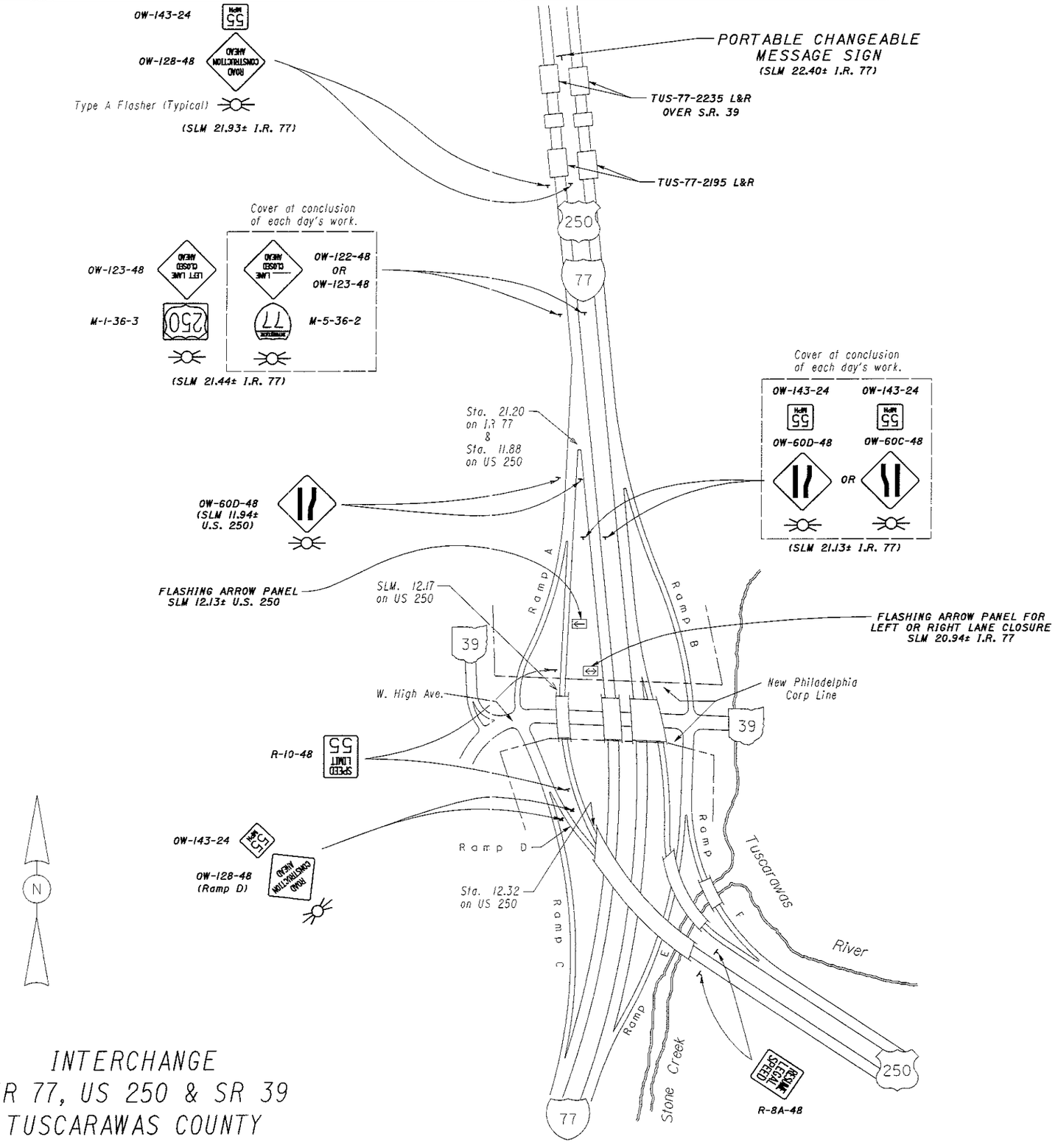
The Contractor shall notify the Engineer at least eighteen (18) days prior to implementing any work zone restrictions that will reduce the width or vertical clearance of any lane on which traffic will be maintained during construction.

The Engineer shall immediately notify the District Roadway Services Manager to advise the Office of Highway Management of the restrictions.

CALCULATED JPB CHECKED JLO

MAINTENANCE OF TRAFFIC NOTES

TUS-250-12.32



INTERCHANGE
IR 77, US 250 & SR 39
TUSCARAWAS COUNTY

NOTES :

1. All sign installations shown on this sheet shall be on permanent supports.
2. Signs for I.R. 77 shall be covered at the conclusion of each day's work.
3. Route marking and regulatory signs will become property of the State at the conclusion of the project.
4. Placement of the Portable Changeable Message Sign shall be behind guardrail.
5. For details not shown, see Std. Const. Dwg. MT-95.30M.

CALCULATED JPB
CHECKED RWW

MAINTENANCE OF TRAFFIC

TUS-250-12.32

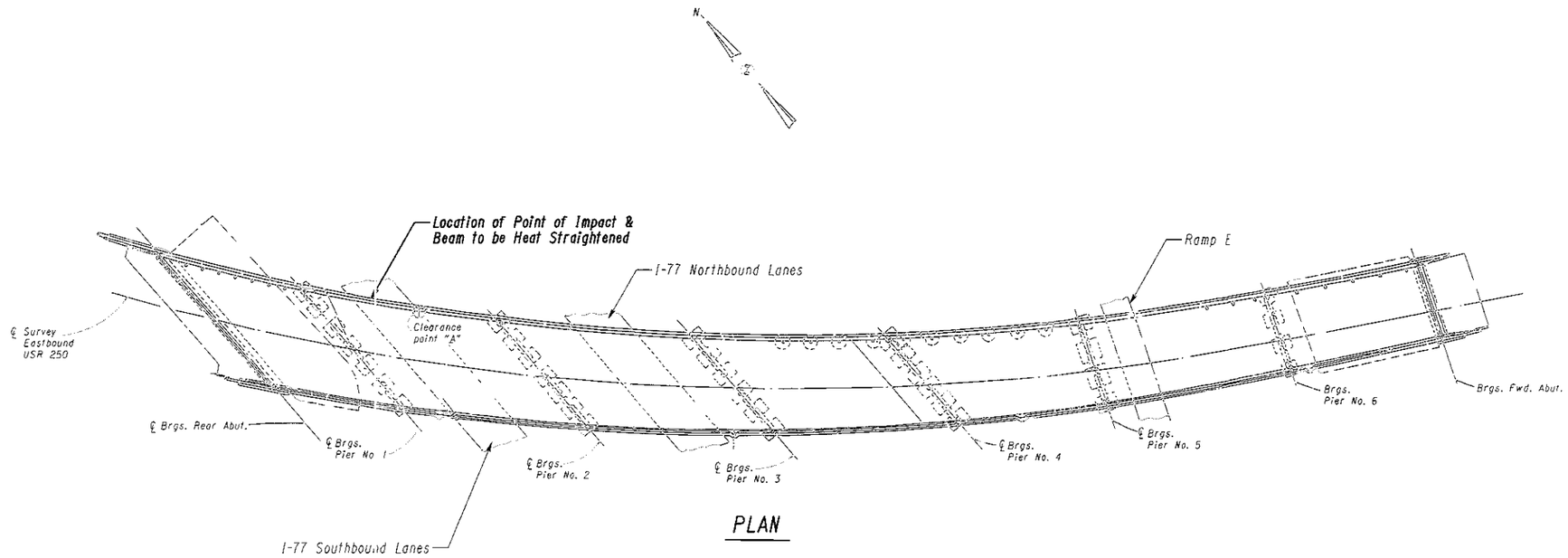
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10

SHEET NUMBER	ITEM	ITEM EXT.	GRAND TOTAL	UNIT	DESCRIPTION	AS PER PLAN SHEET NO.
2						
					MAINTENANCE OF TRAFFIC	
160	614	11100	160	HOUR	LAW ENFORCEMENT OFFICER WITH PATROL CAR	
2	614	18511	2	MONTH	PORTABLE CHANGEABLE MESSAGE SIGN, AS PER PLAN	2
					STRUCTURES	
					(FOR STRUCTURE NO. TUS-250-1232R) SEE SHEET NO. 7	
LUMP	614	11000	LUMP		MAINTAINING TRAFFIC	
	624	10000	LUMP		MOBILIZATION	

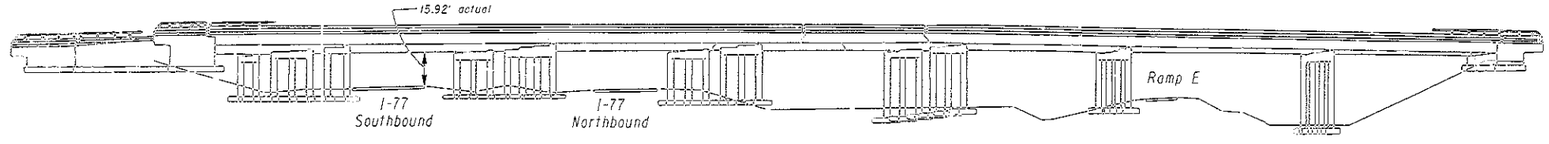
CALCULATED JPB
CHECKED SAL

GENERAL SUMMARY

TUS-250-12.32



PLAN



ELEVATION

DESIGN AGENCY
O.D.O.T.
DISTRICT 11
PRODUCTION DEPARTMENT

DESIGNED	DRAWN	REVIEWED	DATE
JAS	JAS	JLO	12/13/01
CHECKED	REVISED	STRUCTURE FILE NUMBER	
JPB		7904835	

SITE PLAN

BRIDGE NO. TUS-250-1232R
over I.R. 77

TUS-250-12.32

1/6

5/10

REFERENCES

REFERENCE SHALL BE MADE TO STANDARD DRAWINGS :

GSD-1-96 4-20-01

AND TO SUPPLEMENTAL SPECIFICATIONS :

815	2-22-00	863	10-12-99
843	5-5-98	910	7-11-00

PROPOSED WORK

THE INTENT OF THIS PLAN IS TO REPAIR ONE DAMAGED BUILT-UP BEAM WITH WEB STIFFENERS ON STRUCTURE TUS-250-1232R. THE DAMAGED BEAMS SHALL BE REPAIRED BY MEANS OF HEAT STRAIGHTENING AND THE WORK SHALL ALSO INCLUDE NON-DESTRUCTIVE TESTING AND DRILLING OF HOLES TO ARREST CRACKS IN THE BEAM, REPAIR OF DAMAGED WEB, STIFFENERS, AND THE REPLACEMENT OF ALL DAMAGED CROSS FRAMES AS DESIGNATED ON THE PLAN. HEAT STRAIGHTENING OF THE DAMAGED STRUCTURAL STEEL SHALL BE COMPLETED WITHIN 60 DAYS FOLLOWING THE AWARD OF THE CONTRACT.

PREVIOUS CONSTRUCTION PLANS

THE FOLLOWING PREVIOUS PLANS OF THE EXISTING BRIDGE ARE AVAILABLE FOR REFERENCE AT THE DISTRICT II OFFICE OF THE OHIO DEPARTMENT OF TRANSPORTATION, NEW PHILADELPHIA, OHIO:

TUS-21-26.33/ TUS-250-11.60 ORIGINAL CONSTRUCTION PLAN, 1962

DESIGN SPECIFICATIONS

THIS STRUCTURAL REPAIR CONFORMS TO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1996, INCLUDING THE 1997, 1998 & 1999 INTERIM SPECIFICATIONS AND THE ODOT BRIDGE DESIGN MANUAL.

DESIGN DATA

EXISTING STRUCTURAL STEEL - ASTM A33-YIELD STRENGTH 33,000 PSI

UTILITIES

LISTED BELOW ARE ALL UTILITIES LOCATED WITHIN THE PROJECT CONSTRUCTION LIMITS TOGETHER WITH THEIR RESPECTIVE OWNERS :

OHIO DEPARTMENT OF TRANSPORTATION TELEPHONE : 330-339-6633
2201 REISER AVE. SE CONTACT : MARK DAVIS
NEW PHILADELPHIA, OHIO 44663

ITEM 863 - HEAT STRAIGHTENING OF DAMAGED STRUCTURAL STEEL

THE DAMAGED BEAMS (AS SHOWN ON ATTACHED SHEETS) WILL BE HEAT STRAIGHTENED AS PER PROPOSAL NOTE, 528 - 91 AND SUPPLEMENTAL SPECIFICATION 863. THE DAMAGED BEAMS WILL BE TESTED BY THE MAGNETIC PARTICLE METHOD AT THE AREAS WHERE THE WEB STIFFENERS ARE WELDED TO THE BEAMS AND THOSE AREAS AS REQUIRED BY THE PROPOSAL NOTE. ALL WEB STIFFENERS ADJACENT TO THE DAMAGED AREAS WILL BE CHECKED FOR WELDS THAT WERE LOOSENED. IF ANY LOOSENED WELDS ARE DISCOVERED THEY WILL BE GROUND SMOOTH AND PREPARED FOR WELDING AFTER A MAGNETIC PARTICLE TEST HAS BEEN PERFORMED. (AFTER COMPLETION OF THE STRAIGHTENING THE DAMAGED AREAS SHALL BE PRIME COAT PAINTED WITH A SINGLE COMPONENT MOISTURE CURE URETHANE PAINT. THE PRIME COAT PAINT SHALL BE TEMPORARY UNTIL THE CONTRACTOR IS ABLE TO PAINT, AS PER SUPPLEMENTAL SPECIFICATION 815 THE SPECIFIED AREAS USING THE OZEU PAINT SYSTEM.) ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO COMPLETE THIS ITEM EXCEPT FOR THE PAINTING SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 863 - HEAT STRAIGHTENING OF STRUCTURAL STEEL.

ITEM 863, STRUCTURAL STEEL MISC.: HEAT STRAIGHTENING OF DAMAGED WEB STIFFENERS

THIS ITEM SHALL INCLUDE REPAIR OF DAMAGED INTERMEDIATE WEB STIFFENERS BY HEAT STRAIGHTENING OR REPLACEMENT TO MEET THE FINAL TOLERANCES AS PER THE PROPOSAL NOTE 528-91. AFTER THE DAMAGED BEAM HAS BEEN HEAT STRAIGHTENED, THE WEB STIFFENERS SHALL BE CORRECTED. AT THE CONTRACTOR'S OPTION, ALL OR PORTIONS OF THE WEB STIFFENERS MAY BE REPLACED WITH NEW STEEL IN LIEU OF HEAT STRAIGHTENING, AT NO ADDITIONAL COST TO THE STATE. IF THE ENTIRE STIFFENER IS REPLACED, ONLY ONE SIDE MAY BE REMOVED AT A TIME.

ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO COMPLETE THIS ITEM SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 863, STRUCTURAL STEEL MISC.: HEAT STRAIGHTENING OF DAMAGED WEB STIFFENERS.

MAINTENANCE OF TRAFFFIC

FOR MAINTENANCE OF TRAFFIC QUANTITIES AND NOTES, SEE SHEET NO'S. 2-3.

ITEM SPECIAL - FIELD PAINTING OF EXISTING STEEL, SPOT, SYSTEM OZEU

ALL REPAIR AREAS SHALL BE PRIME COATED AFTER THE HEAT STRAIGHTENING PROCESS IS COMPLETED. ANY AREA DAMAGED BY THE COLLISION AND ANY AREA AS DESIGNATED BY THE ENGINEER SHALL BE COATED USING THE OZEU PAINT SYSTEM. THE COLOR OF THE PAINT TO BE USED SHALL CLOSELY MATCH THE EXISTING PAINT. THE OZEU PAINT SYSTEM SHALL BE IN ACCORDANCE WITH SUPPLEMENTAL SPECIFICATION 815.

ITEM 863 - STRUCTURAL STEEL MISC.: STRUCTURAL STEEL RETROFIT (DAMAGED INTERMEDIATE STIFFENER END REMOVAL, GRINDING & NDT)

WHERE POSSIBLE THE DAMAGED INTERMEDIATE WEB STIFFENERS MAY BE REPAIRED BY HEAT STRAIGHTENING. IF A STIFFENER CAN NOT BE HEAT STRAIGHTENED AS DETERMINED BY THE ENGINEER OR WHERE PORTIONS OF THE STIFFENER NEED TO BE REMOVED IN ORDER TO REPAIR A CRACK OR TEAR IN THE WEB, PORTIONS OF THE INTERMEDIATE STIFFENER SHALL BE REMOVED USING THE FOLLOWING SEQUENCE OF OPERATIONS:

1. DRILL 2" DIAMETER HOLES THROUGH THE STIFFENERS AT THE LOCATIONS SHOWN. (AN ALTERNATE METHOD IS TO DRILL A 1" DIA. HOLE PRIOR TO CUTTING THE STIFFENER AS SHOWN ON PLAN SHEET 10, DETAIL "A". A 1" RADIUS SHALL BE GROUND IN THE STIFFENER NEXT TO THE WEB, AS SHOWN.)
2. MAKE THE HORIZONTAL CUT THRU THE STIFFENERS AS SHOWN.
3. MAKE VERTICAL CUT THRU THE STIFFENERS SHOWN BEING CAREFUL TO CUT FAR ENOUGH AWAY FROM THE GIRDER WEB TO AVOID ANY UNDERCUT OR GOUGING OF THE WEB FROM THE CUTTING OPERATION. ALL CUTTING MAY BE DONE BY EITHER THE OXYGEN CUTTING OR THE AIR CARBON ARC PROCESS. CUTTING MAY BE DONE MANUALLY PROVIDED A GUIDE IS USED AND A STRAIGHT CUT IS ATTAINED. IF OXYGEN IS USED THE CUT SHALL BE MADE IN SUCH A MANNER THAT ONLY THE STIFFENER IS SEVERED, AND NOT AT A LOCATION WHERE THE CUT WOULD EXTEND INTO THE VERTICAL FILLET WELDS. IF AIR CARBON ARC IS USED THE CUT SHALL BE MADE NO CLOSER TO THE WEB THAN 1/8". WHATEVER PROCESS IS USED, THE CONTRACTOR SHALL DEMONSTRATE TO THE ENGINEER PRIOR TO START OF THE WORK THAT HE CAN ACCOMPLISH THE WORK WITHOUT DAMAGE TO THE GIRDER WEB.
4. THE SURFACES OF THE VERTICAL CUTS SHALL BE GROUND IMMEDIATELY AFTER DISCARDING THE PORTION OF STIFFENER REMOVED. THIS GRINDING IS TO REMOVE ANY LARGE SURFACE IRREGULARITIES.
5. GRIND ANY REMAINING VERTICAL FILLET WELDS AND STIFFENERS SO THAT THE RESULTING SURFACE OF THE WEB IS SMOOTH. CARE SHALL BE TAKEN THAT THE FULL THICKNESS OF THE WEB IS MAINTAINED AND NO UNDERCUT, GOUGING OR OVERGRINDING OF THE WEB TAKES PLACE. IF THE 2" DIAMETER HOLES OF STEP 1 DID NOT TOUCH THE EDGE OF THE WEB THE HOLES SHALL BE GROUND SO THAT A SMOOTH RADIUS FROM THE FACE OF WEB TO HORIZONTAL TOP OF THE STIFFENER RESULTS. DO NOT GOUGE THE FLANGE.
6. GRIND IRREGULARITIES ON THE TOPS OF THE STIFFENERS.
7. CLEAN THE RETROFIT AREAS OUTLINED IN THE ELEVATION VIEW BY PENCIL SAND BLASTING THE PAINT FROM BOTH SIDES OF THE WEB AND FLANGE-WEB FILLET WELDS. SPECIAL CLEANING BY GRINDING SHALL BE USED ONLY AS DIRECTED BY THE ENGINEER FOR FURTHER INVESTIGATION OF CRACK PRESENCE.
8. THE CONTRACTOR AND THE ENGINEER SHALL CAREFULLY VISUALLY INSPECT THE WEB AND FILLET WELDS. FURTHER CAREFUL GRINDING MAY BE DIRECTED BY THE ENGINEER TO IMPROVE THE PERFORMANCE OF THE NON-DESTRUCTIVE TESTS. GRINDING MUST BE CAUTIOUS ESPECIALLY IN THE CRACK LOCATION. THEN THE CONTRACTOR SHALL NON-DESTRUCTIVELY TEST BOTH AREAS WITH MAGNETIC PARTICLE EXAMINATION AND/OR DYE PENETRANT SO THAT THE ENGINEER MAY FURTHER INSPECT FOR CRACKS.

CONTRACTOR'S PERSONNEL PERFORMING NON-DESTRUCTIVE TESTING SHALL BE QUALIFIED AS PER 863.27.

THE NUMBER OF ANTICIPATED RETROFITS ARE SHOWN ON PLAN SHEET NO. 8/9. (THERE ARE EXTERIOR AND INTERIOR-STIFFENERS TO BE RETROFIT.)

EXISTING STRUCTURE VERIFICATION

DETAILS AND DIMENSIONS SHOWN ON THESE PLANS PERTAINING TO THE EXISTING STRUCTURE HAVE BEEN OBTAINED FROM PLANS OF THE EXISTING STRUCTURE AND FROM FIELD OBSERVATIONS AND MEASUREMENTS. CONSEQUENTLY, THEY ARE INDICATIVE OF THE EXISTING STRUCTURE AND THE PROPOSED WORK BUT THEY SHALL BE CONSIDERED TENTATIVE AND APPROXIMATE. THE CONTRACTOR IS REFERRED TO CMS SECTIONS 102.05. 105.02 AND 513.02/863.07.

CONTRACT BID PRICES SHALL BE BASED UPON A RECOGNITION OF THE UNCERTAINTIES DESCRIBED ABOVE AND UPON A PREBID EXAMINATION OF THE EXISTING STRUCTURE BY THE CONTRACTOR. HOWEVER, ALL PROJECT WORK SHALL BE BASED UPON ACTUAL DETAILS AND DIMENSIONS WHICH HAVE BEEN VERIFIED BY THE CONTRACTOR IN THE FIELD.

ITEM 863 - STRUCTURAL STEEL MEMBERS MISCELLANEOUS FABRIBRICATION, AS PER PLAN (REPLACEMENT OF DAMAGED CROSS FRAMES AND PORTIONS OF WEB STIFFENERS)

REHABILITATION SHALL CONSIST OF REMOVING THE DAMAGED CROSS FRAMES (AS SHOWN ON THE ATTACHED SHEETS) ON STRUCTURE TUS-250-1232R, SUPPLYING NEW CROSS FRAMES AND WELDING THEM BACK TO THE ORIGINAL POSITIONS OF THE CROSS FRAMES THAT WERE REMOVED. AFTER REMOVAL, ALL WELDS SHALL BE GROUND SMOOTH, IN PREPARATION OF WELDING THE NEW CROSS FRAMES IN PLACE. CROSS FRAME ANGLES SHALL BE 3"x3"x5/16". THE NEW CROSS FRAME ANGLES WILL BE WELDED TO THE BEAM STIFFENER AS SHOWN IN THE PLAN.

THOSE PORTIONS OF THE WEB STIFFENERS REMOVED FOR REPAIR OF CRACK IN THE WEB, SHALL BE REPLACED AS SHOWN IN THE PLAN.

ALL SECTIONS OF SS 863 APPLY EXCEPT AS REVISED HEREIN. THE ENGINEER IS RESPONSIBLE FOR ENSURING ANY SHOP OR FIELD FABRICATED STEEL SUPPLIED UNDER THIS BID ITEM IS ACCEPTABLE. THE REQUIREMENTS FOR SUBMITTAL OF SHOP DRAWINGS TO THE OFFICE OF STRUCTURAL ENGINEERING IS WAIVED. AT THE ENGINEER'S OPTION, THE CONTRACTOR SHALL EITHER SUPPLY THE ENGINEER WITH SHOP DRAWINGS, REQUIRED IN SECTION 863.08, PRIOR TO ANY INCORPORATION OF SHOP FABRICATED STEEL AT THE PROJECT, OR SUPPLY THE ENGINEER WITH "AS FABRICATED" DRAWINGS, MEETING 863.08, AFTER COMPLETION OF FIELD FABRICATION. THE ENGINEER SHALL ASSURE THE SUBMITTED DRAWINGS MATCH THE FINAL AS BUILT STEEL INCORPORATED INTO THE WORK. IF THE ENGINEER IS SATISFIED WITH THE DRAWINGS AND THE DELIVERED MATERIALS, THE CONTRACTOR SHALL SUPPLY A COPY SET, STAMPED AND DATED AS PER 863.08, TO THE OFFICE OF STRUCTURAL ENGINEERING FOR RECORD PURPOSES. SUBMITTAL REQUIREMENTS UNDER 863.09, MATERIALS, SHALL BE MADE TO THE ENGINEER. THE CONTRACTOR SHALL FURNISH A COPY OF THE WRITTEN LETTER OF ACCEPTANCE, 863.09, TO THE OFFICE OF STRUCTURAL ENGINEERING WRITTEN LETTER OF ACCEPTANCE.

ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO COMPLETE THIS ITEM EXCEPT FOR PAINT SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 863 - STRUCTURAL STEEL MEMBERS MISCELLANEOUS FABRIBRICATION, AS PER PLAN (REPLACEMENT OF DAMAGED CROSS FRAMES AND PORTIONS OF WEB STIFFENERS). THE QUANTITY HAS BEEN CARRIED TO THE GENERAL SUMMARY.

ITEM 863 - STRUCTURAL STEEL, MISC.: DRILLING STRUCTURAL STEEL (3/4" DIAMETER HOLE, GRINDING & NON-DESTRUCTIVE TESTING)

THIS WORK SHALL CONSIST OF DRILLING 3/4" DIAMETER HOLES AT THE ENDS OF CRACKS, GRINDING AND NDT. TESTING WILL BE AS DIRECTED BY THE ENGINEER. VICUAL CRACKS WERE FOUND AT WEB STIFFENERS WHERE CROSS FRAMES WERE ATTACHED. 3/4" DIAMETER HOLES SHALL BE DRILLED AT THE APPARENT ENDS OF THE CRACKS REVEALED BY THE NDT AND VISUAL INSPECTION PERFORMED UNDER STRUCTURAL STEEL RETROFIT. THE EXPOSED SURFACE OF EACH DRILLED HOLE SHALL BE GROUND SMOOTH AND CAREFULLY INSPECTED FOR CRACKS USING DYE PENETRANT AND/OR MAGNETIC PARTICLE INSPECTION. DRILLING, GRINDING AND TESTING SHALL CONTINUE UNTIL ALL CRACK ENDS ARE REMOVED. WHEN NO CRACKS ARE DETECTED AT A LOCATION, NO HOLES SHALL BE DRILLED. THE WEB STIFFENER DETAIL ON PLAN SHEET 10 SHOWS A TYPICAL CRACK WHICH MAY BE ENCOUNTERED. SINCE ANY OF THE CRACKS COULD PROPAGATE INTO THE FLANGE-WEB FILLET WELD, REMOVING THE ENDS IS IMPERATIVE. THE LOCATION OF ALL HOLES SHALL BE DETERMINED BY THE ENGINEER AND DRILLED UNDER HIS DIRECTION. THE ACCEPTED NUMBER OF 3/4-INCH DIAMETER HOLES DRILLED IN THE STRUCTURAL STEEL AS DETAILED ABOVE WILL BE PAID FOR AT THE CONTRACT PRICE PER EACH HOLE. THIS ITEM IS DEPENDENT UPON FINDING EXISTING CRACKS IN THE WEB AND THE NUMBER OF HOLES TO BE DRILLED IS AN ESTIMATE AND SHALL BE CONSIDERED TENTATIVE AND APPROXIMATE.

"CONTRACTOR'S PERSONNEL PERFORMING NON-DESTRUCTIVE TESTING SHALL BE QUALIFIED AS PER 863.27."

ITEM 863 - STRUCTURAL STEEL, MISC.: WELDING EXISTING CRACKS

AFTER DRILLING HOLES AND PERFORMING NON-DESTRUCTIVE TESTING TO ENSURE THE CRACK TIPS ARE CONTAINED IN THE HOLES, TEARS OR CRACK SHALL BE REPAIRED WITH FULL PENETRATION BUTT WELDING AS PER 863.23 BETWEEN THE HOLES, GRINDING THE WELDS SMOOTH, AND SUBSEQUENT NON-DESTRUCTIVE TESTING AS PER 863.27, HOWEVER ULTRASONIC OR RADIOGRAPHIC INSPECTION WILL NOT BE REQUIRED UNLESS DIRECTED BY THE ENGINEER.

THE ITEM SHALL INCLUDE ALL PREPARATION OF THE CRACK OR TEAR FOR WELDING SUCH AS CLEANING AND GRINDING, THE WELD AND NON-DESTRUCTIVE TESTING WELDING SHALL BE MEASURED IN LINEAR FEET OF CRACK REPAIRED.

DESIGN AGENCY
O.D.O.T.
DISTRICT 11
PRODUCTION DEPARTMENT

DESIGNED	DRAWN	REVIEWED	DATE
JPB	JPB	JLO	12/13/01
CHECKED	REVISED	STRUCTURE FILE NUMBER	
SAL		7904835	

GENERAL NOTES
BRIDGE NO. TUS-250-1232R
over INTERSTATE 77

TUS-250-12.32

BRIDGE SUMMARY (* SEE PROPOSAL NOTE)

GENERAL	SUPERSTRUCTURE			ITEM	ITEM EXT.	TOTAL	UNIT	DESCRIPTION	See Structure Sht. No.
	60			SPECIAL	51912600	60	LIN FT	CONCRETE REPAIR BY EPOXY INJECTION *	
	LUMP			SPECIAL	81500010	LUMP		FIELD PAINTING OF EXISTING STEEL, SPOT CLEAN, SYSTEM OZEU	
	LUMP			SPECIAL	81500014	LUMP		FIELD PAINTING OF EXISTING STEEL, SPOT PRIME, SYSTEM OZEU	
	LUMP			SPECIAL	81500018	LUMP		FIELD PAINTING OF EXISTING STEEL, SPOT INTERMEDIATE COAT, SYSTEM OZEU	
	LUMP			SPECIAL	81500022	LUMP		FIELD PAINTING OF EXISTING STEEL, SPOT FINISH, SYSTEM OZEU	
	60			843	50000	60	SQ FT	PATCHING CONCRETE STRUCTURES WITH TROWELABLE MORTAR	
	900			863	10201	900	POUND	STRUCTURAL STEEL MEMBERS, MISCELLANEOUS LE/EL FABRICATION, AS PER PLAN	2/6
	LUMP			863	19000	LUMP		HEAT STRAIGHTENING OF DAMAGED STRUCTURAL STEEL *	2/6
	7			863	95000	7	LIN FT	STRUCTURAL STEEL, MISC.: WELDING EXISTING CRACKS	2/6
	22			863	95030	22	EACH	STRUCTURAL STEEL, MISC.: HEAT STRAIGHTENING OF DAMAGED WEB STIFFENERS *	2/6
	14			863	95030	14	EACH	STRUCTURAL STEEL, MISC.: DRILLING STRUCTURAL STEEL (3/4" DIA. HOLE, GRINDING & NON-DESTRUCTIVE TESTING)	2/6
	8			863	95030	8	EACH	STRUCTURAL STEEL, MISC.: DAMAGED WEB STIFFENER RETROFIT, GRINDING & NON-DESTRUCTIVE TESTING	2/6

DESIGN AGENCY
O.D.O.T.
DISTRICT 11
PRODUCTION DEPARTMENT

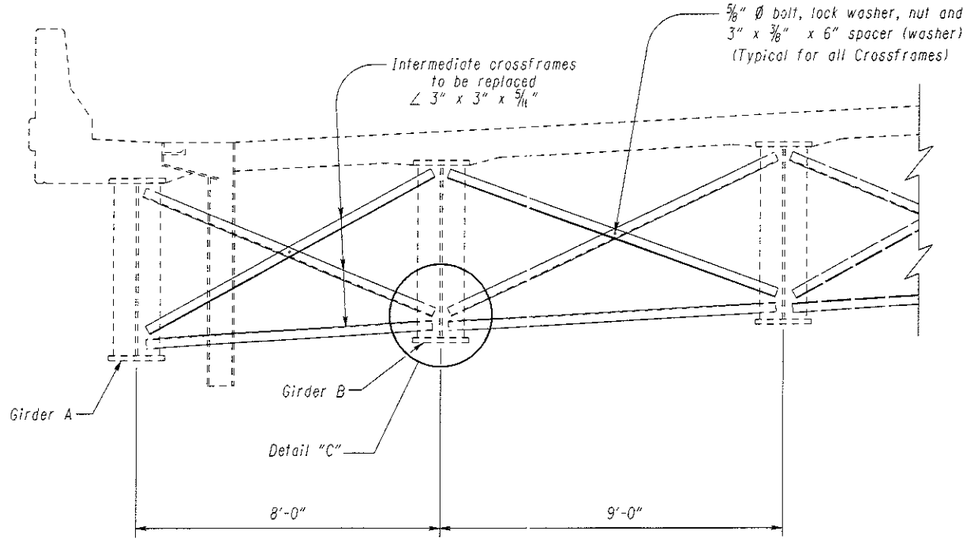
DESIGNED JPB | DRAWN JPB | REVIEWED JLO | DATE 12/13/01
CHECKED SAL | REVISED | STRUCTURE FILE NUMBER 7904835

BRIDGE GENERAL SUMMARY
BRIDGE NO. TUS-250-1232R over I.R.77

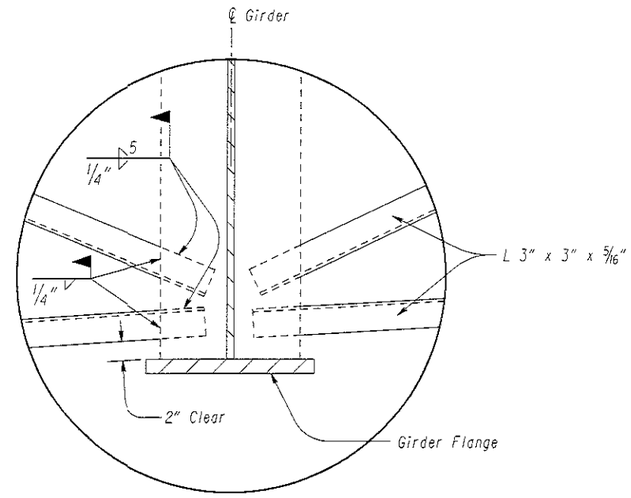
TUS-250-12.32

3/6

7/10

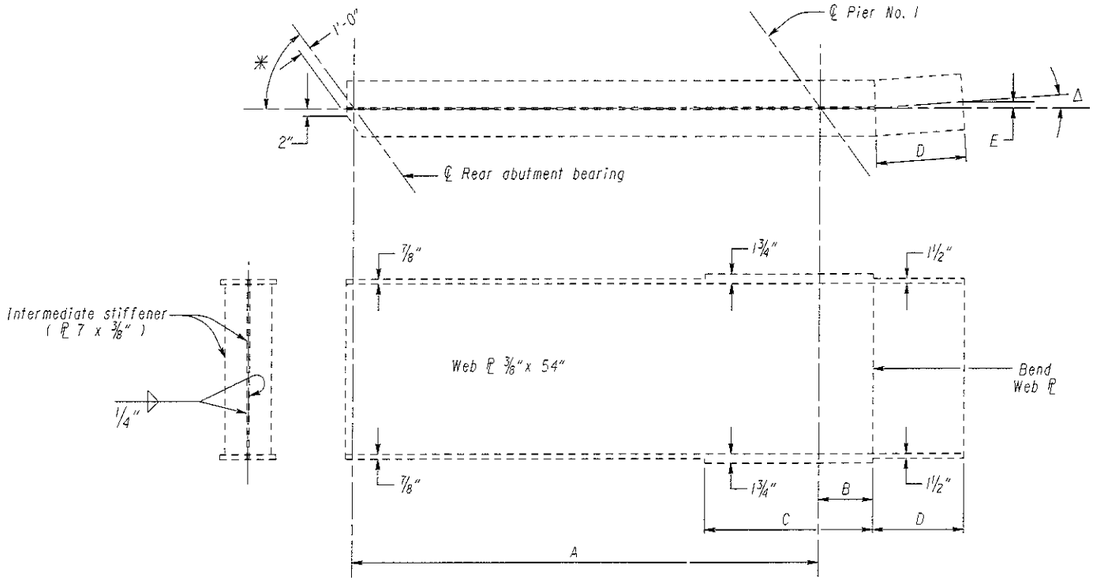


PARTIAL TRANSVERSE SECTION

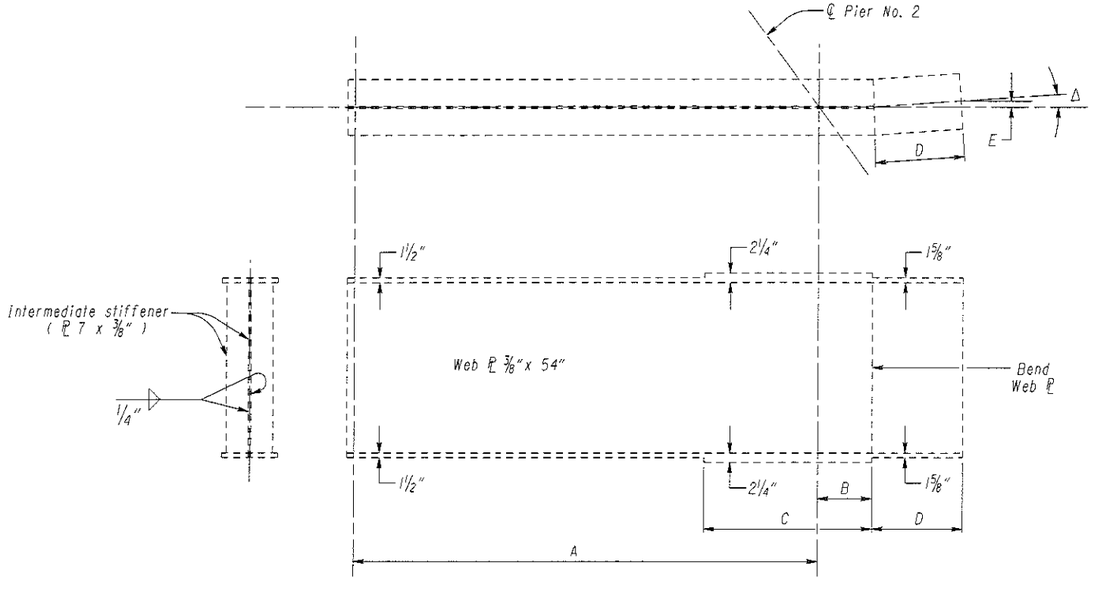


DETAIL "C"

Crossframe Welding Detail



GIRDER	DIMENSIONS						
	A	B	C	D	E	Δ	✳
A	79'- 8 3/8"	9'- 3 3/8"	28'- 4"	11'- 9"	10 1/2"	4° 16' 40"	35° 52' 20"
B	75'- 5 9/16"	8'- 9 7/16"	27'- 8"	11'- 9"	4 3/4"	1° 55' 00"	38° 14' 00"



GIRDER	DIMENSIONS					
	A	B	C	D	E	Δ
A	91'- 10 3/4"	14'- 3"	33'- 3"	11'- 11"	12"	4° 48' 40"
B	91'- 10 3/4"	14'- 3"	32'- 3"	11'- 11"	12"	4° 48' 40"

DESIGN AGENCY
O.D.O.T.
DISTRICT 11
PRODUCTION DEPARTMENT

DESIGNED	DRAWN	REVIEWED	DATE
JAS	JAS	JLO	12/13/01
CHECKED	REVISED	STRUCTURE FILE NUMBER	
JPB		7904835	

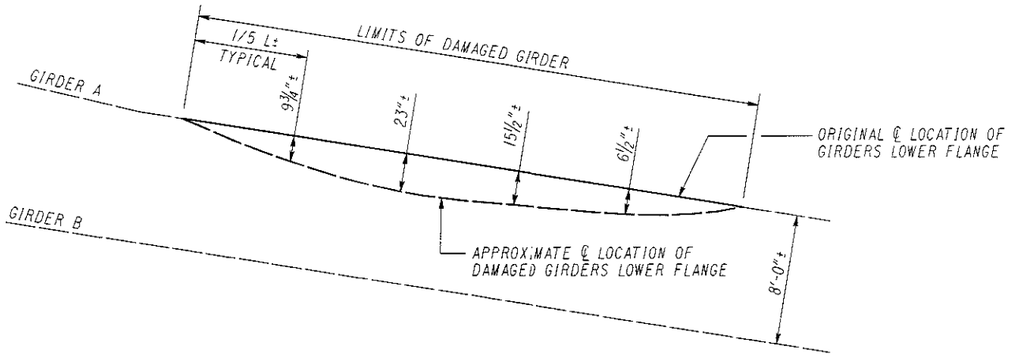
STRUCTURE DETAILS

Bridge No. TUS-250-1232R
over I.R. 77

TUS-250-12.32

4/6

8/10



OUT OF PLANE DETAIL FOR GIRDER A

(FOR CLARITY, CROSS FRAMES NOT SHOWN)



○ - LOCATIONS OF KNOWN CRACKS IN WEB AT STIFFENERS

X - CROSS FRAMES TO BE REPLACED

DESIGN AGENCY
O.D.O.T.
DISTRICT 11
PRODUCTION DEPARTMENT

DESIGNED	DRAWN	REVIEWED	DATE
JPB	JPB	JLO	12/13/01
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SAL		7904835	

FRAMING PLAN FOR SPANS 1, 2, & 3

BRIDGE NO. TUS-250-1232R
over I.R. 77

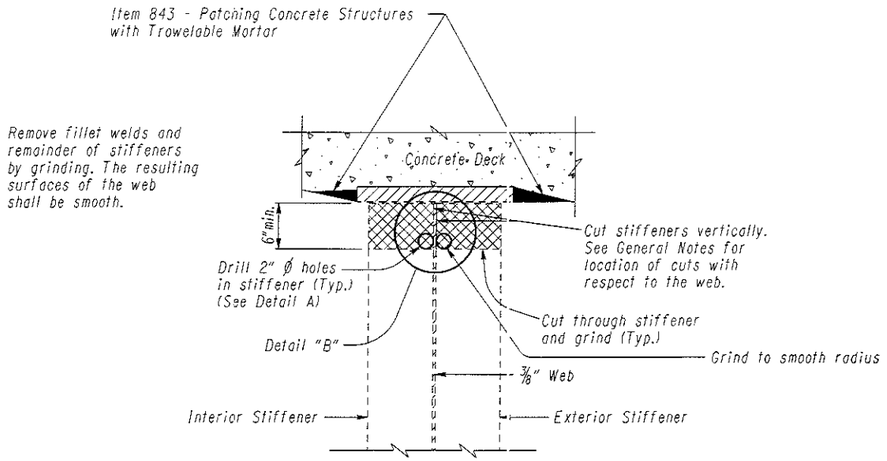
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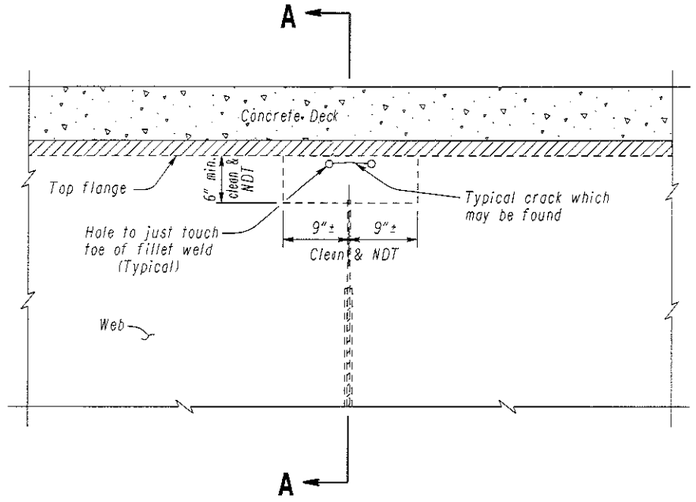
9/10

Portions of damaged stiffeners and fillets to be removed, and replaced as needed

NDT - Non-destructive Testing



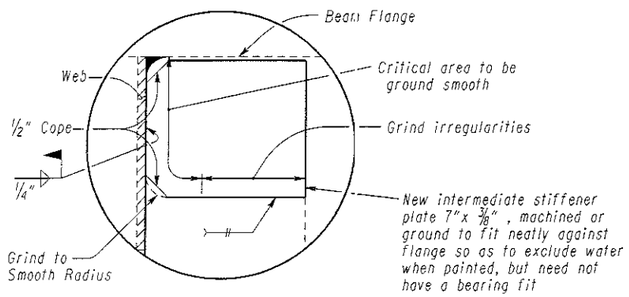
SECTION A-A



WEB STIFFENER RETROFIT

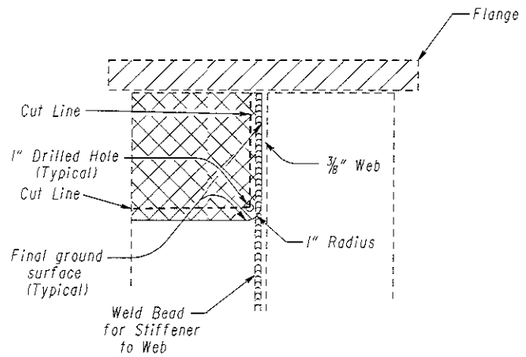
Typical for Interior Elevation View

NOTE: Top flange shown; bottom flange similar



DETAIL "B"

Detail For Portion of Stiffener Replacement



DETAIL "A"

Typical each side of Web

(See General Notes)

Alternate Method to Remove Damaged Portion of Stiffener. Drill 1" Hole, Flame Cut Horizontally and Vertically Then Grind Smooth as Shown.

DESIGN AGENCY
O.D.O.T.
DISTRICT 11
PRODUCTION DEPARTMENT

DESIGNED	DRAWN	REVIEWED	DATE
JAS	JAS	JLO	12/13/01
CHECKED	REVISED	STRUCTURE FILE NUMBER	
JPB		7904835	

WEB STIFFENER RETROFIT DETAILS

Bridge No. TUS-250-1232R
over I.R. 77

TUS-250-12.32

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STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 815

FIELD PAINTING OF EXISTING STEEL, SYSTEM OZEU

February 22, 2000

815.01 Description
815.02 Materials
815.03 Quality Control
815.04 Surface Preparation
815.05 Test Equipment
815.06 Handling
815.07 Mixing and Thinning
815.08 Coating Application
815.09 Caulking
815.10 Safety Requirements and Precautions
815.11 Inspection Access
815.12 Protection of Persons and Property
815.13 Pollution Control
815.14 Work Limitations
815.15 Method of Measurement
815.16 Basis of Payment

815.01 Description. This item shall consist of furnishing all necessary labor, materials, and equipment to clean and paint all existing steel surfaces as specified herein.

815.02 Materials. A three coat paint system consisting of: Organic Zinc Prime Coat, Epoxy Intermediate Coat and a Urethane Finish Coat.

The Contractor shall select a coating system meeting the requirements of Supplemental Specification 910 entitled OZEU Structural Steel Paint. The approved list of coatings meeting this specification is on file at the Office of Materials Management and District Office.

815.03 Quality Control. Quality control will consist of the following items:

A. Contractor Quality Control Specialist. Before any work begins, the Contractor shall designate one individual on each project as a Quality Control Specialist (only one person per project will be necessary unless the Contractor is working at more than 3 sites simultaneously). In which case, it will be necessary to provide an additional Quality Control Specialist for each additional three (or portion of three) sites being painted simultaneously. This person will not be a Foreman or member of the Contractor's production staff (ie. he will not abrasive blast, paint, recover spent abrasives, etc.). He will not be involved in any other miscellaneous tasks (ie. mixing paint, running errands, running or working on equipment, etc.) while any production work is taking place. Documentation that personnel performing quality control related functions are qualified shall be submitted to the Engineer prior to allowing the Quality Control Specialist (QCS) to begin work. Documentation/verification shall be provided to the Engineer that the QCS has received formal training from one of the following: KTA Tator, S. G. Pinney, or Corrosion Control Consultants. He shall be equipped with material safety data sheets, product data sheets, tools and equipment to provide quality control on all facets of the work and shall have a thorough understanding of the plans and specifications pertaining to this project. He shall be responsible for inspecting the equipment at the specified intervals, the abrasives, and the work, at all quality control points. He shall also be responsible for verifying that all work is done within the specified work limitations. He shall cooperate with the Inspector and compare and document quality control readings. He shall have the authority to stop work and the responsibility to inform the Contractor's Foreman of nonconforming work.

B. Quality Control Points. Quality control points (QCP) are points in time when one phase of the work is complete and ready for inspection by both the Contractor and the Engineer prior to continuing with the next operational step. At these points: The Contractor shall afford access to inspect all affected surfaces. If inspection indicates a deficiency, that phase of the work shall be corrected in accordance with these specifications prior to beginning the next phase of work. Discovery of defective work or material after a Quality Control Point is past or failure of the final product before final acceptance, shall not in any way prevent rejection or obligate the State of Ohio to final acceptance.

	Quality Control Points (QCP)	PURPOSE
1	Solvent Cleaning	Remove asphaltic cement, oil, grease, salt, dirt, etc. followed by washdown
2	Grinding Flange Edges	Remove sharp corners
3	Containment/Waste Disposal	Contain, collect & dispose of abrasive blasting debris
4	Abrasive Blasting	Blasted surface to receive paint
5	Prime Coat Application	Check surface cleanliness; apply prime coat; check coating thickness
6	Removing Fins, Tears, Slivers	Remove surface defects and slivers
7	Caulking	Caulk
8	Intermediate Coat Application	Check surface cleanliness; apply intermediate coat, check coating thickness
9	Finish Coat Application	Check surface cleanliness, apply finish coat, check coating thickness
10	Final Review	Visual inspection of system for Acceptance and check total system thickness

815.04 SURFACE PREPARATION. This item shall consist of solvent cleaning (if required), abrasive blasting, providing a wash facility for the Engineer and Inspectors, grinding flange edges, and contain, test and dispose of abrasive blasting debris.

A. Solvent Cleaning (QCP #1) If specifically required by plan note, the bridge shall be solvent cleaned to remove all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants, (QCP #1) (see SSPC-SP 1 Solvent Cleaning for recommended practices). Under no circumstances shall any abrasive blasting be done to areas with asphaltic cement, oil, grease, or diesel fuel deposits. All solvent cleaned areas shall be subsequently washed before abrasive blasting as detailed below.

Washing shall be accomplished with potable water having a nozzle pressure of at least 1,000 PSI (7 MPa)and a delivery rate of not less than 4 gallon (15 L) per minute. The Contractor, shall provide equipment specifications to verify the above. The equipment shall also be equipped with gauges to verify the pressure. The nozzle shall be held at a maximum of 12 inches (300 mm) from the surface being washed.

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 843

PATCHING CONCRETE STRUCTURES
WITH TROWELABLE MORTAR

May 5, 1998

843.01 Description
843.02 Materials
843.03 Test Requirements and Prequalification
843.04 Removal of Concrete
843.05 Surface Preparation
843.06 Patching
843.07 Curing
843.08 Inspection and Sounding of Concrete Patches
843.09 Method of Measurement
843.10 Basis of Payment

843.01 Description.
This item consists of the removal of all loose and disintegrated concrete, preparation of the surface, and the mixing, placing, finishing and curing of the patches in the areas shown or noted on the plans or as directed by the Engineer. The work shall be performed upon concrete components in accordance with these specifications, and in reasonably close conformity with the plans and the manufacturer's specifications and recommendations.

843.02 Materials. The manufacturer will specify whether the product is designed for horizontal, vertical, or overhead patching. All materials shall be prepackaged and stored and incorporated in the work as recommended by the manufacturer. A manufacturer's representative shall be present at the job site until such a time as he and the Engineer are sure that the Contractor is qualified in all aspects of patching concrete structures with the selected materials.

843.03 Test Requirements and Prequalification. Trowelable mortar will meet the following test requirements.

Compressive Strength (ASTM C 109 Modified, 50mm [2-inch cubes])
1 DAY..... 12.3 MPa (1800 psi)
7 DAY..... 37.4 MPa (5500 psi)
28 DAY..... 48.3 MPa (7000 psi)

Splitting Tensile Strength (ASTM C 496)
7 DAY..... 3.7 MPa (550 psi)
28 DAY..... 5.2 MPa (750 psi)

Flexural Strength (ASTM C 78)
7 DAY..... 7.6 MPa (1100 psi)
28 DAY.....10.2 MPa (1500 psi)

Shrinkage (ASTM C 157) at 1,3,14 and 28 days
Max %.....+ 0.3
Min. %..... 0.0

Bond Strength (ASTM C882 modified*)
28 DAY..... 10.2MPa (1500 psi)
*Mortar scrubbed into substrate or as recommended by the manufacturer.

Chloride Ion Permeability (AASHTO T 277) ..... 500 Coulombs or less

Modulus of Elasticity .....24.2 - 27.6 GPa (3,500,000 - 4,000,000 psi)
(ASTM C 469 @ 28 DAYS)

The troweable mortar material proposed for use shall be prequalified. Prior to approval, the manufacturer shall submit independent certified test data showing that the material complies with the performance requirements of this specification to the Office of Materials Management - Cement and Concrete Engineer, 1600 West Broad St., Columbus, Ohio 44223. The certified test data shall also state the following physical properties for the troweable mortar:

1. Color
2. Material Components and Proportions
3. Shelf Life
4. Yield
5. Working Time
6. Final Cure Time
7. Pot Life
8. Consistency

The test data shall be developed by an independent testing laboratory approved by the Office of Materials Management.

The following items shall also be submitted to the Office of Materials Management prior to approval:

1. Manufacturer's technical data sheet for each component.
2. Material safety data sheet for each component.
3. Enough component to produce a liter (quart) sample of troweable mortar
4. A one liter (quart) sample of the solvent to be used for cleanup.

5. Mixing instructions

When the troweable mortar material has been approved by the Office of Materials Management, further performance testing by the manufacturer will not be required unless the formulation or manufacturing process has been changed, in which case new certified test results will be required. Acceptance variances shall be established by the Laboratory.

The Contractor shall furnish the Engineer a copy of the manufacturer's comprehensive job specific preparation, mixing and application instructions. Any significant changes to these instructions which are recommended by the representative for an unanticipated situation shall be approved by the Engineer prior to the adoption of such changes.

843.04 Removal of Concrete. The Engineer shall sound the structure and outline the areas to be removed. All loose, soft, honey-combed, disintegrated concrete, and 6mm (1/4 inch) depth of sound concrete shall be removed. Where the bond between the concrete and a reinforcing bar has been destroyed, or where more than one-half of the periphery of such a bar has been exposed, the adjacent concrete shall be removed to a depth that will provide a minimum 13mm (½ inch) clearance around the bar except where other reinforcing bars make this impractical. After completion of the secondary removal operation, the Engineer will resound the areas to ensure that only sound concrete remains. All work shall be done in a manner that will not damage or shatter the concrete that is to remain, and will not cut, elongate or damage the reinforcing steel in any way. Concrete may be removed by chipping or hand dressing. Chipping hammers shall not be heavier than the nominal 15.9 kg. (35pound) class. Where existing reinforcing bars would be less than 25mm (1 inch) from the proposed finished surface of concrete, they shall, if practical, be driven back into recesses cut in the masonry to obtain that coverage unless otherwise approved by the Engineer.

843.05 Surface Preparation. Cleaning shall precede application of the patching material by not more than 24 hours. The surface to be patched shall be cleaned by abrasive blasting followed by an air blast or by ultra-high pressure water blasting. Blasting abrasives containing more than 1% free silica will not be allowed. Exposed reinforcing and structural steel shall be cleaned to remove all loose and built-up rust, asphalt residue, and all other contaminants detrimental to achieving an adequate bond. It may be necessary to use hand tools to remove scale from the reinforcing steel or anchor bolts. The surface shall be free of spalls, laitance and all traces of foreign material. If necessary, detergent cleaning shall precede blast cleaning to ensure the removal of containments that are detrimental to achieving an adequate bond. Ultra-high hydro-demolition of 69 MPa (10,000 psi) or more is an acceptable method of total surface preparation. Any additional surface preparation shall be in accordance with the manufacturer's recommendations for the patching material which is used. All unchipped surfaces that will receive new material shall be mechanically roughened.

843.06 Patching. The mixing, proportioning, placing and curing procedures, as well as, tools, equipment, labor and materials used shall be in accordance with the manufacturer's specifications and recommendations. The finished surface of the repair area shall be flush with the surrounding area and conform to the original concrete surface.

843.07 Curing. Patches shall be cured in accordance with the manufacturer's recommendations.

843.08 Inspection and Sounding of Concrete Patches. After curing and before final acceptance, all patches shall be sounded. All unsound or cracked patch areas shall be removed and repatched according to this specification at the Contractor's expense. Aerosol paint for outlining shall be provided by the Contractor. All sounding and replacement of rejected areas will be the responsibility of the contractor and included in the unit bid price for this item. Sounding and repatching shall continue until only sound, uncracked patches remain.

843.09 Method of Measurement. The quantity shall be the actual area of the exposed surface of all accepted patches, irrespective of depth or thickness of the patch. If the patch includes corners or edges of members, all of the exposed surfaces shall be included. The cost of all labor, equipment, incidentals and materials for sounding and patching shall be included in the unit price bid for this item.

843.10 Basis of Payment. Payment will be made at the contract price bid for:

Item	Unit	Description
843	Square meter (square foot)	Patching concrete structures with trowelable mortar

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 863

STRUCTURAL STEEL MEMBERS

October 12, 1999

863.01 Description
863.02 Fabricator Approval Procedure
863.03 Fabricator Pre-qualifications
863.04 Levels of Fabrication Qualification
863.05 Fabricator Evaluation and Required Qualifications
863.051 Miscellaneous Level Required Qualifications
863.052 Personnel Qualifications
863.06 Rating System
863.061 Fabricator Rating Review Process
863.07 General
863.071 Fabricator Documentation Responsibility
863.08 Shop Drawings and Submittal Process
863.081 Pre-Fabrication Meeting
863.09 Material
863.10 Material Control
863.11 Care of Material
86312 Workmanship and Straightening
863.13 Finish
863.14 Stiffeners
863.15 Fillers
863.16 Horizontally Curved Beams and Girders
863.17 Joints and Splices
863.18 Pin Holes
863.19 Pins and Rollers
863.20 Holes for High-Strength and Bearing Bolts
863.21 High-Strength Steel Bolts, Nuts and Washers
863.22 Bearing Bolts
863.23 Welding
863.24 Stud Shear Connectors
863.25 Threads for Bolts and Pins
863.26 Shop Assembly
863.27 Nondestructive Testing
863.28 Shipping, Storage and Erection
863.29 Shop Prime Painting

863.30 Cleaning ASTM A 709 Grade 50 W (A588) Steel
863.31 Method of Measurement
863.32 Basis of Payment
Appendix I: Facilities Inspection Check List
Appendix II: Rating Forms
Shop Drawing Rating Form
Material Test Report Rating Form
Fabrication Rating Form
Fracture Critical Fabrication Rating Form
Appendix III: Rating Calculations

863.01 Description. This item shall consist of preparing shop drawings, furnishing, fabricating, nondestructive testing, fabricator performed quality control(QC), documentation, cleaning, shop painting, and erecting of all structural steel, and other structural metals, as specified. It shall also include any work required to move existing steel structures to the plan location, to make necessary repairs and alterations, and to connect or join new with old construction. Approval of Construction Plans required under section 501.06 of the Department's Construction and Material Specifications are required for Structural Steel Members.

863.02 Fabricator Approval Procedure. Fabricators performing work under this specification shall be Pre-qualified by the Office of Structural Engineering (OSE). Requests for such Pre-qualification shall be made by the fabricator in writing. The Pre-qualification process and its requirements are listed in this specification. The Contractor shall select a fabricator from the Pre-qualified Fabricator List in effect the date of Contract Letting. The Contractor shall inform the District Construction Engineer and the Office of Structural Engineering of the selected fabricator.

The OSE may accept subletting of processes which require specialized machinery or knowledge not common to AISC certified fabricators. All requests for subletting shall be made in writing to the OSE. The OSE shall determine if the process is uncommon and evaluate the qualifications of the sublet company. The pre-qualified fabricator must supply a member of his quality control staff to physically witness and perform quality control during the sublet fabrication process.

863.03 Fabricator Pre-qualification. OSE will perform facilities inspections for pre-qualification evaluation of a fabricator. Fabricators meeting all qualification requirements will be assigned a fabrication level and will be included on the Pre-qualified Fabricator List. The Pre-qualified Fabricator list will be updated as necessary by the OSE.

Fabricators shall perform all fabrication in plants located within the continental limits of the United States.

Final conformance of fabrication to contract requirements is the responsibility of the

Contractor. A pre-qualified fabricator does not guarantee the Contractor that work performed will meet quality and conformance requirements of the contract.

863.04 Levels of Fabrication Qualification. There are seven levels of fabricator qualification. Each fabricator shall be listed at the highest level of fabrication they are qualified to perform.

Level	Description of Capabilities
Misc.	Miscellaneous products not designed to carry tension live load but requiring , shop drawings, material test reports, and inspection quality assurance by the Department such as; curb plates, bearings, expansion joints, railings, catwalk, inspection access, drainage or other products not covered by ODOT standard bridge drawings. Also retrofit cross frames, retrofit gusset plates or retro fit lateral bracing or other misc. structural members not included below
ONE	Single span, straight, rolled beam bridges without stiffeners, secondary and detail materials such as retrofit moment plates. Case II Loading
TWO	Multiple span, straight, rolled beam bridges without stiffeners. Case II loading
THREE	Single or multiple span, straight, dog legged or curved, rolled beam bridges including stiffeners. Case I or II Loading
FOUR	Straight or dog legged welded plate girder bridges Case I or II loading
FIVE	Straight, curved, haunched or tapered welded plate girder bridges Case I or II loading
SIX	Truss bridges, fracture critical bridges or bridges with fracture critical members Case I or II loading

863.05 Fabricator Evaluation and Required Qualifications. Fabricators requesting pre-qualification shall have a facilities inspection performed by OSE. A facilities inspection check list is included in this specification (Appendix I). During the inspection the fabricator will furnish OSE's representative with documentation to validate the fabricator meets the criteria listed below:

AISC Certification

Misc. - No AISC category required
Level 1 - Category SBr with P endorsement
Level 2 thru 5 - Category MBr with P endorsement
Level 6 - Category MBr with P and F endorsements

Welding procedure qualifications in conformance with 863.23

Qualified welders in conformance with 863.23

Inspection personnel meeting requirements of 863.052

863.051 Miscellaneous Level Required Qualifications. Fabricators requesting qualification for the Miscellaneous Level shall meet requirements listed in all sections of 863 except as follows: Sections 863.052, 863.06 ,863.061 and 863.081 shall not apply. Where quality control inspection is required by the QCFS or QCPS per section 863.052, the documentation and quality control shall be the responsibility of one employee designated by the Miscellaneous Level fabricator.

863.052 Personnel Qualifications. The fabricator shall designate at least one individual as Quality Control Fabrication Specialist (QCFS). The QCFS shall be a AWS Certified Welding Inspector qualified and certified in accordance with the provisions of AWS QC-1, Standard for Qualification and Certification of Welding Inspectors. The QCFS shall have a thorough understanding of the plans and specifications pertaining to the project. The QCFS shall be responsible for inspecting the work at all quality control (QC) points described in this specification and appendices. The QCFS is also responsible for assuring all equipment is in working order and inspected at the required intervals. The QCFS shall have the direct authority to stop work and report non-conforming work to the Contractor and OSE.

The fabricator shall furnish the QCFS with all tools and equipment necessary to perform quality control (QC) on all facets of the work. The person assigned as QCFS shall be designated the duties full time during the duration of the fabrication work specified in this supplemental specification. No other duties shall be assigned the QCFS that are not quality control inspection.

The fabricator shall designate one individual as Quality Control Paint Specialist (QCPS). The QCPS and the QCFS may be the same person. The QCPS shall have received formal training on paint inspection from one of the following firms: KTA Tator, S. G. Pinney, Corrosion Control Consultants or be NACE Certified. The QCPS shall be responsible for all quality control points (QCP) listed in sections 863.29 and 863.30. The QCPS shall have a thorough understanding of the plans and specifications pertaining to this project. The QCPS shall be responsible for inspecting the coating application equipment at required intervals. The QCPS shall have the direct authority to stop work and report non-conforming work to the QCFS, the Contractor and OSE. The person assigned as a QCPS shall be designated the duties full time during the duration of the coating work. The fabricator shall furnish the QCPS with tools and equipment to provide (QC) on all facets of the coating application

Personnel performing nondestructive testing of weldments shall be qualified in accordance with the American Society for Nondestructive Testings (ASNT) ANSI/ASNT CP-189-1995, Standard for Qualification and Certification of Nondestructive Testing Personnel. Only individuals qualified for NDT Level II may perform nondestructive testing. All nondestructive

testing shall be under the authority of the QCFS or can be performed by the QCFS if qualified.

The fabricator shall have a minimum QC staff level of one QCFS and one QCPS or one person qualified to perform both the QCFS and QCPS functions and the required NDT technicians to perform the non-destructive testing functions. The QCFS and QCPS shall be full time employees of the fabricator, except level one and two fabricators may choose to use outside personnel who meet the qualifications for the QCFS and/or QCPS. The use of outside QC personnel does not eliminate the requirements for the QCFS and QCPS being full-time during the project.

The qualifications of the QCFS, the QCPS, NDT personnel or outside agency personnel shall be approved prior to the fabricator being pre-qualified. Each QC specialist, NDT personnel or agency shall provide a resume listing, qualifications and work experience. QC specialists or NDT staff shall not be modified without the approval of OSE.

The QCFS and QCPS shall be responsible for documenting all inspection points (Appendix II) for each main material piece to show conformance with the requirements of this specification and contract documents. The fabricator is responsible for providing supervisory and any additional QC inspection personnel to control the work properly and to assure satisfactory materials and workmanship. The use of production staff or additional QC staff for specific quality control functions does not eliminate the QCFS's and/or QCPS's responsibility for documentation, QC and final acceptance of fabricated components at all required points.

863.06 Rating System. OSE shall evaluate the fabricator's level of quality during the fabrication process. This evaluation will include quality assurance reviews of shop drawings, material test reports, QC documentation, and shop QA inspection. The rating forms associated with these evaluations are in the Appendix II. OSE shall perform random and/or specific QA inspections. OSE may choose to waive any or all parts of the QA inspection.

The fabricator may also be evaluated by the District construction personnel concerning quality issues effecting field erection. If field evaluations are performed the results will be incorporated into OSE's final rating.

The Fabricator shall perform QC and provide documentation for each main material member at specified check, hold or witness points per Appendix II check lists.

Check points require QC inspection and documentation by the fabricator before the fabrication process continues.
Hold points require QC inspection and documentation by the fabricator before QA inspection can be performed by OSE. The fabrication process can continue after QA inspection.

Witness points require concurrent QC inspection by the fabricator and QA inspection by OSE to physically witness the welding or nondestructive testing .

The results of OSE and field construction QA evaluations shall be the fabricator's rating. This rating shall be reported to the fabricator and shall effect the future qualification of the fabricator as follows:

A Rated Fabricators: Fabricators that perform fabrication resulting in ratings of 90 percent and above, based upon the average of five*consecutive bid line numbers, within the last 24 months and with no individual rating less than 80 percent will be defined as an A rated fabricator. These fabricators shall have the A rating hold points and random QA inspection performed. The A rating hold point is a final shop inspection, prior to shipping or storage, for levels one thru five and all hold and witness points concerning level six. A single rating below 80 percent, or the average of five*consecutive ratings dropping below 90 percent, will result in the fabricator's pre-qualification being lowered to a B rating.

B Rated Fabricators: Fabricators that perform fabrication with ratings 89 to 80 percent, based upon the average of five*consecutive bid line numbers, within the last 24 months and with no individual rating less than 70 percent will be defined as a B rated fabricator. These fabricators shall have all B rating hold points and random QA inspection performed. The B rating hold points are: Radiographic film review, Ultrasonic Inspection witnessing, and final shop inspection prior, to shipping or storage, for levels one thru five and all hold and witness points concerning level six. A single rating below 70 percent, or the average of five* consecutive ratings dropping below 80 percent, will result in the fabricator's pre-qualification being lowered to a C rating.

C Rated Fabricators: The C rating is an interim level for fabricators, newly approved, to validate their QC performance and upgrade to the Department's B and/or A rating level. These fabricators shall have all C rating hold points and random QA inspection performed. The C rating hold or witness points are: Radiographic film review, Ultrasonic Inspection witnessing, Magnetic Particle Inspection witnessing, prime painting inspection and final shop inspection prior to shipping or storage for levels one thru five and all hold or witness points concerning level six .

The C rating is not a permanent qualification level for fabricators. Fabricators who fail to achieve an average rating above 79 percent but average between 70 to 79 percent based on five consecutive bid line numbers within the last 24 months, with no individual rating less than 60 percent, will be reduced one level on the pre-qualification list. The reduced level fabricator shall then have three additional consecutive bid line numbers, within the next 12 months to be averaged to achieve a B rating. Fabricators that still do not achieve a B rating will result in removal from the pre-qualified fabricator list. Any time the average of three consecutive ratings drops below 70 percent, the fabricator shall be removed from the Pre-qualified Fabricator List. The fabricator can request pre-qualification, 863.03, 36 months after removal.

Any rated fabricator that receives a single rating below 60 percent shall be removed from the Pre-qualified Fabricator List. The fabricator can request pre-qualification, 863.03, 36 months after removal.

Fabricators that are rated A and B must complete a minimum of five bid line numbers every two years. Fabricators not this active will be reduced to a C rated fabricator.

*Fabricators achieving an A or B grade in levels four through six must have a minimum of two projects out of the required five bid line numbers in the four through six level.

863.061 Fabricator Rating Review Process. Fabricator may request in writing a reconsideration of the performance rating by a board created by the Department. The board shall be comprised of the Deputy Director, Division of Engineering Policy or his representative, the Administrator of the Office of Structural Engineering or his representative and the Chief Structural Steel Inspector from the Office of Structural Engineering. The board shall hear appeals concerning the Fabricator's performance rating on a specific bridge bid line number. The board has no authority to hear appeals for revocation or suspension of a fabricator from the pre-qualification list.

Within ten days upon receipt of the Department's performance rating the Fabricator may write to the Office of Structural Engineering requesting that the board evaluate the rating. The Fabricator shall also submit additional documentation or evidence bearing on the performance of the work.

The Office of Structural Engineering shall schedule an informal hearing where the Fabricator shall have an opportunity to present Its case. The Department may have representatives at the hearing offering evidence in rebuttal. The board shall consider the evidence and issue its decision within fifteen days of the hearing.

863.07 General. All steel fabrication including the shop application of paint shall be performed in a Pre-qualified structural steel fabricating shop having permanent buildings of adequate size with equipment, heating and lighting facilities and experienced personnel to satisfactorily perform all necessary operations. Areas where flame cutting, air carbon-arc gouging, cambering, welding, cleaning and painting are performed shall be inside permanent buildings. The required air temperature levels shall be maintained while these operations are in progress. Shop assembly of large pieces for fit-up of field connections may be performed outdoors. These provisions will not apply to steel requiring fabrication at the bridge site in the repair, alteration or extension of an existing structure.

Where work consists of repairing and extending or altering existing structures the Contractor shall make such measurements of the original construction as may be required to join accurately old and new work. Shop drawings shall include these measurements. Measurements which may appear upon contract plans to indicate the extent and nature

of such repair or extension shall not relieve the Contractor of this responsibility.

Shop inspection or acceptance of shop drawings by the Department shall not relieve the Contractor of responsibility for erroneous or inconsistent dimensions, notations, omissions or other errors. All parts forming a structure shall be built in accordance with the contract. The Contractor will not be responsible for any contract plan errors.

The Fabricator shall notify OSE at least two weeks in advance of the beginning of shop fabrication, and furnish a proposed fabrication schedule for the work.

The Fabricator shall cooperate fully with the QA inspector, in his inspection of the work in progress. This shall include the storage of members completed during the QA inspector's absence, in such a manner, that he can completely and safely inspect the finished work, unless such hold or witness point inspections have received a written waiver.

Fabricated material shall not be shipped from the shop without prior hold point QA inspections unless such QA inspection is waived by OSE. Failure to conform to this requirement will result in a rating for the reference of 60 percent and reduction of the fabricator's rating to C or loss of pre-qualification if the fabricator's rating is currently a C.

Miscellaneous level structural steel members shall have final inspection performed at the pre qualified fabrication shop. Miscellaneous structural steel members that are not complete at the scheduled inspection, have been shipped to the job site without shop inspection or do not conform to the shop drawings supplied to the QA inspector will be cause for removal of the fabricator from the pre-qualification list. Complete shall be defined as final fabrication and coating with QC inspection, QC documentation and Contractor acceptance of shop drawings and material test reports. The miscellaneous level fabricator will be given a maximum of three written warnings within any 12 month period. The third warning will cause removal from the pre qualified list. The fabricator may be reinstated to the prequalified list after 12 months with a request for prequalification from the fabricator and performance of facilities evaluation by the Office of Structural Engineering.

The Fabricator shall provide office accommodations having a minimum floor area of 11 m^2 (120 square feet) and a minimum ceiling height of 2.1 m (7 feet). This office shall be equipped with adequate working and storage facilities, lighting and electrical outlets. It shall also contain a telephone with direct access to an outside trunk line which shall be for the exclusive use of the QA inspector.

In this specification where the terms "Main," "Secondary" or "Detail" are used, it shall be understood that reference has been made as follows: "Main," refers to material, members and fasteners that are primarily stressed by live load and structure weight; "Secondary," refers to material, members and fasteners that do not directly support live load or main members; "Detail," refers to material, members and fasteners that are essentially non stressed.

Where steel stamps are used for identification purposes, they shall be of the "mini-stress" or "stressless" type.

863.071 Fabricator Documentation Responsibility. The fabricator shall keep and maintain documentation records for each project bid line number concerning;

1. Fabricator approval
2. Shop drawing approval
3. Material test reports
4 Welding qualifications
5. Quality control inspection
6. Non Destructive Testing of welds

This documentation shall be made available for auditing, inspection and copying upon the Department's request. The documentation shall be archived for at least a five (5) year period from the date of final shipment from the fabrication shop.

Documentation systems are the fabricator's responsibility to establish. Quality control documentation shall include all material quality checks, dimensional checks, weld quality inspection, coating inspection checks, etc. to document both to the fabricator and to the Department that all fabrication has been thoroughly inspected and meets the specification requirements. Evaluation of the fabricator's performance by Departmental personnel, using forms defined in Appendix II, will include validation of the fabricator's actual records of inspection. This validation is intended to assure that rating of an individual component will reflect the overall quality of all components.

When establishing documentation records, processes and procedures the fabricator shall review the QA rating forms (Appendix II) which define the Department's QA requirements. The fabricator must establish sufficient QC requirements to perform quality fabrication. The QCFS shall provide a letter of acceptance for each QA inspection check point with a listing of each main member piece marks, dates of QC acceptance and specific check point data as noted on the QA rating forms.

863.08 Shop Drawing and Submittal Process. Structural steel and other metal structural elements which are to be assembled, main and secondary bridge structural steel or main bridge rehabilitation steel, finger joints, modular joints and non-standard joint sealing devices, pot bearings, spherical bearings and non-standard bearing devises and other similar items requiring either shop or field fabrication shall be detailed on shop drawings by the Contractor or Fabricator in accordance with AASHTO "Standard Specifications for Highway Bridges" and this supplemental specification.

Deviation from the contract plans or these shop drawings will not be permitted without the written order or consent of the OSE. Requests for such deviation or change shall be submitted in writing.

The Contractor's shop drawing submission shall include; a written acceptance letter and four copies of these drawings, unless additional copies are requested. The Contractor shall also furnish the fabricator's QCFS with one additional set of these drawings before the pre-fabrication meeting 863.081.

The Contractor shall accept these shop drawings and forward a submission to OSE. The submission shall be received by OSE, seven days before the pre-fabrication meeting, 863.081(levels 1 thru 6) or prior to the start of fabrication (miscellaneous level).

The pre fabrication meeting shall not be scheduled until the drawings have been received by OSE(levels 1 thru 6). Fabrication can begin after the prefabrication meeting is complete (levels 1 thru 6) or after receipt of these drawings (miscellaneous level).

The shop drawings shall be prepared by or under direct supervisory control of an Ohio registered professional engineer having personal professional knowledge of AASHTO Standard Specifications for Highway Bridges, AWS Bridge Welding Code D1.5 and Supplemental Specification 863. Each drawing of the four copies shall bear his or her signature and registration number or his or her Ohio Professional Engineer seal. The submitted shop drawings shall be free of all questions and comments.

The written acceptance from the Contractor shall document acceptance of the shop drawings including confirmation of field verification as required and descriptions of issues resolved between the Contractor, the Engineer, the Fabricator or the Department.

By accepting these shop drawings, the Contractor represents to the Department that all materials, field measurements, construction requirements, contract requirements, performance criteria and similar data have been verified. The Contractor further represents that these drawings have been coordinated and verified with the details of the work to be performed by other fabricators and entities on the project. No allowance for additional cost or delays will be made to the Contractor for incorrect fabrication as a result of failure to coordinate or perform this acceptance.

When changes on these shop drawings are requested by the Department, or the Contractor makes changes in addition to those expressly requested, the shop drawings shall be accepted as above with suitable revision marks to identify the changes.

For changes in location, addition or elimination of splices, acceptance shall be obtained prior to ordering material. After acceptance by the OSE, such plans shall be taken as supplemental to, but in no sense a substitute for, the contract. The QCFS shall be responsible for having documentation of any revised drawings or changes listed above

The prints shall be made from tracings, neatly and accurately drawn on sheets 559 mm x 864 mm (22 x 34 inches).

Shop drawings shall show details, dimensions, size of materials, match mark diagrams for

field connections, and other information necessary for the complete fabrication and erection of the metal work. These drawings shall also show a diagram identifying, by some unique mark, each area of a welded splice to be covered by a single radiograph.

The shop drawings for all multiple span beam and girder bridges shall include an overall layout with dimensions showing the relative unloaded vertical and horizontal position of beam or girder segments with respect to a full length base or work line; camber and horizontal curvature of the beams or girders and the effect of deck surface profile shall be accounted for in this relationship. Required offsets for vertical and horizontal curvature shall be shown at approximately each 1/4 of span length, at field splices and bearing points. Each horizontally curved member shall have offsets shown for each 3.0 m (10 feet) of length to a baseline strung from end to end of the member.

Shop drawings shall specifically identify each piece of steel as to grade(ASTM designation), CVN, Fracture Critical or any special testing requirements. Pieces made of different grades of steel shall not be given the same assembling or erecting mark, even though they may be of identical dimensions and detail.

The shop drawings shall indicate the welding procedure(WPS number) to be used for each joint. Locations and identification numbers of all radiographs taken shall be detailed on the shop drawings.

After all fabrication is completed, the Contractor shall have the Fabricator furnish a 35-millimeter microfilm copy of each shop drawing mounted on an aperture card in accordance with Supplement 1002 on file in the Department. If the details shown on a drawing apply to more than one bridge, an aperture card for that drawing shall be furnished for each bridge to which it applies, each card bearing the applicable bridge number. For structures carrying railroad traffic, an additional set of aperture card-mounted films or, at the option of the railroad, a set of full-size drawings on mylar shall be furnished for each railway company involved.

863.081 Pre-Fabrication Meeting. A pre-fabrication meeting (levels 1thru 6) shall be held at the fabricator's facilities, or another location agreeable to all parties, for review of any fabrication issues, including information on shop drawings, inspection, hold or witness points, unique fabrication items, special processes, scheduling, etc. for the project. Attendance at the meeting shall include the fabricator, the QCFS, the QCPS, OSE's QA inspector and may include the Contractor, or designated representative. The meeting will be conducted by the QCFS, who will also be responsible for distribution of minutes of the meeting documenting all issues discussed.

The time of the meeting shall be agreeable to all parties but no earlier than 7 days after receipt of Contractor accepted shop drawings, 863.08. Fabrication can begin after the prefabrication meeting is complete (levels 1 thru 6). Prefabrication meetings are not required for the Miscellaneous level

863.09 Material. Structural steel and other structure metals shall conform to 711, except steel bar stock utilized for end dams and scuppers may be any weldable grade of low or mild carbon steel commercially available. Welded shear studs shall conform to the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011. Steel plates for main and secondary members shall be cut and fabricated so that the primary direction of rolling is parallel to the direction of the main tensile or compressive stresses.

For these materials the Contractor shall submit certified test data to the OSE showing compliance with the requirement of 711. All certified test data shall be accompanied by copies of mill shipping notices or invoices showing the quantity and size of material being accepted.

The Contractor shall check this material data, provide a letter of written acceptance then forward the submission to OSE seven days prior to member shipment(level 1 thru 6) or prior to final OSE inspection (miscellaneous level).

A single copy of this material data is required for each structure, except where the structure carries railway traffic. Then one additional copy shall be submitted for each railway company involved.

Additionally for Level one through six structural steel members, one copy of main material, certified test data with a letter documenting the QCFS acceptance shall be given to the QA shop inspector before the material passes check point one.

Materials will not be accepted for shipment from the fabrication shop until the Contractor accepted material data is received by the OSE.

When electrodes to be used are not included in the Laboratory's list of approved electrodes and combinations of shielding, certified test data showing compliance with CMS section 711.08 shall be submitted to the Office of Materials Management.

863.10 Material Control. Each piece of steel to be fabricated shall be properly identified for the Engineer or QA Inspector.

The issuance of cutting instructions by the Fabricator to the shop shall be by cross-referencing of the assembly marks shown on the shop drawings with the corresponding item covered on the mill purchase order. The Fabricator's system of assembly-marking individual pieces of steel and the aforementioned issuance of cutting instructions shall be such as to provide a direct reference to the appropriate mill test report.

The Fabricator may furnish from stock, material that he can identify by heat number and mill test report. Any excess material placed in stock for later use shall be marked with the

heat number and the ASTM A 6 specification identification color code, if any, when separated from the full-size piece furnished by the supplier.

During fabrication, each piece of steel shall show clearly and legibly its specification identification color code and heat number. Individually marked pieces of steel which are used in furnished size, or reduced from furnished size only by end or edge trim, that does not disturb the heat number or color code or leave any usable piece, may be used without further color coding provided that the heat number and color code remains legible.

Pieces of steel which are to be cut to smaller size pieces shall, before cutting, be legibly marked with the ASTM A 6 specification identification color code and heat number.

Individual pieces of steel which are furnished in tagged lifts or bundles shall be marked with the ASTM A 6 specification identification color code and heat number immediately upon being removed from the bundle or lift. Pieces of steel which will be subject to fabricating operations such as blast cleaning, galvanizing, heating for forming, or other operations which might obliterate paint color code and heat number marking, shall be marked with steel stamps or by a substantial tag firmly attached or shall be approved by the QA Inspector for obliteration of material identify markings. Main material tested for CVN shall have heat numbers steel stamped into the material at locations acceptable to OSE.

The QCFS shall document by a cover letter documenting QCFS acceptance that material control is performed per specification.

863.11 Care of Material. Structural material shall be stored at the shop or field above the ground, upon platforms, skids or other supports. It shall be straight and have clean and dry surfaces before being worked in the shop. Any rusted or corroded material shall be cleaned prior to use and shall meet ASTM A 6 thickness tolerances after cleaning. The QCFS shall provide a cover letter documenting QCFS acceptance stating that care of material is performed per specification.

863.12 Workmanship and Straightening. If straightening of rolled material is necessary, it shall be done by methods that will not damage the member. When carefully planned and supervised, the application of localized heat is permitted for straightening. The temperature of the heated area shall not exceed 620° C (1150° F) as controlled by pyrometric stick or thermometers. Quenching to accelerate cooling is prohibited.

Fabricated structural steel shall be within the dimensional tolerances specified by Arts. 3.5 and 9.19 of the AASHTO/AWS Bridge Welding Code except where indicated otherwise in these specifications, and with the following additions: Waviness, the deviation of the top or bottom surface of a flange from a straight line or plan curvature, shall not exceed 3 mm (1/8 inch) when the number of waves in a 3.0 m (10 foot) length is four or less, or 1.6 mm (1/16 inch) when more than four, but sharp kinks or bends shall be cause for rejection. For the measurement of camber during lay down, the bearing points shall be relatively

positioned both horizontally and vertically to plan dimensions ± 3 mm (± 1/8 inch). Rolled beams shall be cambered as called for on the plans in the pre-qualified fabricating shop by use of heat or hydraulic jacks. Heating shall be controlled as specified above and follow a formal shop heating procedure. Plate girders shall be cambered by trimming web plates prior to assembly.

Camber shall be measured as the vertical offset between the steel and the common base line extending from abutment bearing to abutment bearing. The maximum camber tolerance at mid span shall be - 0 mm (in.) and the greater of + 19 mm (3/4 inch) or the designed haunch height. The maximum camber tolerance at mid span shall be prorated between the center of the span and each adjacent bearing to provide a smooth unbroken curve. The camber tolerances in Art. 3.5.1.3 of the AASHTO/ AWS Bridge Welding Code shall not apply.

During fabrication, shipping and erection, members shall be so supported and handled that camber is maintained.

The QCFS shall provide a cover letter documenting QCFS acceptance that workmanship and straightness are performed per specification.

863.13 Finish. Sheared edges of all main material shall be planed to a minimum depth of 6 mm (1/4 inch) except for ASTM A709 grade 36 material having a thickness of 16 mm (5/8 inch) or less. Burrs shall be removed. All fins, tears, slivers and burred or sharp edges that are present on any steel member shall be removed by grinding. If these conditions appear during the blasting operation, they shall be removed by grinding and the area re-blasted to the required surface profile.

Structural steel permitted by these specifications may be flame cut, provided a smooth surface free from cracks and notches is secured and provided that an accurate profile is secured by the use of a mechanical guide. Rolled and flame cut surfaces shall meet the requirements of the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011. The surface finish of bearing and base plates and other bearing surfaces that are in contact with each other or with concrete shall meet the ANSI surface roughness requirements as defined in ANSI B46.1, Surface Roughness, Waviness and Lay, Part I:

	ANSI
Steel slabs	50.0a m (2000)
Heavy plates in contact in shoes to be welded	25.0a m (1000)
Milled ends of compression members, milled or ground ends of stiffeners and fillers	12.5a m (500)
Bridge rollers and rockers	6.4a m (250)
Pins and pin holes	3.2a m (125)
Sliding bearings	3.2a m (125)

The QCFS shall provide a cover letter documenting QCFS acceptance that material finish is performed per specification.

863.14 Stiffeners. The bearing ends of bearing stiffeners shall be flush and square with the web and shall have at least 75 percent of this area in contact with the inner surface of the flange. The other end of the stiffener shall have a tight fit as defined below. Bearing stiffeners shall be positioned to be vertical after erection. Intermediate stiffeners which are not used in pairs shall be welded to the compression flange, the tension flange shall be a tight fit. Intermediate stiffeners to which cross frame angles are connected shall be welded to the top and bottom flange. A tight fit is defined as one in which the stiffener and flange are in physical contact over some portion of the end of the stiffener and having no gap in excess of 1.6 mm (1/16 inch). Welds attaching stiffeners to the web plate shall not extend into the clip area. All stiffeners shall be clipped to clear flange-web welds and fillet or rolled shapes. The clip shall be 65 mm (2 ½ inches) along the web and 25 mm (1 inch) along the flange.

The QCFS shall provide a cover letter documenting QCFS acceptance that stiffener details are performed per specification.

863.15 Fillers. Fills shown on the shop drawings shall be dimensioned to the nearest 1.6 mm (1/16 inch) in thickness, but not less than 3 mm (1/8 inch) thick, based on the dimensions for detailing and intended relative position of the abutting elements to be spliced. However, in the final shop assembly, fills shall be furnished with thicknesses sufficient to compensate for any misalignment of abutting elements due to standard rolling mill tolerances or differences in thicknesses of flanges and webs at the splice location. The actual fills used shall be such as to compensate for differences in total thickness or relative positions of more than 1.6 mm (1/16 inch). Fill plates in bolted joints shall be made flush with the perimeter of the splice plates and not be tack welded. The QCFS shall provide a cover letter documenting QCFS acceptance that fills are performed per specification.

863.16 Horizontally Curved Beams and Girders. Beams and girders shall be heat curved as specified by AASHTO Standard Specifications for Highway Bridges, except that flanges for girders may be cut to shape. When members are to be heat curved, the detailed procedure including necessary calculations shall be submitted to OSE for acceptance prior to starting work. The QCFS shall provide a cover letter documenting QCFS acceptance that heat curving procedures are performed per specification.

863.17 Joints and Splices. In bolted construction where tension or flexural members are spliced, not more than 6 mm (1/4 inch) clearance will be allowed between the abutting surfaces of spliced members. For spliced compression members, the abutting surfaces shall be truly faced so as to have a uniform bearing when properly aligned and completely

bolted.

In welded construction, all abutting surfaces shall receive the proper joint preparation as shown on accepted shop drawings. The preparation for field welded butt joints in main members shall be verified by a complete shop assembly as specified in 863.26. The opening in any joint, which is located in the finished structure so as to permit the entrance of water, shall be filled as directed by the Engineer with an approved caulking before paint is applied.

The QCFS shall provide a cover letter documenting QCFS acceptance that joints and splices are performed per specification.

863.18 Pin Holes. Pin holes shall be bored true to size, at right angles to the axis of the member and parallel to each other. The boring shall be done after the member is completely fabricated. Pin holes for up to 127 mm (5 inch) diameter pins shall not exceed the pin diameter by more than 0.51 mm (0.020 inches); holes for larger pins shall not exceed the pin diameter by more than 0.79 mm (0.031 inches). The QCFS shall provide a cover letter documenting QCFS acceptance stating that pin holes are performed per specification.

863.19 Pins and Rollers. Pins and rollers shall be of cold rolled steel and accurately turned to size; they shall be straight and smooth and entirely free from flaws. Pins over 230 mm (9 inches) in diameter shall be annealed. In pins larger than 230 mm (9 inches) in diameter, a hole not less than 50 mm (2 inches) in diameter shall be bored full length along the axis. One pilot and one driving nut shall be furnished for each size of pin. The QCFS shall provide a cover letter documenting QCFS acceptance stating that pins and rollers are performed per specification.

863.20 Holes for High-Strength and Bearing Bolts. Holes shall be cylindrical, perpendicular to the member, clean cut, and free of ragged edges. All burrs shall be removed by countersinking not more than 1.6 mm (1/16 inch) or by grinding. The finished size of the holes for high-strength bolts shall be not larger than nominal diameter of the bolt plus 1.6 mm (1/16 inch), and for bearing type bolts, the holes shall provide a driving fit. The diameter shall not vary by more than 0.8 mm (1/32 inch) from a true circle for 85 percent of the holes in a contiguous group, and not more than 1.6 mm (1/16 inch) for the remainder.

Punched holes shall be made with a die whose diameter does not exceed that of the punch by more than 1.6 mm (1/16 inch). Reaming and drilling shall be done with twist drills and, wherever possible, the reamer shall be directed by mechanical means. Holes for shop bolts shall be sub-punched or sub-drilled 5 mm (3/16 inch) less in diameter than the nominal diameter of the bolt, and shall be reamed to size with the parts assembled, except:

1. A709 grade 36 material thicker than 19 mm (3/4 inch) and grade 50 or 50W steel

thicker than 16mm (5/8 inch) shall not be punched.
2. Materials assembled and adequately clamped together may be drilled full size.
3. Secondary and detail material of A709 Grade 36 steel not thicker than 19 mm (3/4 inch) and grade 50 or 50W steel not thicker than 16 mm (5/8 inch) fastened with high strength bolts may be punched full size.

Holes for field bolts shall be made in the same manner as holes for shop bolts except:

1. Field splices in and connections to main material shall be reamed or drilled assembled per 863.26.
2. Assemblies such as floor beams connected to girders and rolled beam spans connected by diaphragms may be made through steel templates.

All holes punched full size, sub-punched, or sub-drilled shall be located with sufficient accuracy such that after assembling (before sub-punched or sub-drilled holes are reamed) a cylindrical pin 3 mm (1/8 inch) less in diameter than the nominal size of the punched hole may be entered perpendicular to the face of the member without drifting in not less than 75 percent of the contiguous holes in the same plane. All holes shall permit a pin 5 mm (3/16 inch) smaller than the nominal size of the punched holes to be inserted in the above manner. After holes are reamed or drilled full size, 85 percent of the holes in any contiguous groups shall have no offset greater than 0.8 mm (1/32 inch) between adjacent plies. The remainder of the holes shall not be offset more than 1.6 mm (1/16 inch) between adjacent plies. Plugging of improperly located holes is not permitted unless written approval has been obtained from the OSE. Steel templates shall have hardened bushings in holes accurately located in relation to the centerline of the connection as inscribed on the template. Where holes are made using a roto-broach, shell drill or other similar tool, hardened bushings need not be used in the template. The template shall be accurately positioned and bolted or clamped firmly in place prior to its use in reaming or drilling full size holes.

Templates used for reaming matching members or the opposite faces of a single member shall be exact duplicates. Templates used for connections on like parts or members shall be located with sufficient accuracy that the parts or members are duplicates and require no individual match marking.

Holes through multiple piles shall be reamed or drilled full size only when the plies of the joint are held tightly together with bolts or clamps. The joint shall also be pinned if the holes have been sub-punched or sub-drilled. The plies shall be disassembled and cleaned of burrs and shavings prior to final assembly.

Contractor shall have the option to drill or punch bolt holes full sized in unassembled pieces and/or connections including templates for use with matching sub-sized and reamed holes, by means of suitable numerically controlled (N/C) drilling or punching equipment. If N/C drilling or punching equipment is used the Contractor will be required to demonstrate the accuracy of the drilling or punching procedure according to 863.26

Other methods of preparing holes for high strength bolts may be given consideration upon written request to the OSE.

The QCFS shall provide a cover letter and specified check point data documenting QCFS acceptance that holes have been performed per specification.

863.21 High-Strength Steel Bolts, Nuts and Washers. High strength steel bolts, nuts and washers shall meet the provisions of 711.09.

1. General. The Engineer shall be furnished the necessary access to the work in order to observe the installation, tightening and checking of the bolts.

Based on the experience gained by the Engineer and Contractor during the use of the below described installation and inspection procedures for a particular bridge, the Engineer may elect to modify the amount of testing specified in order to expedite the work while still accomplishing properly compacted joints and tightened bolts. Consideration will be given to the use of other fastening systems or assemblies and bolt tightening procedures, if a written request is submitted to the Office of Structural Engineering in accordance with 108.05. The required bolt length shall be determined by adding to the grip the value shown in Table 1. The table values are generalized, with an allowance for manufacturing tolerances, to provide for the nut and positive "stick-through" at the end of the bolt. For each hardened flat washer that is used, add 4 mm (5/32 inch); and for each beveled washer, add 8 mm (5/16 inch). The length determined by the use of Table 1 should be adjusted to the next longer 6 mm (1/4 inch); when installed, the end of the bolt shall be flush with or project several thread lengths outside the face of the nut.

TABLE 1

Bolt Size	To determine required bolt length, add to grip*
mm	mm
M16	24
M20	28
M22	31
M24	35
M27	38
M30	41
M36	47

TABLE 1

Bolt Size	To determine required bolt length, add to grip*
inches	inches
½	11/16
5/8	7/8
3/4	1
7/8	1-1/8
1	1-1/4
1-1/8	1-1/2
1-1/4	1-5/8
1-3/8	1-3/4
1-1/2	1-7/8

*Total thickness of all connected material exclusive of washers.

Washers may, when necessary, be clipped at one location not closer than 7/8 of the bolt diameter from the center of the washer.

2. Preparation. Joint surfaces, including those adjacent to the bolt heads, nuts or washers, shall be free of paint (except for inorganic zinc primers), lacquer, dirt, oil, loose scale, rust, burrs, pits and other substances or defects which would prevent solid seating of the parts or would interfere with the development of complete frictional contact. No gaskets or other yielding material shall be interposed.

Bolts, nuts and washers shall have a residual coating of lubricant when received. Bolts, nuts and washers without their original lubrication shall not be used.

3. Installation. In the final assembly of the parts to be bolted, drift pins shall be placed in a sufficient number of holes (preferably not less than 25 percent for field erection) to provide and maintain accurate alignment of holes and parts, and sufficient bolts shall be installed and brought to a snug tight condition to bring all parts of the joint into complete contact. However, in each flange and web of each beam or girder a minimum of two drift pins shall be used. Snug tight shall be defined as the tightness attained when an impact wrench begins to impact or when the full effort of a man using an ordinary spud wrench is applied. Bolts shall then be installed in any remaining open holes and tightened to a snug tight fit, after which all bolts shall be tightened completely by the turn-of-nut method. Where difficulty is experienced with the fit of the connection and the bolts are used to draw the elements into contact, the bolts in the affected portion of the connection shall be checked for sustained snug tightness after all the bolts are installed. Drift pins shall then be replaced with bolts tightened in the same manner. Field Reaming of full sized shop holes shall not be allowed.

After the bolts are snug tight, the outer face of the nut shall be match-marked with the protruding portion of the bolt to provide the Engineer visual means of determining the relative rotation occurring between the bolt and nut during the process of final tightening. Such marks shall be made by the wrench operator with crayon or paint.

Each bolt shall have a hardened washer under the element (nut or bolt head) turned in tightening. Where an outer face of the bolted parts has a slope of more than 1:20 with respect to a plane normal to the bolt axis, a smooth beveled washer shall be used to compensate for the lack of parallelism. Galvanized A 325M (A 325) bolts shall not be reused. Re-tightening previously tightened bolts, which have become loose by tightening adjacent bolts, is not considered a reuse.

4. Tightening. Tightening of the bolts in a joint should commence at the most rigidly fixed or stiffest point, and progress toward the free edges, both in the initial snugging up and in the final tightening. If required because of bolt entering and wrench operation clearances, tightening may be done by turning the bolt. Impact wrenches, if used, shall be of adequate capacity to perform the required tightening of each bolt in approximately ten seconds.

5. Bolt Tension. Each bolt shall be tightened to provide, when all bolts in the joint are tight, at least the minimum bolt tension shown on Table 2 for the size of bolt used.

TABLE 2

Bolt Size mm	Bolt Tension* kN, minimum A 325 M
M16	91
M20	142
M22	176
M24	206
M27	267
M30	327
M36	475

TABLE 2

Bolt Size inches	Bolt Tension* kips, minimum A 325
½	12
5/8	19
3/4	28
7/8	39
1	51
1-1/8	56
1-1/4	71
1-3/8	85
1-1/2	103

*Equal to 70 percent of specified minimum tensile strengths of bolts, rounded off to the nearest kN (kip).

The bolt tension specified in Table 2 shall be attained by tightening all bolts in the joint the applicable amount of nut rotation specified in Table 3 by the turn-of-nut method.

TABLE 3
NUT ROTATION FROM SNUG TIGHT CONDITION

	Disposition of Outer Faces of Bolted Parts		
Bolt Length (as measured from underside of head to extreme end of point)	Both faces normal to bolt axis	One face Normal to bolt axis and other face sloped not more than 1:20 (bevel washer not used)	Both faces sloped not more than 1:20 from normal to bolt axis (bevel washer not used)
Up to and including 4 diameters	1/3 turn	½ turn	2/3 turn
Over 4 diameters but not exceeding 8 diameters	½ turn	2/3 turn	5/6 turn
Over 8 diameters but not exceeding 12 diameters	2/3 turn	5/6 turn	1 turn

Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by ½ turn and less, a tolerance of plus or minus 30° is permitted. For bolts installed by 2/3 turn and more, a tolerance of plus or minus 45° is permitted.

6. Inspection. (a) The first completed connection of each bridge on the project and as many subsequent connections as are deemed necessary by the Engineer shall be inspected as per paragraph (b) below. Thereafter, where the Engineer has approved the joint compactness and snug-tight condition of bolts prior to bolt tightening by the turn-of-nut method, the bolt tension as required in Table 2 shall be considered as attained if the amount of nut rotation specified by Table 3 is verified by the required match-marking.

(b) Bolts shall be inspected by the use of manual torque wrenches furnished by the Contractor. This testing shall be witnessed by the Engineer and shall be performed to his satisfaction. The inspection wrenches shall be calibrated at least once each working day in a device capable of indicating bolt tension. In this device, which shall have been approved by the Engineer, three bolts representative of the grade, size, length and condition used in the structure shall be placed and tensioned individually. A washer shall be used under the part being turned.

(c) Each of the three bolts shall be tightened in any convenient manner to the tension shown in Table 2. Then, the inspection wrench shall be applied by a slow steady pull to the tightened bolt and the torque required to turn the nut or head 5 degrees, approximately 25 mm (1 inch) at a 300 mm (12 inch) radius, in the tightening direction shall be determined. The average torque measured in the tensioning of the three bolts shall be taken as the job inspection torque.

(d) Bolts represented by the sample described in paragraph (b) which have been tightened in the structure, shall be inspected by applying, in the tightening direction, the inspection wrench and its job inspection torque to 10 percent of the bolts, but not less than two bolts, selected at random in each connection. If no nut or bolt head is turned by this application of the job inspection torque, the connection will be accepted as properly tightened. If any nut or bolt head is turned by the application of the job inspection torque, this torque shall be applied to all the bolts in the connection, and all bolts whose nut or head is turned by the job inspection torque shall be tightened with the inspection wrench to the job inspection torque. The connection shall then be reinspected in the original manner.

7. Calibration Devices. Each calibration device shall be periodically examined by a manufacturer of such devices or by a qualified testing laboratory. Such examination shall be made at least once each year or more often if requested by the Engineer. The testing agency shall certify that each calibration device furnishes, after re-calibration if necessary, an accurate indication of actual bolt tension.

The QCFS shall provide a cover letter documenting QCFS acceptance that any shop applied bolts have been performed per specification.

863.22 Bearing Bolts. Turned, ribbed or other approved bearing type bolts shall meet the provisions of CMS 711.10. The bolts shall be of sufficient length to project at least 6 mm (1/4 inch) beyond the nut when tightened, and the threads on the projecting end shall be

burred. The thread shall not extend into the shear planes of the contact surfaces between the connected parts. In determining whether the bolt threads are excluded from the shear planes, thread length of bolts shall be calculated as two thread lengths greater than the specified thread length as an allowance for thread run out. A washer not thicker than 6 mm (1/4 inch) may be used under the nut. The QCFS shall provide a cover letter documenting QCFS acceptance that shop applied bolts have been performed per specification.

863.23 Welding. All welding shall be performed by the shielded metal-arc, submerged arc, flux cored arc, or stud welding process. Consideration will be given to other methods of metal-arc welding if a written request is submitted to the OSE in accordance with CMS 108.05.

In other respects, the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011 shall govern the work. Welding performed on main members requires procedure testing (PQR) and an approved welding procedure (WPS). The shielded metal arc welding(SMAW) process is considered pre-qualified, and does not requires procedure testing(PQR) but requires an approved welding procedure(WPS). The fabricator shall have an approved PQR, WPS and Welder Qualifications prior to Fabricator Pre-qualification.

If after two repairs to the same area of a weld requiring radiographic quality, there is any part of the original defect remaining or there is a new reject able indication the OSE shall have the right to have the total joint cut apart, all deposited weld metal removed, joint preparation made and the total joint re-welded.

Copies of the accepted shop welding procedures (WPS) shall be posted at each welding location.

The designated QCFS and QA inspectors shall be physically at the facility during all fracture critical (FCM)welding. The fabricator shall not perform FCM welding without prior scheduling with the QCFS and the QA inspectors. The QCFS shall witness at the minimum percentages specified in appendix II, check all welding processes and provide a cover letter with specific check point data. This QCFS acceptance is required for each FCM member weld. For non FCM welds the QCFS shall make frequent inspections, check all welding processes and provide a cover letter with specific check point data documenting acceptance of the welds for each main member.

863.24 Stud Shear Connectors. Stud welding shall conform to the requirements of 863.23 , to the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011, and the following.
Stud shear connectors that are to be welded to the top flanges of beams or girders may be placed after the steel has been erected and suitable scaffolding or deck forming has been provided. Studs that are to be welded to beam or girder webs, end dams, bearing

plates, or to other secondary members and detail material may be placed in the shop. In addition to the stud bend tests of Article 7.6.6.1 of the AASHTO/AWS Bridge Welding Code, bend tests of stud shear connectors shall also be made at the start of each work day, when welding has been interrupted for an hour or more, when changing grounds, when changing weld settings or when changing cable loop due to arc blow. In any case, no more than 500 studs shall be welded to a beam or girder without the welds being field bend tested in accordance with the specified procedure. All tested studs that show no sign of failure as determined by the Engineer may be left in the bent position.

863.25 Threads for Bolts and Pins. Threads for bolts and pins shall conform to the Unified Standard Series ANSI B1.13M (ANSI B1.1-UNC) Class 6g (2A) for external threads and Class 6H (2B) for internal threads, except that pin ends having a diameter of 35 mm (1 3/8 inches) or more shall be threaded 4.23 mm/thread (6 threads to the inch). The QCFS shall provide a cover letter documenting QCFS acceptance that threading for bolts has been performed per specification.

863.26 Shop Assembly. All contact surfaces shall be free of paint, grease, oil, rust, loose mill scale and protruding edges or burrs. The flanges and webs shall not be assembled and welded to form girders or other similar members, nor shall any fabrication or assembly which would interfere with the repair of a butt weld be accomplished until radiographs of all butt welds in the component parts are examined and approved by the QCFS for the A rated fabricators or the QA inspector for B and C rated fabricators unless waived by the OSE.

All fit-up work shall be done with the members assembled in their unloaded position as shown on the shop drawing layout required by 863.08. While assembled in the shop, members shall be adequately supported to prevent misalignment or deflection, especially at joints. Supports shall be designated to prevent settlement during the fit-up, reaming or drilling of connections. The QCFS shall maintain records of the actual dimensions and relative positions of each assembly for each offset required by 863.08 and furnish a copy to the QA inspector, upon request. This provision shall apply to both horizontal and vertical dimensions. Members that become a part of two assemblies shall be repositioned for the second assembly to the dimensions recorded for the first assembly.

All connecting parts assembled in the shop for the purpose of reaming or drilling of holes for field connections or for fit-up of field welded connections shall be match-marked with steel stamps prior to disassembly.

Continuous beam and plate girders including sections adjacent to hinged, pin connected, sliding or rocker bearing joints shall have at least three adjacent segments assembled and holes reamed or drilled while assembled. The fit-up of field welded connections shall be checked by similar shop assembly.

Longitudinal or transverse beams and girders to which diaphragms and floor beams frame

or connect shall be shop assembled to check fit-up of connections to be field welded or to ream or drill holes for bolted connections. Trusses shall be assembled in lengths not less than three abutting panels before field connections are drilled or reamed while assembled.

When the Contractor elects to use numerically controlled (N/C) drilling or punching, assembly shall be performed as specified. Other methods of checking hole alignment and match marking may be given consideration upon written request to the OSE. If the Contractor's proposed methods of CNC assembly fail to produce specified results, the OSE can require the Contractor to perform the work per 863.20 and 863.26 at no additional cost to the Department.

Deck expansion devices shall be shop assembled after fabrication to check fit-up, straightness and roadway cross slope changes. Where a phased construction sequence is a mandatory part of the contract plans, part-width deck segments may be fabricated without the required shop assembly if shop drawings have incorporated a lay down, similar to 863.08, defining vertical offset dimensions from a full length common baseline to all roadway changes including sidewalks, rounding, crowns and field splice points of the expansion device.

Parts not completely assembled in the shop shall be secured by bolts, as far as practicable, to prevent damage in handling and shipping. Field splice plates shall be bolted in their final position in the shop or shifted laterally with respect to their final position so that the ends of the plates are flush with the ends of the member. Welding or tacking will not be permitted on bolted assemblies unless by written acceptance from OSE. Welding authorized shall be performed according to 863.23.

The QCFS shall provide a cover letter and specific check point data documenting QCFS acceptance that shop assembly has been performed per specification.

863.27 Nondestructive Testing. Nondestructive testing (NDT) shall conform to the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011, and this item. Welded repairs in main members for thick scabs, deep kerfs or nicks and similar gross flaws shall be subject to ultrasonic or radiographic inspection as directed by the OSE or Engineer (field repairs). All examined welds and base metal adjacent to a welded joint shall be subject to the quality requirements specified in 863.23. Welds requiring nondestructive testing shall be allowed to cool before they are tested.

The Contractor or Fabricator shall notify the Department in advance of specified non-destructive testing. Such notification is required even if specific QA hold or witness point inspections are not required for A and B rated fabricators.

Where controversy may arise, regarding the interpretation of radiographs, magnetic particle indications or the acceptability of welds, the OSE has the final authority to accept the welds. Field radiographic inspection shall be accepted by the OSE prior to subsequent construction activities that would make weld repair inaccessible.

1. Radiographic Inspection of Welds. All members subject to radiographic testing shall have the welds ground smooth. Web splices shall be ground only where radiographed, except at outside fascia surfaces which shall be ground full length. Radiographic inspection shall be made of the following welds:

(a) The full length of all butt welds in flange material of plate girders or rolled beams. 100% of butt welds in back up bars that remain in the structure.

(b) The top and bottom one-third of transverse web splices in plate girders or rolled beams including any cope holes.

(c) Butt welds in longitudinal stiffeners attached to tension areas of webs.

(d) Twenty-five percent of each longitudinal web splice as selected by the inspector.

(e) Full length of field flange cut repairs.

(f) Any other weld specified by the Contract or AWS Bridge welding code.

The radiograph identification mark shown on the shop drawing layout shall be steel stamped in the area marked "Weld Identification" of Figures 6.1A thru 6.1D of the AASHTO/AWS Bridge Welding Code in a manner to make it visible in the radiograph of the area without resorting to superimposed like markings. Steel Stamped identification marks on flange plates shall be placed so that after assembly of girders, they will be on the inside of flange, but out of the area to which the web will fasten. Films of repaired welds shall also be identified by the letter "R". Steel Stamped identification numbers shall not be placed within the weld area. Other required markings shall be made by using superimposed characters. Where areas being radiographed are adjacent to the edge of the plate, the film shall be located and a technique employed which will include the top and bottom images of the plate edge. Films 114 by 432 mm (4 ½ by 17 inches) shall be used where practicable. The minimum film size shall be 114 by 254 mm (4 ½ by 10 inches).

Whenever an unacceptable weld occurs in the web sections enumerated, an adjoining 300 mm (12 inch) length of weld not previously examined shall be radiographed. If unacceptable flaws are found in this adjoining segment, the remainder of the weld (if any) shall be examined.

Radiographs shall be submitted to the OSE for acceptance and shall be accompanied by certification from the Contractor or Fabricator that the radiographic examination was performed in conformance to these specifications, field sketches and by two copies of the radiographic technician's analysis report listing unacceptable defects and causes for rejection. The technician's report shall include identification and energy level or source strength in becquerels of the radiation source, film to source distance, film type, and exposure time for each radiograph as well as the signature of the technician and his NDT level. The contact films shall become the property of the Department. Field main material

repairs shall have sketches which clearly show specific locations, lengths and depths of field cuts or damages repaired by field welding.

2. Magnetic Particle Inspection of Welds. All welding required in the fabrication of each beam or girder shall be completed and all visual defects shall be corrected prior to the examination by magnetic particle inspection. Dry powder magnetic particle inspection shall be made of at least 0.3 m (1 foot) of each 3.0 m (10 feet) or fraction thereof for each size of weld in the following:

(a) Flange-to-web welds, including ends of girder after trimming.
(b) Moment plate to flange welds
(c) Bearing stiffener welds
(d) Other welds designated by the Contract or AWS Bridge Welding Code.

Test sections shall be random locations selected by the QA inspector and/or the QCFS, and the examination shall be conducted with the QA inspector observing for C rated fabricators, unless waived by OSE. The Fabricator shall position the welds as necessary for the inspection with consideration of safety and convenience to the inspecting personnel.

Welds shall be inspected after they have been cleaned. When magnetic particle testing is used, the procedure and techniques shall be in accordance with the the dry powder magnetic-particle examination of welds using the prod or the yoke method per AWS 6.7.6. The prod test equipment shall have a functioning ammeter. The prod magnetizing current shall be 100 amperes per 25 mm (inch) of prod spacing but not less than 400 amperes. Only aluminum prods shall be permitted.

When unacceptable defects are found in a section, both adjacent 1.5 m (5 foot) segments or the full length of the weld if it is a lesser amount shall be tested. Welds requiring repair shall be retested after repairs are complete. Consideration will be given to performance of MPI inspections prior to complete welding, if the fabricator's quality control plan is acceptable to the Department and additional processing does not produce a potential for cracking.

Not all of the enumerated surface defects of Article 9.21 of the AASHTO/AWS Bridge Welding Code will be located by an inspection of this type. Welds shall be considered unacceptable if they produce such indications that are in excess of the above quality standards.

The Fabricator shall record the piece mark, the location on the member, the defect description and the proposed repairs for any defects found.

3. Ultrasonic Testing of Welds. Ultrasonic inspection shall be made of the following:

(a) Complete joint penetration flange-to-web, T or corner joints, 25% for non FCM, 25% compression or shear FCM and 100%. Tension FCM.

(b) Complete penetration butt welds 100% tension FCM and 25% compression FCM,

(c) Other welds designated by the Contract or AWS Bridge Welding Code.

The QCFS shall provide a cover letter, specified certification, sketches and technician reports documenting QCFS acceptance that nondestructive testing has been performed per specification.

863.28 Shipping, Storage and Erection. Members damaged by improper handling, storing, transportation or erection shall be repaired or replaced, at the discretion of the OSE, at no expense to the Department.

During transportation, adequate blocking shall be in place between members to prevent movement and facilitate unloading. Field connection holes shall not be used for tie-down, unless they are reinforced by additional plates, angles or other material bolted in place. Bearing components shall be banded together.

Material to be stored either in the fabricating shop or in the field shall be placed on skids or blocks to prevent the metal from coming in contact with the ground. Girders and beams shall be placed and shored in an upright position for shipment ,field storage and shop storage. Field splice plates shall be bolted in their final position or shifted laterally with respect to their final position. All material shall be kept clean and properly drained. Bearing devices and anchorages shall be installed according to 516. Bearing surfaces and surfaces to be in permanent contact shall be thoroughly cleaned before the members are assembled.

During erection, drifting will be permitted to draw the parts into position, but the holes shall not be enlarged nor the metal distorted. Erection (drift) pins shall be cylindrical and not more than 0.8 mm (1/32 inch) smaller than the hole diameter. Field splices and connections shall have not less than one-half of the holes filled with pins and snug tight bolts (preferably half bolts and half pins) before the member is released from the hoisting equipment. Field splices and connections commenced prior to erection of the connected parts shall be completed before erection. Splices and connections subject to construction loads during erection shall have not less than three-fourths of the holes so filled. Permanent fastening of steel truss tension chord members shall be completed before the falsework is removed, but compression chord members shall not be permanently fastened until the span is released sufficiently from the falsework to bring the compression chord joints into full bearing. Elevations of panel points and ends of floor beams shall be properly regulated and maintained until the falsework is removed.

Enlarging by any method the holes of splices and/or connections between segments or elements of main members is prohibited without approval by the OSE.

Structures shall be adjusted to correct alignment and camber before permanent fastening is begun. Cross frames and lateral bracing in continuous beam or girder spans shall not

be permanently fastened in any span until all main connections in adjacent spans have been completed; however, sufficient bracing shall be installed to meet the requirements of 501.06. Where erection bolts are used, they shall be not less than 16 mm (5/8-inch) diameter. Bolts for unpainted applications of A709 Grade 50W (A588) steel shall be A 325, Type 3. Erection bolts shall be A 307 bolts with lock washers or nuts tack welded to the bolt, or A 325 bolts tightened to a snug tight condition as described in 863.21 and having nuts tack welded to the bolt. End cross frames and end dams shall be erected in a manner that assures all bearing parts will remain in bearing contact.

The QCFS shall provide a cover letter documenting QCFS acceptance that shipping from the shop and shop storage has been performed per specification.

863.29 Shop Painting. This section contains requirements for the application and inspection of the shop prime coat as specified in the contract plans. The payment for the shop prime coat is included in the price bid for structural steel.

The QCPS shall be responsible for being familiar with the applicable paint specifications called for in the contract plans. Where specific shop Quality Control Points (QCP) are established in the specification, the QCPS shall comply with those requirements. If no shop prime coat QCPs are defined in the applicable paint specification, the QCPs in this section shall be the responsibility of the QCPS to assure that all QCPs meet specifications
.

Shop Prime coat shall be as specified in the contract documents.

Quality Control Points. Quality control points (QCP) are points in time when one phase of the work is complete and ready for inspection by the fabricator and QA Inspector. The next operational step shall not proceed unless the QCP has been accepted or QA inspection waived by the QA Inspector. At these points the Fabricator shall afford access to inspect all affected surfaces. If QA Inspection indicates a deficiency, that phase of the work shall be corrected in accordance with these specifications prior to beginning the next phase of work. Discovery of defective work or material after a Quality Control Point is past or failure of the final product before final acceptance, shall not in any way prevent rejection or obligate the Department to final acceptance.

Quality Control Points (QCP)	(PURPOSE)
1.) Shop Solvent Cleaning	Remove asphaltic cement, oil, grease salt, dirt, etc.
2.) Shop Grinding Flange Edges	Remove sharp corners, per AWS
3.) Shop Abrasive Blasting	Blasted surface to receive paint, including repair of fins, tears, slivers or sharp edges

4.) Shop Prime Coat Application	Check surface cleanliness apply prime coat check coating thickness

Shop Solvent Cleaning (QCP # 1). The steel shall be solvent cleaned were necessary to remove all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants per SSPC-SP 1 Solvent Cleaning. Under no circumstances shall any abrasive blasting be done to areas with asphaltic cement, oil, grease, or diesel fuel deposits. Steel shall be allowed to dry before blast cleaning begins.

Shop Grinding Edges (QCP # 2). All corners of thermally cut or sheared edges shall have a 1/16 inch radius or equivalent flat surface at a suitable angle. Thermally cut material thicker than 1 ½ inch shall have the sides ground to remove the heat effected zone, as necessary to achieve the specified surface profile.

Shop Abrasive Blasting (QCP #3). All steel to be painted shall be blast cleaned according to SSPC-SP10. Steel shall be maintained in a blast cleaned condition until it has received a prime coat of paint.

Metallized or galvanized steel, and other surfaces not intended to be painted, shall be covered and protected to prevent damage from blasting and painting operations. Any adjacent coatings damaged during the blasting operation shall be repaired at the fabricators expense.

The abrasive shall produce an angular profile. After each use and prior to reuse, the abrasive shall be cleaned of paint chips, rust, mill scale and other foreign material by equipment specifically designed for such cleaning.

Abrasives shall also be checked for oil contamination before use. A small sample of abrasives shall be added to ordinary tap water. Any detection of a oil film on the surface of the water shall be cause for rejection. The QCPS shall perform and record this test at the start of each shift.

The surface profile shall be a minimum of 40 mm (1.5 mils) and a maximum of 90 mm (3.5 mils). The QCPS shall record the surface profile with replica tape ASTM D 4417 Method C. For Automated blasting process: Five each recorded readings at random locations on one member for 20% of the main members or one beam per shift (which ever is greater) and One(1) recorded reading for 10% of all secondary material. For Manual blasting process: five each recorded readings at random locations for each main member and one recorded reading for 25 percent of all secondary material.

Abrasives of a size suitable to develop the required surface profile shall be used. Any abrasive blasting which is done when the steel temperature is less than 3° C(5° F) above the dew point shall be re-blasted when the steel temperature is at least 3° C(5° F) above the dew point. The QCPS shall record temperature and dew point shall be recorded prior

to blasting and at the start of each shift.

All abrasives and residue shall be removed from all surfaces to be painted with a vacuum cleaner equipped with a brush-type cleaning tool, or by double blowing. All blast cleaned steel shall be kept dust free, dry and shall be prime coated within 24 hours. The QCPS shall perform and record the following test to ensure that the compressed air is not contaminated: blow air from the nozzle for 30 seconds onto a white cloth or blotter held in a rigid frame. If any oil or other contaminants are present on the cloth or blotter, abrasive blasting shall be suspended until the problem is corrected and the operation is verified by a repeated test. This test shall be done prior to blowing and at the start of each shift.

Abrasive blasting and painting may take place simultaneously as long as abrasive blasting debris and/or dust by the blowing operation does not come in contact with freshly painted surfaces. Work areas for blasting and painting shall be physically separated to eliminate contamination of the priming operation.

All fins, tears, slivers and burred or sharp edges that are present on any steel member or that appear after the blasting operation shall be conditioned per ASTM A6 and the area reblasted to provide the specified surface profile.

Shop Prime Coat Application(QCP # 4). The surfaces to be painted shall be clean and dry. Paint shall not be applied in rain, snow, fog or mist, or to frosted or ice-coated surfaces. After QCP #3 has been accepted prime painting shall be completed before the cleaned surfaces have degraded from the prescribed standards, but in every case within 24 hours. The QCPS shall record the time between blasting and priming. Failure to prime coat the within 24 hours will require re-blasting before prime coating. The QCPS shall record that the paint is applied when the ambient temperature and humidity are as specified. Primer shall be applied by spray methods. The paint may be thinned for spraying. The type of thinner and the amount used shall be as recommended by the printed instructions of the manufacturer.

Before the paint is applied, it shall be mixed to a uniform consistency and maintained during its application. Primer shall be spray applied and continuously agitated by a automated agitation system(hand held mixers are not allowed) during application. The paint shall be mixed with a high shear mixer. Paddle mixers or paint shakers shall not be used. Paint shall also not be mixed or kept in suspension by means of an air stream bubbling under the surface.

The primer shall be applied in a neat workmanlike manner as a continuous film of uniform thickness which is free of holidays, pores, runs or sags. Spray application shall produce a wet coat at all times; the deposition of semi-dry particles on the surface shall be avoided. The Fabricator shall take precaution to prevent contamination of surfaces that have been prepared for painting and surfaces freshly painted. The prime coat shall be applied within the shop. The steel shall not be handled unnecessarily or removed from the shop until

paint has dried sufficiently to allow thickness gaging and to resist being marred in handling and shipping.

A prime coat shall coat all surfaces including insides of holes, behind stiffener clips and contact surfaces of connection or splice material which are to be fastened with shop or field bolts. Surfaces which are to be imbedded in concrete and surfaces within 50 mm (2 inches) of field welds other than those attaching intermediate or end cross frames to beams or girders shall only receive a mist coat not less that .5 mils(12.5 um) nor more than 1.5 mils(37.5 um). Pins, pin holes and contact surfaces of bearing assemblies, except those containing self-lubricating bronze inserts, shall be painted with one coat of prime paint. Erection marks shall be applied after the prime coat is dry, using a thinned paint of a type and color which is completely concealed by and compatible with the second coat.

The QCPS shall record the actual dry film thickness for the prime coat as specified. Thick films shall be reduced by screening, sanding, or sweep blasting. Any re-coating of prime paint that has cured longer than 24 hours with prime paint shall be done as recommended by the paint manufacturer's printed instructions. If "mud cracking" occurs, the affected area shall be scraped to soundly bonded paint and the area re-coated. Uncured paint damaged by rain, snow or condensation shall be permitted to dry; the damaged paint shall then be removed and the surface repainted.

The primed coat shall be adequately cured before the intermediate coat is applied. This curing time shall be not less than that recommended by the paint manufacturer's printed instructions.

Testing Equipment. The Fabricator shall provide the QCSP inspector the following testing equipment in good working order for the duration of the project. When the Fabricator's people are working at different locations simultaneously, additional test equipment shall be provided for each crew for the type of work being performed. When test equipment is not available, no work shall be performed.

1. One Spring micrometer and 3 (unless otherwise specified on plans) rolls of extra-coarse replica tape.

2. One (Positector 2000 or 6000, Quanix 2200, or Elcometer A345FBI1) and the calibration plates, 38-200 mm and 250-625 mm (1.5 -8 mils and 10-25 mils) as per the NBS calibration standards in accordance with ASTM D-1186.

3. One Sling Psychrometer including Psychometric tables - Used to calculate relative humidity and dew point temperature.

4. Two steel surface thermometers accurate within 1° C(2° F) or One portable infrared thermometer available from:
   Model: Raynger ST Series (-18° C to 400°C)

Manufacturer: Raytek Inc.
Santa Cruz, Ca.
(800)227-8074

or accepted equal to the portable infrared thermometer

5. Flashlight 2-D cell

6. SSPC Visual Standard for Abrasive Blast Cleaned Steel SSPC-Vis 1-89

Handling. All paint and thinner shall be delivered to the fabricator in original, unopened containers with labels intact. Minor damage to containers is acceptable provided the container has not been punctured. Thinner containers shall be a maximum of 19 L (5 gallons).

Paint shall be stored at the temperature recommended by the manufacturer to prevent paint deterioration. The QCPS shall record storage temperatures.

Each container of paint and thinner shall be clearly marked or labeled to show paint identification, component, color, lot number, stock number, date of manufacture, and information and warnings as may be required by Federal and State laws. The QCPS shall record the lot number, stock number and date of manufacture.

All containers of paint and thinner shall remain unopened until used. The label information shall be legible and checked at the time of use. Solvent used for cleaning equipment is exempt from the above requirements.

Paint which has livered, gelled or otherwise deteriorated during storage shall not be used. However, thixotropic materials which can be stirred to attain normal consistency may be used. The oldest paint of each kind shall be used first. No paint shall be used which has surpassed its shelf life.

The Fabricator shall provide thermometers capable of monitoring the maximum high and low temperatures within the storage facility. The Fabricator is responsible for properly disposing of all unused paint and paint containers.

The Fabricator shall furnish TE-24 and the QCPS records for all materials used on the project to the QA Inspector.

Mixing and Thinning. All ingredients in any container of paint shall be thoroughly mixed immediately before use and the primer shall be continuously mixed by an automated agitation system (hand held mixers not allowed). Paint shall be carefully examined after mixing for uniformity and to verify that no unmixed pigment remains on the bottom of the

container. The paint shall be mixed with a high shear mixer (such as a Jiffy Mixer). Paddle mixers or paint shakers are not allowed. Paint shall not be mixed or kept in suspension by means of an air stream bubbling under the paint surface. The QCPS shall record that all equipment is working correctly.

All paint shall be strained after mixing. Strainers shall be of a type to remove only skins and undesirable matter, but not pigment.

No thinner shall be added to the paint without the QCPS's approval, and only if necessary for proper application as recommended by the manufacturer. When the use of thinner is permissible, thinner shall be added slowly to the paint during the mixing process. All thinning shall be done under supervision of the QCPS. In no case shall more thinner be added than that recommended by the manufacturer's printed instructions. Only thinners recommended and supplied by the paint manufacturer may be added to the paint. No other additives shall be added to the paint.

Catalysts, curing agents, or hardeners which are in separate packages shall be added to the base paint only after the base paint has been thoroughly mixed. The proper volume of catalyst shall then be slowly poured into the required volume of base with constant agitation. Liquid which has separated from the pigment shall not be poured off prior to mixing. The mixture shall be used within the pot life specified by the manufacturer. Therefore only enough paint shall be catalyzed for prompt use. Most mixed, catalyzed paints cannot be stored, and unused portions of these shall be discarded at the end of each working day.

COATING APPLICATION

General. Galvanized or metallized surfaces shall not be painted. All new structural steel shall be painted. The following methods of application are permitted for use by this specification, as long as they are compatible with the paint being used: air-less or conventional spray. Brushes, daubers, small diameter rollers or sheepskins may be used for places of difficult access when no other method is practical.

Cleaning and painting shall be so programmed that dust or other contaminants do not fall on wet, newly-painted surfaces. Surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Over spray shall be removed with a stiff bristle brush or wire screen without damaging the paint. No visible abrasives from adjacent work shall be left on the prime. Abrasives on the prime coat shall be removed.

Spray Application (General). All spray application of paint shall be in accordance with the following:

Spray equipment shall be kept clean so dirt, dried paint and other foreign materials are not deposited in the paint film. Any solvent left in the equipment shall be completely removed before using.

Paint shall be applied in a uniform layer with overlapping at the edges of the spray pattern. The border of the spray pattern shall be painted first; with the painting of the interior of the

spray pattern to follow, before moving to the next spray pattern area. A spray pattern area is such that the gun shall be held perpendicular to the surface and at a distance which will ensure that a wet layer of paint is deposited on the surface. The trigger of the gun should be released at the end of each stroke. The QCPS shall record that each spray operator demonstrated to the QCPS the ability to apply the paint as specified. Any operator who does not demonstrate this ability shall not spray.

The QCPS shall document that all spray equipment used follows the paint manufacturer's equipment recommendations . Equipment shall be suitable for use with the specified paint. to avoid paint application problems.

If air spray is used, traps or separators shall be provided to remove oil and condensed water from the air. The traps or separators must be of adequate size and must be drained periodically during operations. The following test shall be made by the Fabricator and verified by the QCPS to insure that the traps or separators are working properly.

The QCPS shall perform and record that air is blown from the spray gun for 30 seconds onto a white cloth or blotter held in a rigid frame. If any oil, water or other contaminants are present on the cloth or blotter: painting shall be suspended until the problem is corrected and the operation is verified by repeating this test. This test shall be made at the start of each shift and at 4 hour intervals. This is not required for an airless sprayer.

Application Approval. The end of the application of primer for each beam or girder shall be subject to QCPS inspection and approval to detect any defects which might result from the fabricator's methods. If defects are discovered, the fabricator shall make all necessary adjustments to the method of application to eliminate defects before proceeding with additional prime coat application.

Temperature. Paint shall not be applied when the temperature of the air, steel, or paint is below 4° C (40° F). Paint shall not be applied when the steel surface temperature is expected to drop below 4° C (40° F) before the paint has cured for the minimum times specified below:

	10° C (50° F)	16° C (60° F)	21° C (70° F)
Primer	4 hrs.	3 hrs.	2 hrs.

The QCPS shall record and monitor the above temperatures and times.

Moisture. Paint shall not be applied when the steel surface temperature is less than 3° C (5° F) above the dew point. Paint shall not be applied to wet or damp surfaces or on frosted or ice-coated surfaces. Paint shall not be applied when the relative humidity is greater than 85%. Paint shall not be applied outdoors. The QCPS shall record the relative humidity prior to painting, at every shift and 4 hour intervals

Repair Procedures. Damaged areas, and areas which do not comply with the requirements of this specification, shall be repaired in a manner to blend the patched area with the adjacent coating. The finished surface of the patched area shall have a smooth, even profile with the adjacent surface.

The QCPS shall submit his method of conducting repairs, correcting runs, sags , mud cracking and un-workman like conditions in writing to the OSE.

Dry Film Thickness. Prime thickness, shall be determined by use of Type 2 magnetic gage in accordance with the following:

Five separate spot measurements shall be made, spaced evenly over each 9 square meters (100 square feet) of painted surface area. Three gage readings shall be made for each spot measurement. The probe shall be moved a distance of 25 to 75 mm (1 to 3 inches) for each new gage reading. Any unusually high or low gage reading that cannot be repeated consistently shall be discarded. The average (mean) of the 3 gage readings shall be used as the spot measurement. The average of five spot measurements for each such 9 square meter (100 square foot) area shall not be less that the specified thickness. No single spot measurement in any 9 square meter (100 square foot) area shall be less than 80% of the specified minimum thickness nor greater than 120% of the maximum specified thickness. Any one of 3 readings which are averaged to produce each spot measurement, may under-run or over-run by a greater amount. The 5 spot measurements shall be made for each 9 square meter (100 square feet) of area.

The specified coating thickness is 3 mils minimum to 5 mils maximum.

Safety Requirements and Precautions. The fabricator shall meet the applicable safety requirements of the Ohio Industrial Commission and the Occupational Safety and Health Administration (OSHA).

Inspection Access. In addition to the requirements of CMS 105.11, the fabricator shall furnish, erect, and move scaffolding and other appropriate equipment, to permit the QA Inspector the opportunity to closely observe all affected surfaces. Material shall be separated for inspection and safely braced. This opportunity shall be provided to the Inspector during all phases of the work and storage.

The QCPS shall provide a cover letter and specified check point data documenting QCPS acceptance that shop painting has been performed per specification.

863.30 Cleaning A709 Grade 50W Steel (ASTM A 588) Before the new steel is shipped All the exposed surfaces of A 709 Grade 50W (A588) steel that are to be left unpainted shall be solvent cleaned where necessary to remove all traces of asphaltic cement, oil, grease, diesel fuel deposits, chalk, paint marks and other soluble contaminants per SSPC-SP 1 Solvent Cleaning. QCP #1 and QCP #2 shall apply per 863.29.

Fascia beams (girders) shall be shop blast cleaned to SSPC- SP6 commercial blast. QCP#3 shall apply per 863.29.

After the placement of the superstructure concrete. All the exposed surfaces of A 709 Grade 50W (A588) steel that are to be left unpainted shall be solvent cleaned where necessary to remove all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants per SSPC-SP 1 Solvent Cleaning.

The use of acid for cleaning will not be permitted.

The QCPS shall provide a cover letter and specified check point data documenting QCPS acceptance that shop cleaning has been performed per specification.

863.31 Method of Measurement. Structural steel shall be measured by either lump sum or the plan weight of steel, whichever is stipulated in the contract.

If the quantity of structural steel to be paid is the plan weight of steel, the actual number of kilograms (pounds) shall be computed from the accepted shop drawing by using a unit weight of 7850 kg/m^3 (490 pounds per cubic foot). Waste material, such as is removed by burning, cutting, machining, etc., shall not be considered as pay weight except for that material removed in the edge preparation for groove welds. Material removed to form bolt holes shall be included in the pay quantity provided that only those portions of the bolts projecting beyond the holes are included for payment. Only bolts and materials that remain in place shall be included. Any thickness and weight of members in excess of that called for on the plans (due to overweight or other cause) shall not be included in determining the weight to be paid for, unless an increase in size of a member has been requested by then OSE.

Pay weight for steel castings shall be based on scale weights of the finished pieces prior to painting. Castings shall be weighed by the Fabricator, in the presence of the inspector, and weights recorded on shop bills.

The weight of paint coat, galvanized coat, run-off bars, and weld metal in all field or shop butt welds shall not be included. Fillet welds may be included if completely itemized.

The weight of other metals and preformed bearing pads not separately itemized are to be included with the structural steel. The following unit weights in kg/m^3 (pounds per cubic foot) shall be used: Cast steel and deposited weld metal 7850 (490), cast iron 7210 (450), phosphor or leaded bronze 8810 (550), lead 11370 (710). The weight of preformed bearing pads shall be calculated as an equivalent volume of lead.

The number of welded stud shear connectors to be paid for shall be the actual number installed and accepted.

863.32 Basis of Payment. Payment will be made at contract prices for:

Item	Unit	Description
863	Lump sum	Structural steel members, miscellaneous level fabrication
863	Lump sum	Structural steel members, level one fabrication
863	Lump sum	Structural steel members, level two fabrication
863	Lump sum	Structural steel members, level three fabrication
863	Lump sum	Structural steel members, level four fabrication
863	Lump sum	Structural steel members, level five fabrication
863	Lump sum	Structural steel members, fracture critical, level six fabrication
863	Kilogram (pound)	Structural steel members, miscellaneous level fabrication
863	Kilogram (pound)	Structural steel members, level one fabrication

863	Kilogram (pound)	Structural steel members, level two fabrication
863	Kilogram (pound)	Structural steel members, level three fabrication
863	Kilogram (pound)	Structural Steel Members, level four fabrication
863	Kilogram (pound)	Structural steel members, level five fabrication
863	Kilogram (pound)	Structural steel members, fracture critical, level six fabrication
863	Each	Welded stud shear connectors

OHIO DEPARTMENT OF TRANSPORTATION
P.O. Box 899
25 South Front Street
Columbus, OH 43215-0899
614-466-4082 / 614-752-4824 fax / jrandall@dot.state.oh.us

Facilities inspection has been performed by _____ From the Office of Structural Engineering (OSE)____/____/_____ Based upon this report your facility will be evaluated for acceptance into the Prequalified Fabricator List as specified by SS863.02

Facilities Evaluation Check List

1. Company Name: _____
2. Address: _____
3. Phone:_____ Fax:_____ E Mail_____

4. AISC Certification, enclose copy of certification:_____
   a. Level Miscellaneous: No AISC certification
   b. Level 1 Fabricator: S Br category with P endorsement
   c. Level 2 thru 5 Fabricator: M Br category with P endorsement
   d. Level 6 Fabricator: M Br category with P and F endorsements

5. Company Representative
   a. President: _____
   b. Chief Engineer: _____
   c. Shop Superintendent: _____
   d. QCFS, enclose certifications: _____
   e. QCPS, enclose certifications: _____
   f. NDT Staff or Agency, enclose certifications: _____
6. Building Facilities:
   a. Indoor heated fabrication area, length and width (ft): _____
   b. Indoor heated paint area, length and width (ft): _____
   c. Lay down assembly area, length and width (ft): _____
   d. QA Inspection Office area meets specification 863.07

7A. Lifting Equipment:
   1. Overhead equipment maximum piece lifting capacity (Lbs.) _____
   2. Mobile equipment maximum piece lifting capacity (Lbs.)_____

7B. Material Preparation:
   1. Shearing and planed edges, comments: _____

   2. Cutting, manual guided methods required for levels 1 thru 3
   3. Cutting Automated guided methods required for levels 4 thru 6, maximum length:_____
   4. Bending processes available, comments: _____
   5. Reentrant corners and rounding edges, comments: _____

7C. Welding Processes
   1. Levels 1 and 2 must have SMAW, check for calibration paperwork: _____
   2. Level 3 thru 6 must have SMAW and FCAW or SAW, check for calibration paperwork: _____
   3. Electrode oven, check operation and calibration paperwork: _____
   4. Level 6, flux hoppers check for calibration paperwork: _____
   5. Current approved PQR, separate submission required.
   6. Complete package of WPS, separate submission required.
   7. Qualified welders, separate submission required.

7D. NDT Technicians or Agency:
   1. Level 3 fabrication requirements:
      a. Magnetic Particle Inspection(MPI): Dry powder with aluminum prods or probe check machine calibration per ASTM E709 each 6 month: _____
      b. MPI ANSI/ASNT CP-189-1995 Level II, enclose certifications

   2. Level 4 thru 6 fabrication requirements:
      a. MPI as per level 3 above
      b. Ultrasonic Testing (UT) Equipment: AWS D1.5-95 section 6.15 and qualification 6.17: _____
      c. UT ANSI/ASNT CP-189-1995 Level II , enclose certifications
      d. Radiographic Testing (RT) Equipment: AWS D1.5-95 section 6.12 viewer: _____
      e. Evaluation of production sample RT film and report per AWS D1.5-95 section 6.10: _____
      f. RT ANSI/ASNT CP-189-1995 Level II, enclose certifications

7E. Drilling and Punching Processes, check work in process meets SS863.20 and 26:
_____

7F. Shop Bolting:
   1. Skidmore Tension Devise, calibrated yearly: _____
   2. Inspection Torque Wrench: _____

7G. Coating:
   1. Methods available for blast cleaning: _____
   2. Grit and shot mixture, examine sample work for profile: _____
   3. Methods available for painting: _____
   4. Check for operation of painting and paint inspection equipment see 863.29: _____
   5. Metallizing methods available: 85% Zinc, 15% Aluminum wire method: _____
   6. Galvanizing methods available: _____

Appendix II

FABRICATOR _____RATING FOR SHOP DRAWINGS

Project_____ Bid Line No. _____ Shop I.D. _____ Bridge:_____

Rater/Date _____ Reviewer/Date _____

Contractor Coordination (10 %) (1 point each)

	Y	N	NA
1. The contractor's P.E. has stamped and approved each shop drawing, including revisions.			
2. Shop drawing notes indicate that the contractor field verified the existing structure per the contract.			
3. Contractor submitted documentation addresses any contract changes due to, but not limited to, field conditions, plan errors or fabrication issues.			
4. Contractor accepted shop drawings were received seven (7) working days prior to the start of fabrication.			

Title Block (1%) (1 point each)

1. The project number is per the contract.			
2. All bid line numbers are shown and separated per the contract.			
3. The county, route and section of the structure are per the contract.			
4. The structure file number (SFN) is shown.			

General Notes (5%) (1 point u.n.o.)

1. The type and grade of steel are per the contract. (15 pts)			
2. Charpy V Notch (CVN) is specified per the contract. (15 pts)			
3. Non-destructive testing (NDT) is specified per the contract. (10 pts)			
4. Welding specifications are per the contract. (10 pts.)			
5. The system that produces high strength bolt holes is specified. (5 pts.)			
6. The match marking system is specified per supplemental specification 863.			
7. Surface preparation is specified per the contract.			
8. The coating system is specified per the contract.			
9. The rounding of all sheared or flame cut edges and corners is specified.			

Framing or Erection Plan (10%) (1 point u.n.o.)

	Y	N	NA
1. Main and secondary member piece marks correlate to detail drawings. (15 pts)			
2. The skew of substructures is per the contract.			
3. Transverse or radial center to center main member spacing is per the contract.			

4. The field splices are dimensioned from a centerline of bearing.			
5. The center to center of bearings is dimensioned along the full length base line.			

Lay down Assemblies (30%) (1 point u.n.o.)

Vertical Lay down Assemblies

1. A full length base line is from abutment to abutment. (5 pts)			
2. Cambers are dimensioned vertically from the baseline at points shown in the contract. At the minimum, these points shall be bearings, field splices and approximate span quarter points. (5 pts.)			
3. The baseline is horizontally dimensioned at the camber points. (5 pts)			
4. Vertical offsets are dimensioned to a consistent location on each member.			

Horizontal Lay down Assemblies

1. A full length base line is from abutment to abutment. (15 pts)			
2. Bearings, mid-ordinates and field splices are dimensioned to the centerline of web from a perpendicular to the baseline. (10 pts)			

Sub-Assemblies

1. Transverse or longitudinal main members, to which diaphragms and floor beams frame or connect, are detailed to locate bearings and splices from plan and elevation baselines. (15 pts)			

Main Member Details (30%) (1 point u.n.o.)

1. All material sizes, type, quantity and grade are per the contract. (30 pts)			
2. Fracture critical plates are identified per AWS and the contract. (25 pts)			
3. Fracture critical welds are identified by WPS number and FC designation per AWS and the contract. (25 pts)			
4. The bolt lengths, diameters, holes and types are shown per the contract. (20 pts)			
5. The splice pattern, edge distance, and maximum gap are per the contract (20 pts)			
6. All weld sizes, terminations and other details are per the contract. (20 pts)			
7. The bearing stiffeners are plumb at erection and have end fit conditions per the contract. (15 pts)			
8. The contract spacing for intermediate and connection stiffeners is not exceeded. (15 pts)			
9. All stiffeners have clips, section views and end fit conditions per the contract. (15 pts)			

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10. End conditions, not limited to, integral or semi integral abutment details, flange clips, distances between end of member and center line of bearing or special fit-up are per the contract. (10 pts)
11. Re-entrant corners are provided with a 1" (25.4 mm) radius (10 pts)
12. Flange and web width or thickness transitions are per the contract. (10 pts)
13. Individual curved member camber diagrams are supplied with offsets at 10'-0" (3.048 m) centers. (5 pts)
14. Individual member camber diagrams are dimensioned at locations consistent with the contract. This includes approximate quarter span points. (5 pts.)
15. Radiograph locations and markings are identified per the contract. (2 pts)
16. Coated and un-coated areas are detailed per the contract.
17. Main member cross-sections are dimensioned.

Secondary Member Details (9%) (1 point u.n.o.)

1. Material size(s) and type(s) are shown per the contract. (15 pts)
2. Transverse bridge geometry is included in secondary member details. (10 pts.)
3. Shop and field weld sizes, terminations and other details are per the contract.(10 pts)
4. Bolt lengths, diameters, holes and types are shown per the contract. (10 pts)
5. Secondary member work points are dimensioned where necessary for the coordination of trades.
6. Strut and diagonal cross frame legs are matched on each side of the web.

Y= yes, N= no, NA = not applicable

Fabricator Rating = {Y / (Y + N) } x Section Factor (There are no partial points)

Contractor Coordination _____ (Y) / _____ (Y + N) x 10 = _____
Title Block _____ (Y) / _____ (Y + N) x 1 = _____
General Notes _____ (Y) / _____ (Y + N) x 5 = _____
Framing/Erection Plan _____ (Y) / _____ (Y + N) x 10 = _____
Lay down Assemblies _____ (Y) / _____ (Y + N) x 30 = _____
Main Member Details _____ (Y) / _____ (Y + N) x 35 = _____
Secondary Member Details _____ (Y) / _____ (Y + N) x 9 = _____

Appendix II

Fabricator_____**Rating for Performance of Shop Drawings**_____%

Appendix II

FABRICATOR _____ **RATING FOR TEST REPORTS**

Project:_____ **Bid line No.:**_____ **Shop ID.** _____ **Bridge No.:**_____
Rater/Date:_____ **Reviewer/Date:** _____

I. General Project Information	**Y**	**N**	**NA**
1. Project number is shown (1 point)			
2. Bid line number is called out (1 point)			
3. Bridge number is specified (1 point)			
4. Name of fabricator is identified (1 point)			
5 Bid line numbers are separated (1 point)			
6. Material test reports are cross referenced to drawing piece marking system (2 point)			

II. Complete Mill Test			
1. All materials shown on the shop drawings have test reports and shippers (30 points)			
2. Test reports meet all contract requirements; CMS, ASTM, CVN and/or Fracture Critical. (25 points)			
3. The producing mill is domestic (10 points)			
4. Test reports show material size, shape, & length (4 points)			
5. Test reports show grade of steel (3 points)			
6. Material quantity is shown on the Test Reports (2 points)			
7. Test reports show mill's name (2 points)			
8. Test reports show purchaser of material (2 points)			

III. Timeliness			
Test report submission was 7 working days prior to release for shipping (15 points)			

TEST REPORTS RATING TOTAL			

Y = yes, N = no, NA = not applicable
No partial points are available for a yes, no or not applicable section.

V. FOLLOW-UP SEQUENCE FOR INCOMPLETE MILL TEST

	DATE Performed	**DATE DUE**	**RESULT**
1. Fax and Phone call to the Contractor requesting incomplete information.			
2. Non-compliance letter and phone call to Contractor 30 days after sending fax.			
3. IOC to District after 10 days from sending non-compliance letter.			
4. District action performed.			

Appendix II

FABRICATOR_____ **RATING FOR SHOP FABRICATION**

Project: _____ **Bid line No.:**_____**Shop ID:**_____ **Level:**_____

Rater/Date:_____**Reviewer/Date:**_____

Check, Hold or Witness Point Descriptions for Levels of Fabrication 1 thru 5	**Yes**	**No**	**NA**
ASTM A709, Grade, Physical & Chemical Requirements, CVN : Check point one (1) QCFS acceptance by cover letter listing piece marks and dates			
Heat number and member description (1 point)			
Yield Strength, Fy (psi) (3 points)			
Tensile Strength, Fu (psi) (1 point)			
Elongation% and gage length (2 point)			
CVN minimum average energy(ft lb.) (1 point)			
Chemical Requirements (1 point)			
Heat No. Steel Stamped and matched to Mill Test Reports per 863.10 prior to release or painting (1 point)			
ASTM A6 Quality and permissible Variations: Check Point two(2) QCFS acceptance by cover letter listing piece marks and dates.			
ASTM A6, Permissible variations in cross-section (1 point)			
ASTM A6, Permissible variations in Straightness & Storage (1 point)			
ASTM A6 and 863.11, Surface indications, Pitting due to rusting (1 point)			
ASTM A6, Laminar indications (1 point)			
Material Preparation per AWS D1.5, AASHTO and 863: Check Point three (3) QCFS acceptance by cover letter listing piece marks and dates			
Cutting beyond (inside) the prescribed lines AWS 3.2.2 (1 point)			
Cutting roughness AWS 3.2.2 (1 point)			
Occasional notches AWS 3.2.2 (1 point)			
Cut Edge Discontinuities AWS 3.2.3 (1 point)			
Reentrant corners AWS 3.2.4 and Radii of Beam copes 3.2.5 (1 point)			
Rounding of edges main members AWS 3.2.9 (1 point)			
Shearing distortion 863.13 (1 point)			
Bending , 90 degrees to rolling direction, visual inspection look for cracks AASHTO (1 point)			

Cambering and Sweep per 863.12, AWS and AASHTO: Check Point four (4) QCFS acceptance by cover letter listing piece marks and dates.			
Cambering or Straightening, AASHTO shop procedure posted (1 point)			
1150 degrees F pyrometric sticks (follow shop procedure) (5 points)			
location and shape of heats (follow shop procedure) (1 point)			
location and number of support blocks (follow shop procedure) (1 point)			
Natural Cooling (follow shop procedure) (5 points)			
Straightness and camber are per 863.12 (5 points)			
Flange and Web Butt Splice Welding per AWS, 863.23 and AASHTO: Check Point five (5) QCFS acceptance by frequent audits and documentation of listed data for each splice and dates.			
Size, grade , piece mark and locations of parts to be fitted (1 point)			
Clean scale, moisture, grease & foreign material per AWS 3.2.1 (1 point)			
Groove weld fit up tolerance, AWS 3.3 (1 point)			
Shop Welding Procedure (WPS) identification and ODOT approval date. (5 point)			
Tackers Name and SS#, ODOT Qualified, procedure (1 point)			
Welders Name and SS#, ODOT Qualified, procedure (1 point)			
Flux and Wire combination, does it match WPS (1 point)			
Joint geometry tolerances per AWS figure 2.4 (2 point)			
Preheat Temperature (F) and Shop Temperature(F) (1 point)			
Amperage (Amps),Voltage (Volts),Travel Speed (IPM) (5 point)			
Back gouge and cleaning per AWS 3.2.6 (5 point)			
Visual inspection width, thickness AWS 3.6.3 (5 point)			
Visual inspection surface finish AWS 3.6.4 125 uin. (2 point)			
Radiographic Inspection per AWS, 863.27 and AASHTO: Check Point six (6), Hold Point for B & C Rated fabricators QCFS acceptance by cover letter listing piece marks , dates and with technician's reports.			
Radiographic inspection 100% flange butt welds and back up bar splices(ODOT review required, Critical process) (5 point)			
Radiographic inspection web butt welds, top & bottom 1/3 (ODOT review required, Critical process) (5 point)			

Radiographic inspection 100% longitudinal stiffeners butt welds (ODOT review required, Critical process) (5 point)			
Radiographic inspection 25% longitudinal web splice(ODOT review required, Critical process,) (5 point)			
Radiographic identification marked steel stamped and visible in radiographic film, correct image quality indicator (1 point)			
Top and bottom of plate edges visible in the radiographic film (5 point)			
Radiographic technician's signed analysis report (1 point)			
Ultrasonic Inspection per AWS, 863.27 and AASHTO: Check Point seven (7), Hold and Witness Point for B & C Rated Fabricators QCFS acceptance by cover letter listing piece marks , dates and with technician's reports.			
Ultrasonic inspection 25% of complete penetration T or corner joints . (ODOT review required, Critical Process, 100% QA witness with B and C rated fabricators (2 point)			
Ultrasonic technician's signed analysis report (1 point)			
Ultrasonic equipment qualification per AWS 6.17 (1 point)			
Flange to Web Fillet Welds per AWS, 863 and AASHTO: Check Point eight (8), QCFS acceptance by frequent audits , documentation of listed data for each member and dates.			
Size, grade , piece mark and locations of parts to be fitted (1 point)			
Clean scale, moisture, grease & foreign material per AWS 3.2.1 (1 point)			
Standard fillet weld fit up tolerance, 1/16" AWS 3.3 (1 point)			
Welding Procedure (WPS) identification and ODOT approval date (5 point)			
Tackers Name and SS#, ODOT Qualified, procedure (1 point)			
Welder Name and SS#, ODOT Qualified, procedure (3 point)			
Flux and Wire combination, does it match WPS (1 point)			
Preheat Temperature (F) and Shop Temperature(F) (2 points)			
Amperage (Amps),Voltage (Volts) and Travel Speed (IMP) (5 points)			
Visual inspection weld size and profile, AWS 3.6 (5 point)			
Stiffener Fitting per AWS, 863 and AASHTO: Check Point nine (9) QCFS acceptance by cover letter listing piece marks and dates.			
Bearing Stiffener, mill fit @ bearing, tight fit @ other end, 863.14 (1 point)			
Intermediate Stiffener without cross frames, tight fit at tension flange, 863.14 (1 point)			

Connection Stiffener weld fit at both flanges 863.14 (1 point)			
Clearance between clipped stiffener corners and fillets on rolled beams (1 point)			
Stiffener Fillet Welds per AWS, 863 and AASHTO: Check Point ten(10) QCFS acceptance by frequent audits ,documentation of listed data for each member and dates			
Size, grade , piece mark and locations of parts to be welded (1 point)			
Clean scale, moisture, grease & foreign material per AWS 3.2.1 (1 point)			
Standard fillet weld fit up tolerance, 1/16" AWS 3.3 (1 point)			
Welding Procedure (WPS) identification and ODOT approval date (5 points)			
Tackers Name and SS#, ODOT Qualified, procedure (1 point)			
Welder Name and SS#, ODOT Qualified, procedure (3 point)			
Flux and Wire combination, does it match WPS (1 point)			
Preheat Temperature(F) and Shop Temperature(F) (2 point)			
Amperage (Amps), Voltage(Volts) and Travel Speed (IMP) (5 point)			
Visual inspection weld size and profile, AWS 3.6 (5 point)			
Magnetic Particle Inspection per AWS, 863.27 and AASHTO: Check Point eleven (11), Hold and Witness point for C Rated Fabricators.QCFS acceptance by cover letter listing piece markes, dates and with technicians report's.			
Magnetic Particle Inspection 10% of flange to web welds and girder ends after trimming (ODOT review required, Critical Process) Dry powder prod method or probe. 100% QA witness with C rated fabricators. (2 point)			
Magnetic Particle Inspection 10% of Bearing Stiffener Welds (ODOT review required, Critical process) Dry powder prod method or probe. 100% QA witness with C rated fabricators. (2 point)			
Magnetic Particle technician's signed analysis report (1 point)			
Calibration of Magnetic Particle Equipment every 6 months (1 point)			
Shop Laydown per AWS, 863, and AASHTO: Check Point twelve (12) QCFS acceptance by frequent audits, documentation of listed data for each member and dates.			
Hole patterns, size, spacing, gage, accuracy, 863.20 (2 point)			
Hole deburring, 863.20 (1 point)			

Blocking horizontal & vertical dimensions @ bearings, after all welding is complete. 1/8" + or - 863.26 (5 point)			
Blocking camber dimensions @ points specified, after all welding is complete 863.12 (5 point)			
Horizontal curvature of curved members, after all welding is complete 1/8"/10'-0" AWS 3.5 (2 point)			
Fitup at bolted splice, 1/4" max gap SS863.11			
Shop applied bolts, nuts and washers accepted by TE-24			
Shop installed bolts calibration devise periodically examined per 863.21			
Bolts tightened per 863.21			
Center to center of field splices matches plan dimensions (1 point)			
Flatness at bearing seats, after all welding is complete AWS 3.5.1.9 (2 point)			
Cleaning per 863.27, SSPC and ASTM: Check Point thirteen (13) QCFS acceptance by documentation of listed data for each member and dates.			
Shop solvent cleaning per SSPC-SP1 where necessary (5 point)			
Shop grinding edges 1/16", material thicker than 1 ½" shall be checked for removal of the heat effected zone. (1 point)			
Shop blast cleaned SSPC-SP10, Automated process: Five(5) each recorded readings at random locations on one member for 20% of the main members and One(1) recorded reading for 10% of all secondary material with replica tape ASTM D4417 method C, 1.5 to 3.5 mil profile , 863.29 (10 point)			
Shop blast cleaned SSPC-SP10, Manual process: five(5) each recorded readings at random locations for each main member and one(1) recorded reading for 25% of all secondary material with replica tape ASTM D4417 method C, 1.5 to 3.5 mil profile, 863.29 (10 point)			
Steel ,Ambient (Dry bulb) and Wet bulb Temperatures, Humidity and Dew Point recorded prior to blasting and at the start of each shift (5 degree F above dew point). (2 point)			
Abrasive produces angular profile (1 point)			
Abrasive mix for oil contamination start of each shift (1 point)			
Removal of abrasives & residue by vacuum or double blowing (5 point)			
Test blow air for oil or other contaminants. Blotter test for 30 seconds at the start of each shift. Not required with vacuum (1 point)			
Condition all fins slivers and burred or sharp edges per ASTM A6. Re-blast to 1.5 to 3.5 mil profile, unless conditioned area is less than one square foot per main member (1 point)			

Painting per 863.29, SSPC and ASTM: Check Point fourteen (14), Hold Point for C Rated Fabricators. QCFS acceptance by documentation of listed data for each member and dates.			
Time and dates between blasting and painting (1 point)			
Ambient temperature & humidity (minimum 40 deg.F and 5 deg F above dew point) (5 point)			
Temperature of paint storage location (max/ min) (2 point)			
Paint TE-24, manufactures name and lot numbers (2 point)			
Painter mixes paint with a high shear mixer and strains (5 point)			
Painter is checking operation of automated agitation system with every new paint batch (5 point)			
Prime inside of bolt holes, behind stiffener clips (5 point)			
Prime thickness 3 to 5 mils: 3 gage readings for each spot measurement with 5 spot measurements in each 100 square foot (see additional instructions with paint system notes)(10 point)			
Workman like finish; mud cracking, holidays, pores, runs or sags. (5 point)			
Prime has dried sufficiently prior to handling (1 point)			
Cleaning ASTM A709 Grade 50W steel (A588) Check point fifteen (15). QCFS acceptance by documentation of listed data for each member and dates.			
Shop solvent cleaning per SSPC-SP1 where necessary (5 point)			
Shop grinding edges 1/16"(1 point)			
Shop blast fascia members cleaned SSPC-SP6 achieved			
Abrasive mix for oil contamination start of each shift (1 point)			
Removal of abrasives & residue by vacuum or double blowing (1 point)			
Test blow air for oil or other contaminants. Blotter test for 30 seconds at the start of each shift. Not required with vacuum (1 point)			
Condition all fins slivers and burred or sharp edges per ASTM A6. Re blast to 1.5 to 3.5 mil profile, unless conditioned area is less than one square foot per main member (1 point)			
Repair procedures, QA Inspection : Hold point sixteen (16), Required for all Fabricators.QCFS acceptance by documentation of listed data for each repaired member and dates.			
QCSF documentation describing problem and proposed repair method. (1 point)			
QA /OSE acceptance of proposed repair methods (1 point)			

Appendix II

Fabricator follows repair methods (2 points)			
NDT acceptance by QCSF and QA/OSE (2 points)			
Contractor acceptance and OSE received Shop drawings revised to show as built condition (1 point)			
Final Shop, Shipping or Storage, QA Inspection: hold Point seventeen (17), Required for all Fabricators. QCFS presents member and required QCSF documentaion from check points 1 thru 16 for QA acceptance.			

NA = Not Applicable, No partial points are available for a Yes, No or NA answer

Sum of {Y/(Y + N) x Section %}

Check Point 1_____(Y) / _____(Y + N) X 12 = _____
Check Point 2 _____(Y) / _____(Y + N) X 1 = _____
Check Point 3 _____(Y) / _____(Y + N) X 1 = _____
Check Point 4 _____(Y) / _____(Y + N) X 1 = _____
Check Point 5_____(Y) / _____(Y + N) X 12 = _____
Check Point 6_____(Y) / _____(Y + N) X 15 = _____
Check Point 7_____(Y) / _____(Y + N) X 12 = _____
Check Point 8_____(Y) / _____(Y + N) X 6 = _____
Check Point 9 _____(Y) / _____(Y + N) X 1 = _____
Check Point 10_____(Y) / _____(Y + N) X 1 = _____
Check Point 11_____(Y) / _____(Y + N) X 8 = _____
Check Point 12_____(Y) / _____(Y + N) X 9 = _____
Check Point 13_____(Y) / _____(Y + N) X 4 = _____
Check Point 14_____(Y) / _____(Y + N) X 4 = _____
Check Point 15_____(Y) / _____(Y + N) X 1 = _____
Check Point 16_____(Y) / _____(Y + N) X 12 = _____

Summation Fabricator rating for performance of QA Inspection = _____

Required Hold or Witness points
A Rating hold points = 7, 16 and 17
B Rating hold points = 6, 7, 16 and 17
C Rating hold or witness points = 6, 7, 11, 14, 16 and 17

Appendix II

FABRICATOR_____ RATING FOR SHOP FABRICATION LEVEL 6 (FCM)

Project: _____ Bid Line No.:_____Shop ID:_____

Rater/Date_____ Reviewer/Date _____

Check, Hold or Witness Point Descriptions for Level of Fabrication 6 , Fracture Critical Members (FCM)	**Yes**	**No**	**NA**
ASTM A709, Grade, Physical & Chemical Requirements, CVN : Check point One (1) QCFS acceptance by cover letter listing piece marks and dates			
Heat number and member description (1 point)			
Yield Strength, Fy (psi) (3 points)			
Tensile Strength, Fu (psi) (3 points)			
Elongation % and gage length (2 points)			
Material killed fine-grain practice (AWS 12.4.2) (5 point)			
Zone 2 CVN minimum average energy (A709 Table S1.3) (2 point)			
CVN impact testing "P" plate frequency (5 point)			
Chemical Requirements (1 point)			
Heat No. Steel Stamped and matched to Mill Test Report per 863.10 prior to release or painting (1 point)			
ASTM A6 Quality and permissible Variations: Check Point Two (2) QCFS acceptance by cover letter listing piece marks and dates.			
ASTM A6, Permissible variations in cross-section (1 point)			
ASTM A6, Permissible variations in Straightness & Storage (1 point)			
ASTM A6 and 863.11, Surface indications, Pitting due to rusting (1 point)			
ASTM A6, Laminar indications (1 point)			
Material Preparation per AWS D1.5, AASHTO and 863: Check Point Three (3) QCSF acceptance by cover letter listing piece marks and dates			
Cutting beyond (inside) the prescribed lines AWS 3.2.2 (1 point)			
Cutting roughness AWS 3.2.2 (1 point)			
Occasional notches AWS 3.2.2 (1 point)			
Cut Edge Discontinuities AWS 3.2.3 (1 point)			
Reentrant corners AWS 3.2.4 and Radii of Beam copes 3.2.5 (1 point)			
Rounding of edges AWS 3.2.9 (1 point)			

Shearing distortion 863.13 (1 point)			
Heat Bending , 90 degrees to rolling direction, visual inspection (document any cracking NDT required) AASHTO and AWS 12.12 (5 point)			
Cambering and Sweep per 863.12, AWS and AASHTO: Check Point Four (4) QCFS acceptance by cover letter listing piece marks and dates			
Cambering or Straightening, AASHTO and AWS 12.12 shop procedure posted (2 points)			
1150 degrees F pyrometric sticks (follow shop procedure) (5 points)			
location and shape of heats (follow shop procedure) (1 point)			
location and number of support blocks (follow shop procedure) (1 point)			
Natural Cooling (follow shop procedure) (5 point)			
Straightness and camber are per 863.12 (5 points)			
Flange and Web Butt Splice, Web-to-Flange CJP Welding per AWS, 863.23 and AASHTO: Hold and Witness Point Five (5) QCFS acceptance by witnessing, frequent audits and documentation of listed data for each splice and dates			
Size, grade, piece mark and location of parts to be fitted (1 point)			
Clean scale, moisture, grease & foreign material per AWS 3.2.1 (1 point)			
Groove weld fit up tolerance, AWS 3.3 (1 point)			
Shop Welding Procedure (WPS) identification and ODOT approval date. (5 point)			
Tackers Name and SS#, ODOT Qualified, procedure (2 point)			
Welders Name and SS#, ODOT Qualified, procedure (3 point)			
Flux and Wire combination, does it match WPS (2 point) Are Flux and Wire lot tested Check Temperature of Flux oven			
Joint geometry tolerances per AWS figure 2.4 (2 point) witness			
Preheat Temperature (F) and shop temperature(F) (3 point) witness			
Amperage (Amps), Voltage(Volts), Travel Speed(F) (3 point) witness			
Backgouge and cleaning per AWS 3.2.6 (3 point) witness			
Visual inspection width, thickness AWS 3.6.3 (5 point) witness			
Visual inspection surface finish AWS 3.6.4 125 uin. (5 point) witness			
Radiographic Inspection per AWS, 863.27 and AASHTO: Check Point Six (6) Hold point QCFS acceptance by cover letter listing piece marks, dates and with technician's reports.			

Radiographic inspection 100% flange butt welds and back up bars splices(ODOT review required, Critical process, Document separately) (5 point)			
Radiographic inspection web butt welds, top & bottom 1/3 (ODOT review required, Critical process ,Document separately) (5 point)			
Radiographic inspection100% longitudinal stiffeners butt welds (ODOT review required, Critical process, Document separately) (5 point)			
Radiographic inspection 25% longitudinal web splice(ODOT review required, Critical process, Document separately) (5 point)			
Radiographic identification marked steel stamped and visible in radiographic film, Hole-type image quality indicator (1 point)			
Top and bottom of plate edges visible in the radiographic film (5 point)			
Removal of weld reinforcement (1 point)			
Radiographic technician's signed analysis report (1 point)			
Ultrasonic Inspection per AWS, 863.27 and AASHTO: Check point Seven (7) Hold and witness point QCFS acceptance by cover letter listing piece marks, dates and with technicians reports			
Ultrasonic inspection 100% of complete penetration butt welds in FCM tension or reversal of stress flanges or back up bars. (ODOT review required, Critical Process, 100% QA witness (5 point)			
Ultrasonic inspection 25% of complete penetration butt welds in FCM compression flange or back up bar.(ODOT review required, Critical Process, 100% QA witness (2 point)			
Ultrasonic inspection 25% of complete penetration T or corner joints FCM subject to compression or shear. (ODOT review required, Critical Process, 100% QA witness (2 point)			
Ultrasonic inspection 100% of complete penetration T or corner joints FCM subject to tension or reversal of stress (ODOT review required, Critical Process, 100% QA witness (5 point)			
Ultrasonic technician's signed analysis report (1 point)			
Ultrasonic equipment qualification per AWS 6.17 (1 point)			
Repair procedure per AWS 12.17 hold and witness point Eight (8) QCFS acceptance by witnessing, frequent audits and documentation of listed data for each splice and dates			
Sketch of discontinuity with member piece mark and location on member (1 point)			
QA witness of discontinuity for determination of critical or non critical repairs (2 point)			
Noncritical repair, WPS and repair procedure pre approved (1 point)			

Critical repair, WPS and repair procedure approved for each repair by OSE (2 point)			
Welders Name and SS#, ODOT Qualified last 6 months or annual renewal (1 point)			
Preheat temperature prior to air carbon arc (1 point) witness*			
Grind surfaces to be welded smooth and bright (1 point) witness*			
Flux and Wire combination, does it match WPS (1 point) Are Flux and Wire lot tested, Check Temperature of Flux oven			
Joint geometry tolerances per AWS figure 2.4 (2 point) witness*			
Preheat Temperature (F) and shop temperature (F) (1 point) witness*			
Amperage (Amps), Voltage (Volts) and Travel Speed (IPM) (1 point) witness*			
Visual inspection width, thickness AWS 3.6.3 (2 point) witness*			
Visual inspection surface finish AWS 3.6.4 125 uin. (2 point) witness*			
Visual inspection weld size and profile, AWS 3.6 (2 point) witness*			
Non destructive testing as specified by repair procedure(5 points) witness*			
* witness required for critical repairs not required for non critical repairs			
Flange to Web Fillet Welds per AWS, 863 and AASHTO: Hold and witness Point nine(9),QCFS acceptance by witnessing, frequent audits and documentation of listed data for each splice and dates			
Size, grade, piece mark and locations of parts to be fitted (1 point)			
Clean scale, moisture, grease & foreign material per AWS 3.2.1 (1 point)			
Standard fillet weld fit up tolerance, 1/16" AWS 3.3.1 (1 point)			
Welding Procedure (WPS) identification and ODOT approval date (5 point)			
Tackers Name and SS#, ODOT Qualified, procedure (2 points)			
Welder Name and SS#, ODOT Qualified, procedure (3 points)			
Flux and Wire combination, does it match WPS Are Flux and Wire lot tested Check temperature of flux oven (2 points)			
Preheat Temperature (F) and shop temperature (1 point) witness			
Amperage (Amps)Voltage (Volts (1 point) Travel Speed (IMP) (5 points) witness			
Visual inspection weld size and profile, AWS 3.6 (5 point) witness			

Stiffener fitting per AWS, 863 and AASHTO: Check Point Ten(10) QCFS acceptance by frequent audits, documentation of listed data for each member and dates			
Bearing Stiffener, mill fit @ bearing, tight fit @ other end, 863.14 (1 point)			
Intermediate Stiffener without cross frames, tight fit at tension flange 863.14 (1 point)			
Connection stiffener weld fit at both flanges 863.14 (1 point)			
Clearance between clipped stiffener corners and fillets on rolled beams (1 point)			
Stiffener fillet welds per AWS, 863 and AASHTO: Hold and witness Point Eleven (11)QCFS acceptance by frequent audits, documentation of listed data for each member and dates			
Size, grade, piece mark and location of parts to be welded (1 point)			
Clean scale, moisture, grease & foreign material per AWS 3.2.21 (1 point)			
Standard fillet weld fit up tolerance 1/16" AWS 3.3 (1 point)			
Welding Procedure (WPS) identification and ODOT approval date (5 point)			
Tackers Name and SS#, ODOT Qualified, procedure (1 point)			
Welder Name and SS#, ODOT Qualified, procedure (3 point)			
Flux and Wire combination, does it match WPS (1 point) Are Flux and Wire lot tested Check temperature of flux oven			
Record Preheat Temperature(F) and shop temperature(F) (2 point) witness			
Amperage (Amps),Voltage(Volts), Travel Speed (IMP) (3 point) witness			
Visual inspection weld size and profile, AWS 3.6 (5 point) witness			
Magnetic Particle Inspection per AWS, 863 and AASHTO: Check Point twelve (12), Hold and witness for C rated fabricators. QCFS acceptance by cover letter listing piece marks, dates and with technicians reports			
Magnetic Particle Inspection 10% of flange to web welds and girder ends after trimming (ODOT review required, Critical Process, Document separately) Dry powder prod method or probe (2 point) 100% QA witness.			
Magnetic Particle Inspection 10% of Bearing Stiffener Welds (ODOT review required, Critical process, Document separately) Dry powder prod or probe method (2 point). 100% QA witness..			
Magnetic Particle technician's signed analysis report (1 point)			
Calibration of Magnetic Particle Equipment every 6 months (1 point)			

Shop Laydown per AWS, 863, and AASHTO: Check Point thirteen(13) QCFS acceptance by frequent audits, documentation of listed data for each member and dates			
Hole patterns, size, spacing, gage, accuracy, 863.20 (2 point)			
Hole de-burring, 863.20 (1 point)			
Blocking horizontal & vertical dimensions @ bearings, after all welding is complete. (document) 1/8" + or - 863.12 (document separately) (5 point)			
Blocking camber dimensions @ points specified, after all welding is complete 863.12 (document separately) (5 point)			
Horizontal curvature of curved members, after all welding is complete 1/8"/10'-0" AWS 3.5.1.4 (document separately) (2 point)			
Fit up at bolted splice, 1/4" max gap 863.17 (2 point)			
Center to center of bearings matches plan dimensions (1 point)			
Flatness at bearing seats, after all welding is complete AWS 3.5.1.9 (2 point)			
Cleaning per 863.27, SSPC and ASTM: Check Point fourteen(14)acceptance by documentation of listed data for each member and dates			
Shop solvent cleaning per SSPC-SP1 where necessary (5 point)			
Shop grinding edges 1/16", material thicker than 1 ½" shall be checked for removal of the heat effected zone. (1 point)			
Shop blast cleaned SSPC-SP10, Automated process: Five(5) each recorded readings at random locations on one member for 20% of the main members or one beam for each shift (which ever is greater) and One(1) recorded reading for 10% of all secondary material with replica tape ASTM D4417 method C, 1.5 to 3.5 mil profile (10 point)			
Shop blast cleaned SSPC-SP10, Manual process: five (5) each recorded readings at random locations for each main member and One(1) recorded reading for 25% of all secondary material with replica tape ASTM D4417 method C, 1.5 to 3.5 mil profile (10 point)			
Steel ambient (dry bulb) and wet bulb temperatures, humidity and dew point recorded prior to blasting and at the start of each shift (5 degree F above dew point). (2 point)			
Abrasive produces angular profile (1 point)			
Abrasive mix for oil contamination start of each shift (1 point)			
Removal of abrasives & residue by vacuum or double blowing (5 point)			
Test blow air for oil or other contaminants. Blotter test for 30 seconds at the start of each shift. Not required with vacuum (1 point)			

Conditioning all fins slivers and burred or sharp edges ASTM A6 then reblast to 1.5 to 3.5 mil profile, unless condition is less than one square foot per each side of the main member. (1 point)			
Painting per 863, SSPC and ASTM: Hold or Check Point fifteen(15)QCFS acceptance by documentation of listed data for each member and dates.			
Time and dates between blasting and painting (1 point)			
Ambient temperature & humidity (minimum 40 deg.F and 5 deg F above dew point) (1 point)			
Temperature of paint storage location (max/ min) (1 point)			
Paint TE-24, manufactures name and lot numbers (1 point)			
Painter mixes paint (high shear mixer) and strain (5 point)			
Painter is checking operation of automated agitation system with every new paint batch (5 point)			
Prime inside of bolt holes, behind stiffener clips (5 point)			
Prime thickness 3 to 5 mils: 3 gage readings for each spot measurement with 5 spot measurements in each 100 square foot (see additional instructions with paint system notes) (10 point)			
Workman like finish; mud cracking, holidays, pores, runs or sags. (5 point)			
Prime has dried sufficiently prior to handling (1 point)			
Cleaning ASTM A709 Grade 50W steel (A588) Check point sixteen (16). QCFS acceptance by documentation of listed data for each member and dates.			
Shop solvent cleaning per SSPC-SP1 where necessary (5 point)			
Shop grinding edges 1/16"(1 point)			
Shop blast fascia members cleaned SSPC-SP6 achieved			
Abrasive mix for oil contamination start of each shift (1 point)			
Removal of abrasives & residue by vacuum or double blowing (1 point)			
Test blow air for oil or other contaminants. Blotter test for 30 seconds at the start of each shift. Not required with vacuum (1 point)			
Condition all fins slivers and burred or sharp edges per ASTM A6. Re blast to 1.5 to 3.5 mil profile, unless conditioned area is less than one square foot per main member (1 point)			
Repair procedures, QA Inspection : Hold point seventeen (17), Required for all Fabricators.QCFS acceptance by documentation of listed data for each repaired member and dates.			

QCSF documentation describing problem and proposed repair method. (1 point)			
QA /OSE acceptance of proposed repair methods (1 point)			
Fabricator follows repair methods (2 points)			
NDT acceptance by QCSF and QA/OSE (2 points)			
Contractor acceptance and OSE received Shop drawings revised to show as built conditions (1 point)			
Final Shop, Shipping or Storage, QA Inspection: hold Point Eighteen (18), Required for all Fabricators. QCFS presents member and required QCSF documentation from check points 1 thru 17 for QA acceptance.			

Y = Yes, N = No, NA = Not Applicable, No partial points are available for a Y, N or NA answer

Sum of {Y/(Y + N) x Section %}

Check Point 1 _____(Y) / _____(Y + N) X 7 = _____
Check Point 2 _____(Y) / _____(Y + N) X 2 = _____
Check Point 3 _____(Y) / _____(Y + N) X 5 = _____
Check Point 4 _____(Y) / _____(Y + N) X 2 = _____
Check Point 5 _____(Y) / _____(Y + N) X 15 = _____
Check Point 6 _____(Y) / _____(Y + N) X 15 = _____
Check Point 7 _____(Y) / _____(Y + N) X 15 = _____
Check Point 8 _____(Y) / _____(Y + N) X 15 = _____
Check Point 9 _____(Y) / _____(Y + N) X 7 = _____
Check Point 10_____(Y) / _____(Y + N) X 2 = _____
Check Point 11_____(Y) / _____(Y + N) X 7 = _____
Check Point 12_____(Y) / _____(Y + N) X 15 = _____
Check Point 13_____(Y) / _____(Y + N) X 7 = _____
Check Point 14_____(Y) / _____(Y + N) X 7 = _____
Check Point 15_____(Y) / _____(Y + N) X 7 = _____
Check Point 16_____(Y) / _____(Y + N) X 7 = _____
Check Point 17_____(Y) / _____(Y + N) X 7 = _____

Summation Fabricator rating for performance of QA Inspection = _____

Required Hold or witness points = 5, 6, 7, 8, 9, 11, 12, 17 and 18

A Rating witness points require QC / QA inspection for 10 % of the work in progress.
B Rating witness points require QC / QA inspection for 25 % of the work in progress.
C Rating witness points require QC / QA inspection for 50 % of the work in progress.

Appendix III

Fabricator Rating: Summation of Appendix II check lists

Fabricator Rating For Performance Of Shop Drawings _____ x 20% = _____

Fabricator Rating For Performance Of Test Reports _____ x 20% = _____

Fabricator Rating For Performance Of Shop Fabrication _____ x 60% = _____

Fabricator Rating = _____

Fabricator Rating District's Construction Comments

Designer's Note

The selected bid item for 513 should be based on a comparison of the type of structure to be built versus the capability of the level of fabricator as defined in section 863.04. As example a continuous rolled beam bridge with no stiffeners would require a level 2 fabricator. If the rolled beam bridge had stiffeners required to attach cross frames then a level 3 fabricator would be specified.

A supplemental description should be added defining the type of steel

i.e.
863 Lump Sum Structural Steel Members, Level Four (4), A 709, grade 36

For bridges with fracture critical members or fracture critical bridges a level 6 is required (See Section 863.04)

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 910
OZEU STRUCTURAL STEEL PAINT

July 11, 2000

910.01 Description
910.02 Organic Zinc Prime Coat
910.03 Epoxy Intermediate Coat
910.04 Urethane Finish Coat
910.05 Performance Requirements
910.06 Prequalification
910.07 Sampling

910.01 Description. This specification covers the formulation and testing of a three coat structural steel paint system consisting of an organic zinc prime coat, an epoxy intermediate coat and a urethane finish coat (OZEU). Material requirements for the respective coats shall be as follows.

910.02 Organic Zinc Prime Coat. The organic zinc prime coat shall consist of a zinc dust filled, two or three-component epoxy polyamide, and selected additives as required:

A. Physical Requirements.

	Minimum
Total Solids, % by weight of paint, ASTM D 2369	70
Pigment, % by weight of total solids, ASTM D 2371	83
Total zinc dust, % by weight of pigment	93
Total zinc, % by weight, of total solids, by calculation	77
Total solids, % by volume, ASTM D 2697	45
Color, greenish gray, approximating FS-595B-34159, Visual comparison	
Pot Life at 77° F (25° C) and 50% Relative Humidity (R.H.), hours	6

By observation of Ford B cup viscosity, pot life is deemed exceeded if the viscosity rose more than 30 percent or if gelled particles appear in the mix. A one quart (one liter) container of mixed material is used.

B. Qualitative Requirements.

Mixing shall conform to Section 5.2, SSPC-Paint 20 using only a high shear (Jiffy) mixer.
Storage life - Section 5.4, SSPC-Paint 20
Mudcracking - Section 5.7, SSPC-Paint 20

C. Material Quality Assurance : Analysis for each component.

1. Three-component systems.
   a. Resin

Nonvolatiles, % by weight	± 2
Density	± 0.2 lb per gal (± 0.02 g/mL)
Viscosity	± 5 KU or ± 5 sec., Ford Cup

   b. Hardener

Nonvolatiles, % by weight	± 2
Density	± 0.2 lb per gal (± 0.02 g/mL)
Viscosity	± 5 KU or ± 5 sec., Ford Cup

   c. Zinc

Total Zinc metal, % by weight	± 2

2. Two-component systems.
   a. Zinc/Resin Component

Total Zinc metal, % by weight	± 2
Density	± 2%
Viscosity	Dependent on test
Nonvolatiles, % by weight	± 2

   b. Hardener Component — Variance*

Nonvolatiles, % by weight	± 2
Density	± 0.2 lb per gal (± 0.02 g/mL)
Viscosity	± 5 KU or ± 5 sec., Ford Cup

* Variance within the mean of the tests of the previously submitted sample for qualification.

910.03 Epoxy Intermediate Coat. The epoxy intermediate coat shall be a two-part product composed of a base component and a curing agent suitable for application over the epoxy-polyamide zinc rich primer.

The base component shall contain an epoxy resin together with color pigments, mineral fillers, gellant, leveling agent, and volatile solvents. The curing agent component shall contain a liquid polyamide resin and volatile solvent. The coating shall also meet the following:

A. Physical Requirements

1. Color: White, meeting or exceeding, FS-595B-37875 as per ASTM E 1347
2. Components: Two, mixed prior to application
3. Volume solids, ASTM D 2697: 50.0% minimum

4. Pot life: 6 hours, minimum @ 77° F (25°C)
   By observation of Ford B cup viscosity, pot life is deemed exceeded if the viscosity rose more than 30 percent or if gelled particles appear in the mix. A one liter (quart) container of mixed material is used.
5. Curing Time:
   a. Set-to-touch, ASTM D 1640: 4 hours Maximum @ 77°F (25°C)
   b. Dry To recoat, ASTM D 1640: 24 hours Maximum @ 77°F (25°C)
   c. Full cure: 7 days @ 50°F (10°C), Maximum
      No pick-up when rubbed with a cloth soaked in Methyl Ethyl Ketone
6. Fineness of Grind, ASTM D 1210: Hegman 3 minimum
7. Volatile Organic Compounds, maximum, ASTM D 3960:
   3.5 lbs/gal (0.419 g/mL), as applied.

B. Material Quality Assurance for each component.

TEST	VARIANCE*
Density	± 2%
Viscosity	Dependent on test
Total Solids, % by weight	± 2
Pigment, % by weight	± 2
Nonvolatile Vehicle, % by weight	± 2

*Variance shall be within the noted range based upon the test average of the previously submitted sample.

910.04 Urethane Finish Coat. The urethane finish coat shall be a two-component polyester and/or acrylic aliphatic urethane and shall be suitable for use as a finish coat over the white epoxy polyamide intermediate coat.

A. Physical Requirements.

1. Finish: Specular Gloss, 60 degree, ASTM D 523: 85% minimum;
   70% minimum after 3000 hours weathering resistance
2. Volume Solids, ASTM D 2697: 42% minimum
3. Cure (Dry) Time at 77°F (25°C) and 50% RH
   Set to touch ASTM D 1640: 30 Minutes, minimum
   4 Hours, maximum
4. Pot Life: 4 hours minimum at 77°F (25°C)
   By observation of Ford B cup viscosity, pot life is deemed exceeded if the viscosity rose more than 30% or if gelled particles appear in the mix. A one liter (quart) container of mixed material is used.
5. Volatile Organic Compounds, ASTM D 3960: maximum, 0.419 g/mL
   (3.5 lbs./gal.), as applied.
6. Colors**

Brown FS-595B	10324
Green FS-595B	14277
Blue FS-595B	15526

**Contractor's choice unless specified on plans.

B. Material Quality Assurance: Analysis for each component.

TEST	VARIANCE*
Density	± 2%
Viscosity,	Dependent on test
Total Solids, by Weight	± 2%
Pigment, by Weight	± 2%
Nonvolatile Vehicle, by weight	± 2%

*Variance shall be within the noted range based upon the test average of the previously submitted sample.

910.05 Performance Requirements. The coating system, which consists of the organic zinc prime coat, the epoxy intermediate coat, and the urethane topcoat, shall be tested prior to use.

Three panels for each of the specified tests shall be prepared to the requirements of the ASTM D 609 except that the thickness shall be 1/8 inch (3 mm) minimum and the steel shall be ASTM A 36/A 36 M hot rolled steel. The surface shall be blast cleaned (using coal slag abrasive) to equal, as nearly as is practical, the standard Sa 2-1/2 of ASTM D 2200 (Steel Structures Painting Council SSPC-SP10 meets this requirement), and the surface shall have a nominal height of profile of 1 to 3.5 mils (25 to 88 μm) verified by using appropriate replica tape. The panels shall be coated and permitted to cure in accordance with the manufacturer's printed instructions. The dry film coating thickness in the system to be tested shall be as follows:

Organic Zinc:	3.0 - 5.0 mils (75 - 125 μm)
Epoxy:	5.0 - 7.0 mils (125 - 175 μm)
Urethane:	2.0 - 4.0 mils (50 - 100 μm)

The coating system shall pass each of the following tests:

A. Fresh water resistance test (ASTM D 870). The panels shall be scribed as per ASTM D 1654 to the depth of the base metal in the form of an "X" having at least 2-inxh (50 mm) legs and then immersed in fresh tap water at (75 ± 5°F) (25 ± 3°C). After 30 days of immersion, the panels shall show no rusting nor shall the coating show any blistering, softening or discoloration. Blistering shall be rated by ASTM D 714.

B. Salt water resistance test (ASTM D 870). The panel shall be scribed as specified in "A" above and then immersed in a water solution of 5 percent sodium chloride at (75 ± 5ºF) (25 ± 3ºC). The panels shall show no rust nor shall the coating exhibit any blistering or softening after 7, 14, and 30 days. Blistering shall be rated by ASTM D 714. The sodium chloride solution shall be replaced with a fresh solution after examination at 7 and 14 days.

C. Weathering resistance test. The panels shall be tested in accordance with ASTM D 4587 Method D, utilizing Ultra Violet A 340 bulbs. The panels shall be placed on test at the beginning of a wet cycle. After 3000 hours continuous exposure, the coating shall show no blistering or loss of adhesion, nor shall the panels show any rusting. The 60 degree specular gloss measurements shall be performed on the sprayed panels utilized for this test. The three initial measurements (one per panel) will be average together. The three final measurements also will be averaged together.

D. Salt fog resistance test. The panels shall be scribed as specified in "A" above, and then tested in accordance with ASTM B 117. After 3000 hours of continuous exposure the coating shall show no loss of bond nor shall it show rusting or blistering beyond 2 mm (1/16 inch) form the center of the scribe mark. Blistering shall be rated by ASTM D 714.

E. Elcometer adhesion test, ASTM D 4541. The panels shall be tested in accordance with the following: lightly sand the coating surface and aluminum dolly and apply a quick set adhesive. Allow adhesive to cure overnight. Scribe the coating and adhesive around the dolly prior to testing. Make a minimum of four trials to failure and report the four trials. No trial shall be less than 400 psi (2.8 MPa). Fracture at the primer-blast interface shall be caused for rejection.

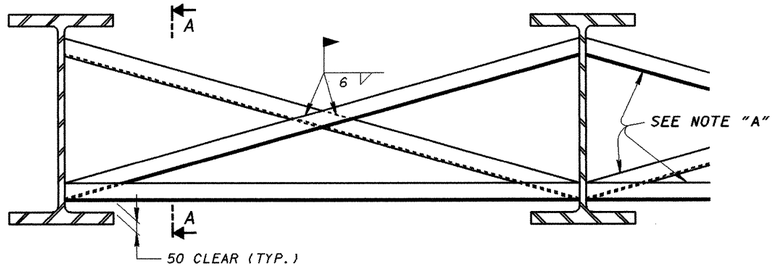
910.06 Prequalification. Prior to approval, copies of the manufacturer's certified test data showing that the coating system complies with the performance requirements of this specification shall be submitted to the Engineer of Tests, 1600 W. Broad St., Columbus, Ohio 44223. The certified test data shall also state the following physical properties for each coating: Density, g/mL (lbs. per gal.); Solids, % by weight; Solids, % by volume; Viscosity; Drying time; Volatile Organic Compounds content, g/mL (lb. per gallon).

The test data shall be developed by an independent testing laboratory approved by the Lab and shall include the brand name of the paint, name of manufacturer, number of lots tested, and date of manufacture.

The following items shall also be submitted to the Lab prior to approval: manufacturer's technical data sheet for each coating; material Safety Data Sheet for each coating; enough components to produce a 4 liter (one gallon) sample of each coating; and, a one liter (one quart) sample of the thinner to be used with each coating.

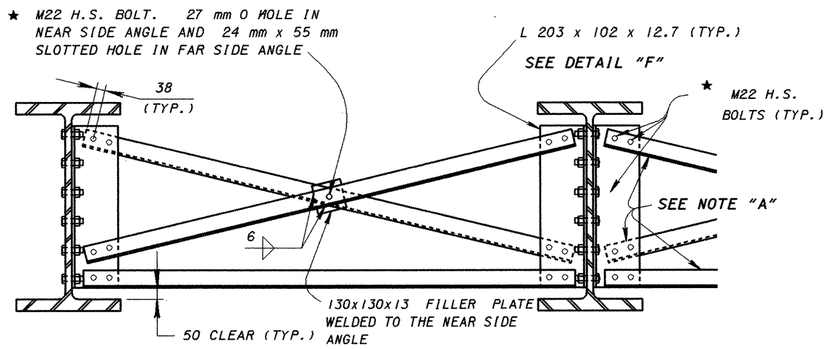
When the coating has been approved by the Director, further performance testing by the manufacturer will not be required unless the formulation or manufacturing process has been changed, in which case new certified test results will be required.

910.07 Sampling. Acceptance variances shall be established by the Laboratory.



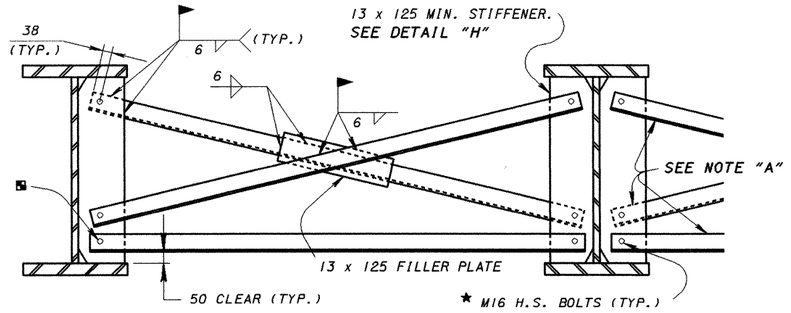
TYPE 1: INTERMEDIATE WELDED CROSSFRAME DETAILS

FOR ROLLED BEAM BRIDGES
AASHTO CASE II



TYPE 2: INTERMEDIATE BOLTED CROSSFRAME DETAILS

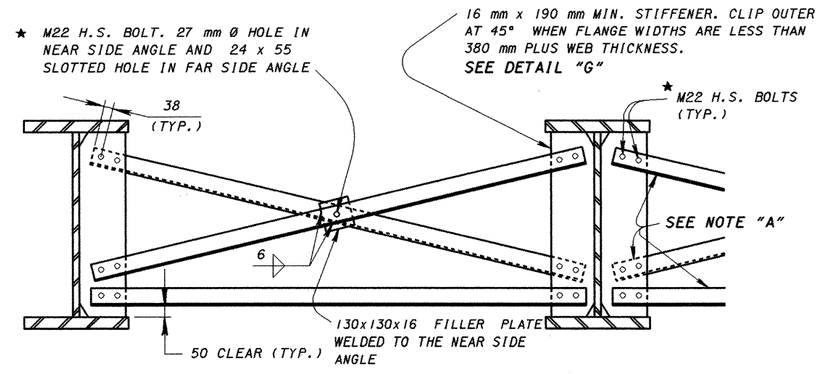
FOR ROLLED BEAM BRIDGES
AASHTO CASE I OR CASE II



TYPE 3 INTERMEDIATE WELDED CROSSFRAME DETAILS

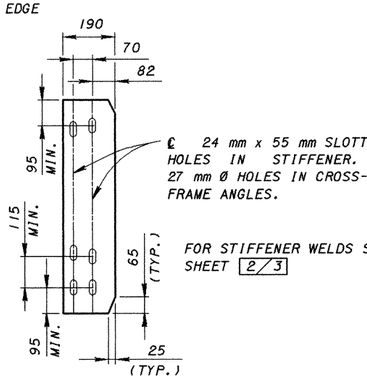
FOR GIRDER BRIDGES AND AASHTO CASE I ROLLED BEAM BRIDGES

CROSSFRAME ANGLE SIZE	
DEPTH OF BEAM/GIRDER	MINIMUM SIZE ANGLE
D < 1250 mm	76x76x7.9
1200 mm < D < 1350 mm	89x89x9.5
1300 mm < D < 1550 mm	102x102x9.5

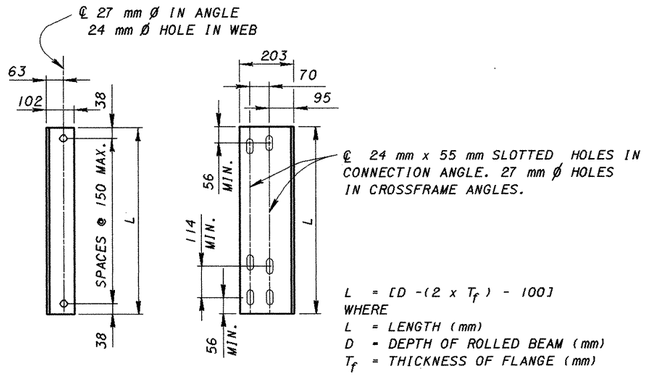


TYPE 4 INTERMEDIATE BOLTED CROSSFRAME DETAILS

FOR GIRDER BRIDGES AND AASHTO CASE I ROLLED BEAM BRIDGES



DETAIL "G"



DETAIL "F"

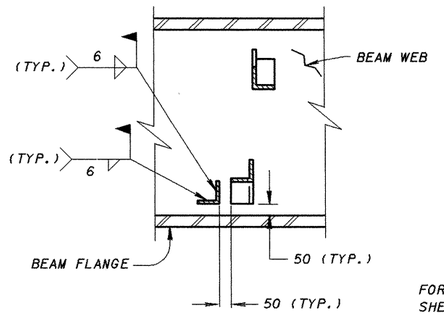
★ ALL BOLTS ARE A325M TYPE 1 GALVANIZED FOR A GALVANIZED OR PAINTED BRIDGE AND A325M TYPE 3 FOR A588M WEATHERING STEEL BRIDGE. EACH ANCHOR ASSEMBLY SHALL INCLUDE A BOLT, NUT AND TWO (2) WASHERS, TIGHTENED PER CMS SECTION 513.15.

THE FABRICATOR SHALL CHECK LONGITUDINAL CROSSFRAME SPACING SO THAT INTERFERENCE WITH BOLTED SPLICES, ANCHOR BOLTS, COMPLETE PENETRATION WEB OR FLANGE WELDED SPLICES AND BEARING STIFFENERS CAN BE AVOIDED. SPACING SHALL BE ADJUSTED TO PROVIDE AT LEAST 150 mm OF LONGITUDINAL CLEARANCE. THE FABRICATOR MAY ADJUST CROSS-FRAME SPACES UP TO A MAXIMUM OF 5000 mm CENTER TO CENTER UNLESS THE CONTRACT DRAWINGS PROVIDE A NOTED MAXIMUM.

FOR COMPLETELY SHOP PAINTED OR GALVANIZED SYSTEMS, A TYPE 2 OR TYPE 4 CROSSFRAME SHALL BE USED.

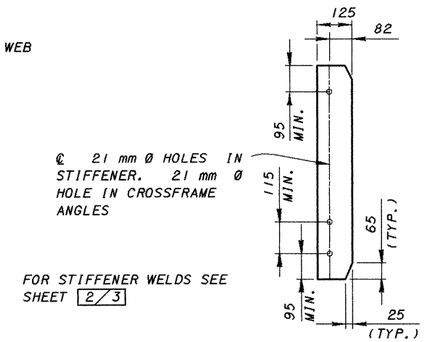
AT THE OPTION OF THE CONTRACTOR, TYPE 2 CROSSFRAME CAN BE USED IN LIEU OF TYPE 1 CROSSFRAME AND TYPE 4 CROSSFRAME CAN BE USED INSTEAD OF TYPE 3 CROSSFRAME.

■ AT SKEWED STRUCTURES THE NEED OF SLOTTED HOLES AT EACH CROSS FRAME LOCATION SHALL BE INVESTIGATED AND SPECIFIED ON THE PLANS AS REQUIRED.



SECTION A-A

NOTE "A"
MATCH CROSSFRAME LEGS TO EACH SIDE OF THE WEB, SEE CROSSFRAME ANGLE SIZE GUIDE TABLE FOR SIZES



DETAIL "H"

DESIGN AGENCY
OFFICE OF STRUCTURAL ENGINEERING

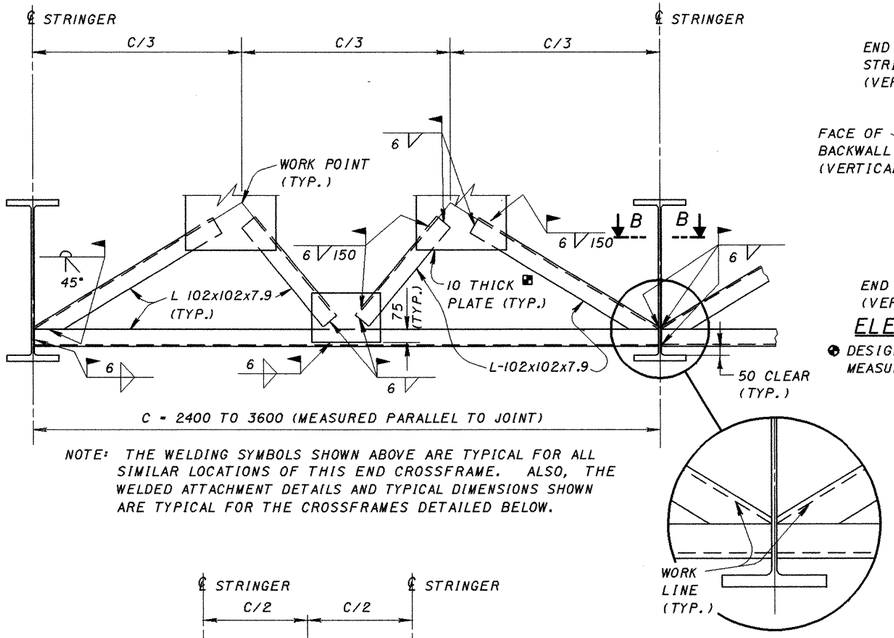
STATE OF OHIO DEPARTMENT OF TRANSPORTATION
Brad Farrell — ADMINISTRATOR
11-21-97 — DATE

REVISIONS	DESIGNED	DRAWN	CHECKED	REVIEWED
	JCR	BDB/FO	JS	WTL

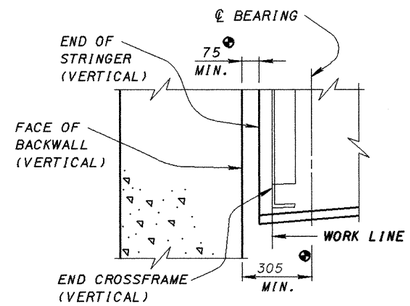
STANDARD
GENERAL STEEL DETAILS

GSD-1-96M

1/3



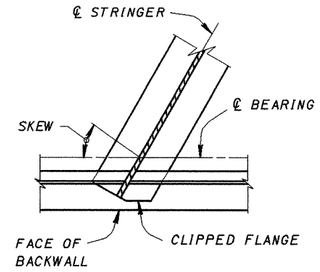
NOTE: THE WELDING SYMBOLS SHOWN ABOVE ARE TYPICAL FOR ALL SIMILAR LOCATIONS OF THIS END CROSSFRAME. ALSO, THE WELDED ATTACHMENT DETAILS AND TYPICAL DIMENSIONS SHOWN ARE TYPICAL FOR THE CROSSFRAMES DETAILED BELOW.



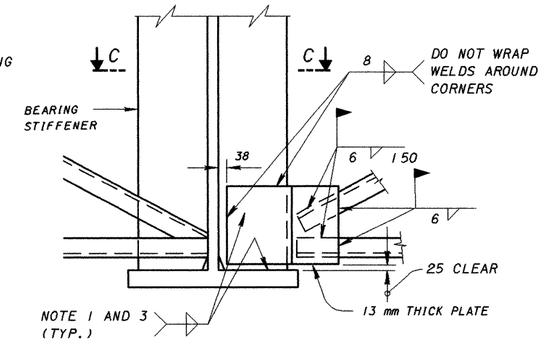
ELEVATION OF BEAM/GIRDER

◆ DESIGNER TO ESTABLISH DIMENSION REQUIRED, MEASURED NORMAL TO BACKWALL.

■ 10 THICK PLATE IS A PART OF THE EXPANSION JOINT SYSTEM. SEE EXPANSION JOINT STANDARD DRAWINGS FOR DETAILS.

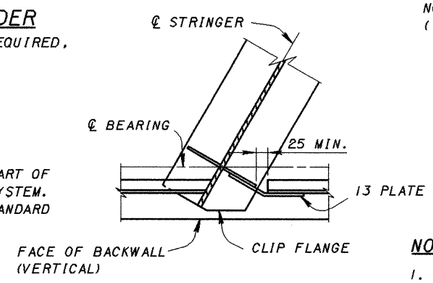


SECTION B-B

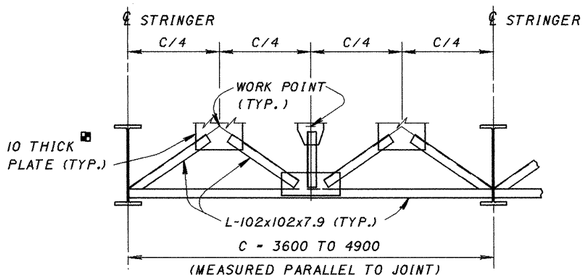


BEAM/GIRDER END

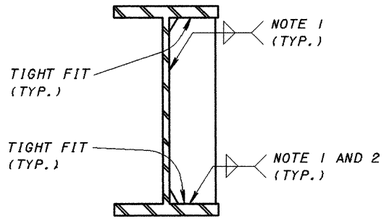
END CROSSFRAME FOR SKEWED BRIDGES WHERE BEARING STIFFENERS INTERFERE WITH END CROSSFRAMES.



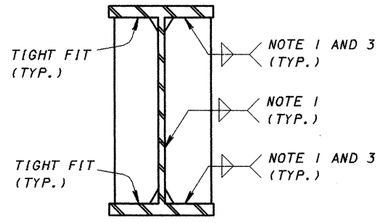
SECTION C-C



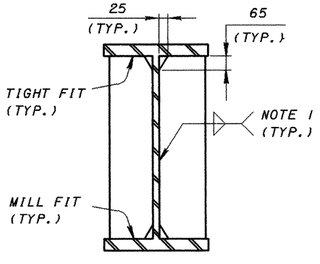
END CROSSFRAME DETAILS



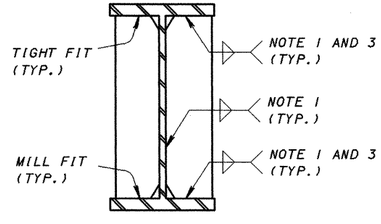
INTERMEDIATE STIFFENER



INTERMEDIATE STIFFENER WITH CROSSFRAMES



BEARING STIFFENER



BEARING STIFFENER WITH CROSSFRAMES

NOTES:

1. PROVIDE 6 mm WELD WHEN THE THICKER PLATE IS 19 mm OR LESS OR 8 mm WELD WHEN THE THICKER PLATE IS GREATER THAN 19 mm, UNLESS DESIGN REQUIRES LARGER WELDS (SEE CMS 513.17).
2. INTERMEDIATE STIFFENERS REQUIRE FILLET WELDS TO THE COMPRESSION FLANGE ONLY PER CMS 513.08.
3. STIFFENERS TO WHICH CROSS FRAMES CONNECT REQUIRE FILLET WELDS TO BOTH FLANGES PER CMS 513.08

BEARING STIFFENER: BEARING STIFFENER SHALL BE VERTICAL AFTER ERECTION.

WELDS: STIFFENER TO STRINGER WELDS SHALL BE TERMINATED AS GIVEN BELOW:

A. STIFFENER TO STRINGER FLANGE WELDS 6 mm ± 3 mm AT BOTH ENDS OF THE STIFFENER.
B. STIFFENER TO STRINGER WEB WELDS 13 mm ± 6 mm AT BOTH ENDS OF THE STIFFENER.

MILL FIT: THE BEARING ENDS OF THE BEARING STIFFENER SHALL BE FLUSH AND SQUARE WITH THE WEB AND SHALL HAVE AT LEAST 75 PERCENT OF THIS AREA IN CONTACT WITH THE INNER SURFACE OF THE FLANGE.

TIGHT FIT: A TIGHT FIT IS DEFINED AS ONE IN WHICH THE STIFFENER AND FLANGE ARE IN PHYSICAL CONTACT OVER SOME PORTION OF THE END OF THE STIFFENER AND HAVING NO GAP IN EXCESS OF 1.6 mm.

BEAM OR GIRDER ENDS: FOR STRUCTURES ON GRADE THE BEAM OR GIRDER ENDS SHALL BE CUT IN A MANNER THAT THEY ARE VERTICAL AFTER ERECTION. A 75 mm MINIMUM CLEARANCE AT 16°C SHALL BE MAINTAINED BETWEEN THE VERTICAL ENDS OF THE BEAMS OR GIRDERS AND THE VERTICAL FACE OF THE BACKWALL.

WORK POINTS: WORK POINTS SHALL BE COORDINATED BETWEEN EXPANSION JOINT AND STRUCTURAL STEEL SUPPLIERS TO ASSURE FIT UP AT ALL DESIGN LOCATIONS.

TRANSITION OF THICKNESS OR WIDTH AT BUTT JOINTS: REFER TO SECTION 9.20 OF THE AMERICAN WELDING SOCIETY (AWS) BRIDGE WELDING CODE AS AMENDED BY SUPPLEMENTAL SPECIFICATION 1011 WHICH PROVIDES TRANSITION DETAILS OF THICKNESSES AND WIDTHS AT COMPLETE PENETRATION BUTT JOINTS.

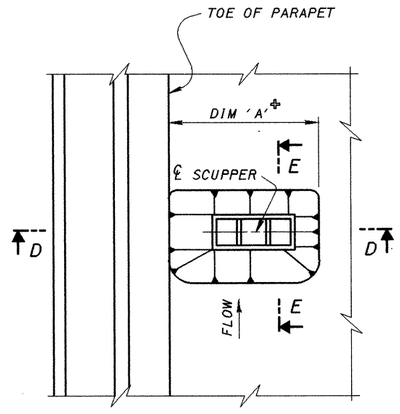
DESIGN AGENCY: OFFICE OF STRUCTURAL ENGINEERING

STATE OF OHIO DEPARTMENT OF TRANSPORTATION — 11-21-97 (DATE)
Brad Fogel — ADMINISTRATOR

STANDARD

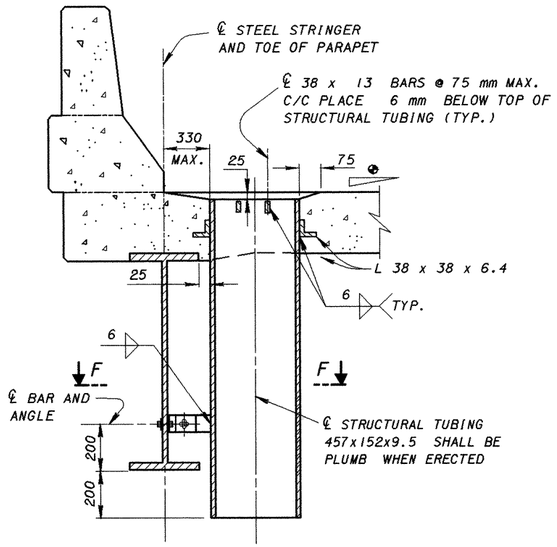
GENERAL STEEL DETAILS

REVISIONS	DESIGNED	CHECKED	REVIEWED
	JCR	JS	WTL
DRAWN BDB/FO			GSD-1-96M

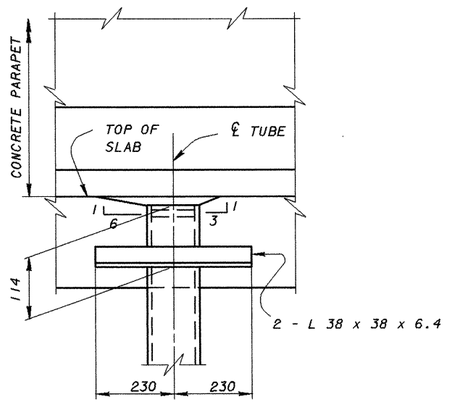


PLAN

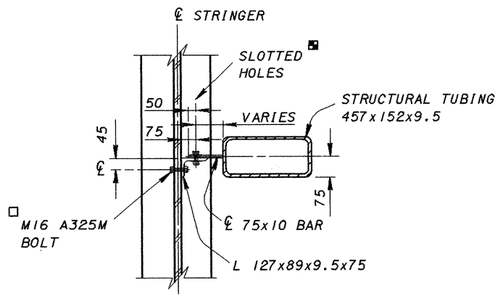
✣ DIMENSION 'A' SHALL NOT EXTEND BEYOND THE LIMITS OF THE SHOULDER (SHALL NOT FALL IN THE TRAFFIC LANE)



SECTION D-D



SECTION E-E



SECTION F-F

THE SCUPPERS SHALL BE LOCATED ON THE BRIDGE DECK BASED ON BRIDGE GEOMETRY AND THE CONTRIBUTING DECK DRAINAGE.

THE CONCRETE DECK, AT THE TWO SCUPPER CORNERS AWAY FROM THE CURB LINE, SHALL BE REINFORCED BY 900 mm LONG #13M BAR, ONE BAR AT EACH CORNER, ORIENTED AT 45° TO THE SCUPPER.

◔ SQUARE CUT TOP OF TUBE UNLESS DESIGNER SPECIFIES CROSS SLOPE GREATER THAN 13 mm PER 305 mm IN WHICH CASE THE TOP IS TO BE CUT PARALLEL TO THE CROSS SLOPE.

◘ SLOTTED HOLES SHALL BE 17 mm x 39 mm. THE SLOT SHALL BE HORIZONTAL IN THE 75 mm x 10 mm BAR AND VERTICAL IN THE ANGLE. USE A M16 A325M HIGH STRENGTH HEX HEAD BOLT WITH HEX NUT AND WASHERS, TIGHTEN AS PER CMS 513.15.

□ M16 A325M TYPE 1 GALVANIZED FOR A GALVANIZED OR PAINTED BRIDGE AND A325M TYPE 3 FOR A588M WEATHERING STEEL BRIDGE. EACH ASSEMBLY SHALL INCLUDE A BOLT, NUT AND TWO (2) WASHERS, TIGHTENED PER CMS SECTION 513.15. FOR A GALVANIZED BRIDGE SYSTEM PROVIDE A 88 mm x 88 mm x 3 mm PREFORMED BEARING PAD WITH A 20 mm Ø HOLE AS PER CMS 711.21 BETWEEN THE BEAM WEB AND THE ANGLE. FIELD DRILL 20 mm DIAMETER HOLE IN THE WEB AFTER THE DECK CONCRETE HAS BEEN POURED.

THE SUPPORT ANGLES, BARS, SUPPORT BOLTS AND RELATED HARDWARE ARE INCLUDED WITH SCUPPERS FOR PAYMENT.

SCUPPERS INCLUDING SUPPORT ANGLES, BARS, BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH CMS 711.02.

DESIGN AGENCY
OFFICE OF STRUCTURAL ENGINEERING

STATE OF OHIO DEPARTMENT OF TRANSPORTATION
Brad Fogwell — ADMINISTRATOR
11-21-97 — DATE

REVISIONS	DESIGNED	CHECKED	REVIEWED
	JCR	JS	WTL
	DRAWN JFF/FO		GSD-1-96M

STANDARD
GENERAL STEEL DETAILS

TEMPORARY SIGN SUPPORT REQUIREMENTS

A. PLACEMENT OF SIGNS WHICH WILL REMAIN MORE THAN ONE DAY:

1) LATERAL PLACEMENT TO NEAREST EDGE OF SIGNS SHALL BE AS FOLLOWS:

   a) ON THE RIGHT SIDE OF THE ROAD FOR APPROACHING TRAFFIC (EXCEPT FOR DUAL MOUNTED SIGNS AND SIGNS DESIGNATED IN THE PLANS FOR LEFT SIDE MOUNTING).

   b) CURBED ROADWAY - MINIMUM 0.6 m BEHIND FACE OF CURB.

   c) UNCURBED ROADWAY- 3.7 m FROM EDGE OF TRAFFIC LANE OR 1.8 m FROM EDGE OF PAVED OR USEABLE SHOULDER, WHICHEVER IS GREATER.

   d) BEHIND GUARDRAIL OR BARRIER - PREFERABLY 0.6 m BEHIND FACE OF GUARDRAIL (MINIMUM 0.3 m) FOR SIGNS ON CLASS A SUPPORTS: 1.2 m FOR CLASS B OR C SUPPORTS: 0.3 m BEHIND FACE OF CONCRETE BARRIER UNLESS BARRIER TOP MOUNTING IS REQUIRED BY THE PLAN.

2) VERTICAL CLEARANCE OF SIGNS, MEASURED ABOVE ROADWAY ELEVATION: SHALL BE AS FOLLOWS:

   a) RURAL - 1.5 m WHEN PARKED CARS, CONSTRUCTION EQUIPMENT, ETC WILL NOT OBSCURE SIGN VISIBILITY.

   b) RURAL AREAS WITH PARKED CARS OR CONSTRUCTION EQUIPMENT - 2.1 m

   c) URBAN - 2.1 m

   d) CARE SHALL BE TAKEN TO ASSURE THAT SIGNS WILL NOT BE OBSCURED BY CONSTRUCTION EQUIPMENT, TREES, WEEDS OR OTHER OBSTACLES. BRUSH, WEEDS OR GRASS WITHIN THE RIGHT OF WAY SHALL BE TRIMMED AS NECESSARY. SIGNS SHALL NORMALLY BE VISIBLE TO TRAFFIC 122 m TO 183 m IN ADVANCE OF THE SIGN.

3) SUPPORTS FOR SIGNS WHICH WILL REMAIN IN PLACE MORE THAN ONE DAY SHALL BE FIXED RATHER THAN PORTABLE EXCEPT IN SITUATIONS WHERE THE SIGN MUST REST ON PERMANENT PAVEMENT OR OTHER SURFACE WHICH WOULD BE DAMAGED BY INSERTION OF POST TYPE SUPPORTS.

B. PLACEMENT OF SIGNS WHICH WILL REMAIN FOR ONE DAY OR LESS:

1) SAME AS A-1 ABOVE EXCEPT THAT SIGNS MAY BE PLACED ON THE ROADWAY ONLY IF THEY DO NOT INTRUDE INTO A TRAFFIC LANE IN USE.

2) MINIMUM OF 0.3 m ABOVE ROADWAY

C. CLASSES OF SUPPORTS:

ALL TEMPORARY SIGN SUPPORTS SHALL BE OF THE FOLLOWING TYPES:

1) CLASS A:

SUPPORTS SHALL BE USED FOR EXPOSED LOCATIONS ON HIGHWAYS WHERE TRAFFIC APPROACH SPEEDS OF 40 MPH AND HIGHER ARE ENCOUNTERED. THEY ARE ALSO SUITABLE FOR USE IN ALL OTHER LOCATIONS.

2) CLASS B:

SUPPORTS SHALL BE USED FOR EXPOSED LOCATIONS ON HIGHWAYS WHERE TRAFFIC APPROACH SPEEDS OF LESS THAN 40 MPH ARE ENCOUNTERED. THEY ARE ALSO SUITABLE FOR USE IN ALL APPLICATIONS DEFINED FOR CLASS C SUPPORTS.

3) CLASS C:

SUPPORTS MAY ONLY BE USED WHERE FULLY PROTECTED BY GUARDRAIL, CONCRETE BARRIER AND IN LOCATIONS POSITIVELY PROTECTED FROM TRAFFIC SUCH AS ON RETAINING WALLS OR WHERE TRAFFIC APPROACH SPEEDS ARE LESS THAN 25 MPH.

D. TRAFFIC APPROACH SPEEDS:

TRAFFIC APPROACH SPEEDS SHALL BE THE LOCALLY POSTED SPEED (NOT ADVISORY SPEED SIGNS) OR THE MEASURED ACTUAL (85TH PERCENTILE) SPEED (IF AVAILABLE) OF APPROACHING TRAFFIC, WHICHEVER IS HIGHER, ADJACENT TO THE SIGN LOCATION.

TABLE

APPROACH SPEED (MPH)	COMPLETELY PROTECTED BY GUARDRAIL OR BARRIER	PARTLY PROTECTED BY GUARDRAIL OR BARRIER *	GREATER THAN 9 m FROM EDGE OF PAVEMENT	WITHIN 9 m FROM EDGE OF PAVEMENT
40 AND HIGHER	A, B OR C	A OR B	A OR B **	A ONLY
26 TO 39	A, B OR C	A OR B	A OR B	A OR B
0 TO 25	A, B OR C	A, B OR C	A, B OR C	A, B OR C

* IF SUPPORTS ARE BEHIND GUARDRAIL BUT NOT FULLY 1.7 m BEHIND FACE OF RAIL OR IF SIGN IS NOT 0.3 m BEHIND FACE OF CONCRETE BARRIER.

** 9 m CRITERION IS BASED UPON STRAIGHT ROADWAY AND A SLOPE OF 6 to 1 OR FLATTER. SUPPORTS ON THE OUTSIDE OF CURVES OR LOCATED DOWN A SLOPE (STEEPER THAN 6 : 1) WILL REQUIRE USE OF CLASS A SUPPORTS.

E. BALLASTING

BALLASTING OF PORTABLE SUPPORTS SHALL BE WITH SANDBAGS PLACED WITHIN 0.3 m OF THE GROUND. IN NO CASE SHALL HARD OBJECTS BE USED FOR BALLAST.

F. STRENGTH OF SIGN SUPPORTS

THE CONTRACTOR SHALL CHOOSE SIGN SUPPORTS OF ADEQUATE STRENGTH AND WITH ADEQUATE FOUNDATIONS AND ANCHORAGE TO SUPPORT THE SIGN SIZES ERECTED. PROPRIETARY DEVICES SHALL NOT BE LOADED BEYOND THE LIMITS RECOMMENDED BY THE MANUFACTURER. SLIP-BASE TYPE BREAKAWAY BEAM CONNECTIONS SHALL BE AT LEAST PARTIALLY EMBEDDED IN CONCRETE CONSISTING OF A 0.3 m DEEP BY 0.3 m DIAMETER COLLAR. SIGN SUPPORTS WHICH FAIL UNDER TYPICAL WIND LOAD CONDITIONS SHALL BE IMMEDIATELY MODIFIED OR REPLACED WITH A SUPPORT OF ADEQUATE STRENGTH.

G. PROHIBITED SUPPORTS

THE FOLLOWING SUPPORT TYPES SHALL NOT BE PERMITTED ON PROJECTS:

1) SUPPORTS FABRICATED FROM AUTOMOTIVE AXLE DIFFERENTIAL ASSEMBLIES AND SIMILARLY HEAVY ASSEMBLIES WHICH CANNOT BE CONSIDERED BREAKAWAY TYPE.

2) SUPPORTS CONSISTING OF VERTICAL POSTS WITH ANGLED BRACES MADE FROM DRIVEPOST OR OTHER RIGID ELEMENTS.

CLASS A SUPPORTS

FIXED SUPPORTS

1) ALL #2 AND #3 POST WHEN INSTALLED SINGLY OR IN PAIRS (SIDE BY SIDE) ACCORDING TO THE DETAILS OF TC-41.20M. THE NUMBER OF SUPPORTS SHALL BE AS SHOWN ON TC-52.10M AND TC-52.20M.

2) THE FOLLOWING POST TYPES, WHEN INSTALLED SINGLY, BY IMBEDMENT OR DRIVING INTO EARTH TO A DEPTH OF ABOUT 1.1 m.

   a) - UP TO 102 X 102 mm WOOD.

   b) - UP TO 51 mm DIAMETER SCHEDULE 40 STEEL PIPE.

   c) - UP TO 76 mm DIAMETER SCHEDULE 40 ALUMINUM PIPE.

   d) - UP TO 56.4 mm SQUARE, 12 GAUGE WALL, PUNCHED STEEL POST.

   e) - UP TO 152 X 203 mm WOOD WITH BREAKAWAY HOLES SHOWN BELOW.

3) THE FOLLOWING POST TYPES WHEN INSTALLED IN PAIRS (SIDE BY SIDE) WITH LESS THAN 2 m BETWEEN POSTS, BY IMBEDMENT OR DRIVING INTO EARTH TO A DEPTH OF ABOUT 1.1 m :

   a) - UP TO 102 X 102 mm WOOD.

   b) - UP TO 51mm DIAMETER SCHEDULE 40 STEEL PIPE.

   c) - UP TO 76 mm DIAMETER SCHEDULE 40 ALUMINUM PIPE.

   d) - UP TO 51 mm SQUARE, 14 GAUGE WALL, PUNCHED STEEL POST.

4) FIXED TYPE III BARRICADES:

5) ALL BREAKAWAY CONNECTION BEAM SUPPORTS, WHEN INSTALLED ACCORDING TO THE PROPER DETAILS SHOWN ON TC-41.10M WITH A MINIMUM CLEAR DISTANCE BETWEEN SUPPORTS OF 2.1 m FOR SUPPORTS LARGER THAN W6 X 9.

6) ANY BREAKAWAY POST OR POST AND CONNECTION WHICH HAS BEEN CRASH TESTED AND APPROVED BY THE FHWA AS SATISFYING THE BREAKAWAY CRITERIA DESCRIBED IN 630.06.

(CONTINUED ON MT-105.11M)

METRIC

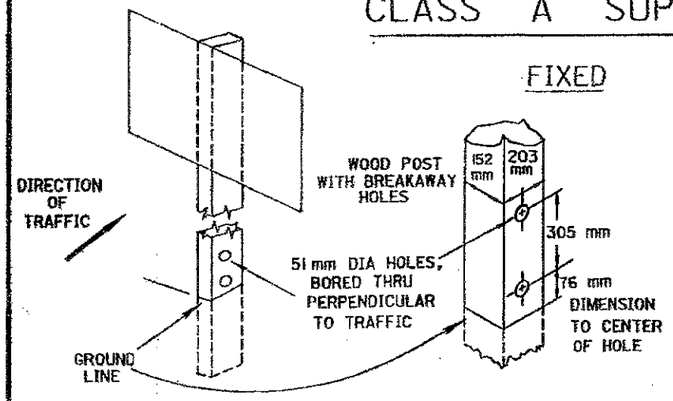
BUREAU OF DESIGN SERVICES
DIVISION OF HIGHWAYS
OHIO DEPARTMENT OF TRANSPORTATION

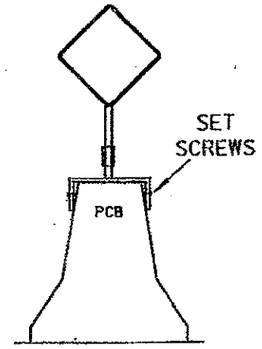
MAINTENANCE OF TRAFFIC	DATE 04/25/94
TEMPORARY SIGN SUPPORT	
STANDARD CONSTRUCTION DRAWING MT-105.10M	
APPROVED Jay Braga ENGR. OF DESIGN SERVICES	

WCC

CLASS A SUPPORTS

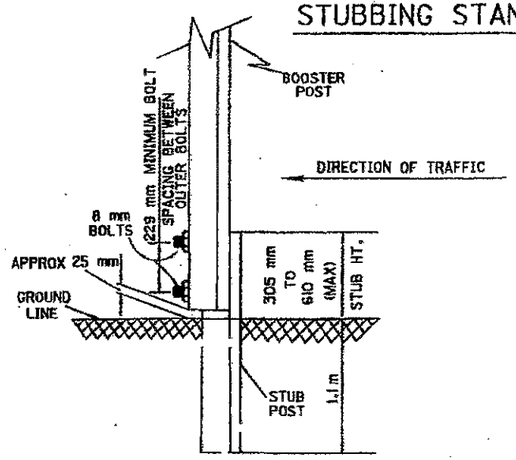
FIXED





CLASS A SUPPORTS

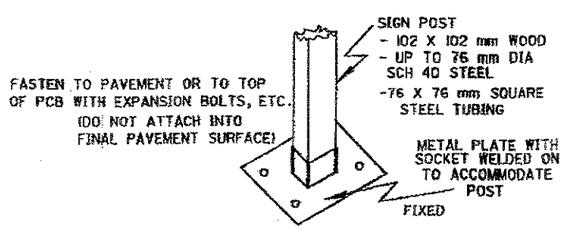
STUBBING STANDARD

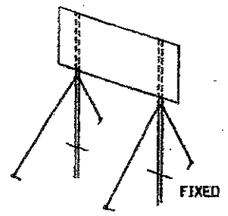


NOTES

1. FOR USE WITH #3 POST OR SMALLER ONLY
2. BOLTS SHALL BE STEEL OR ALUMINUM
3. A MINIMUM OF TWO FASTENERS SHALL BE USED PER ASSEMBLY
4. BOOSTER POST SHALL BE MOUNTED BEHIND STUB POST
5. BOOSTER POST SHALL BE THE SAME OR 1.5 kg/m LESS THAN STUB POST

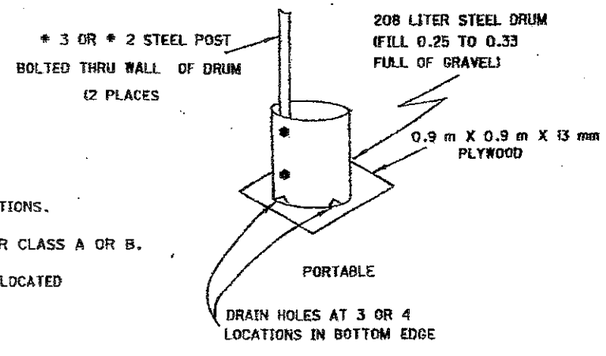
CLASS B SUPPORTS





ANY CLASS A SIGN POST WITH GUY WIRES ADDED TO INCREASE SIGN CARRYING ABILITY. (GUY WIRES SHALL NOT BE HEAVIER THAN 3.2 mm DIA. BRAIDED CABLE. GUY ANCHORS SHALL NOT EXTEND MORE THAN 152 mm ABOVE GROUND SURFACE).

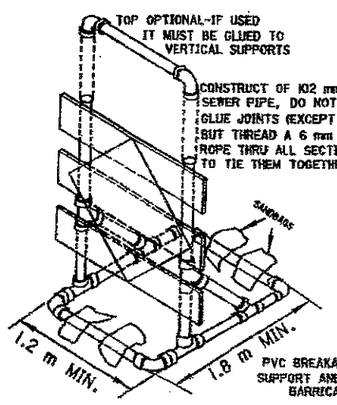
CLASS C SUPPORTS

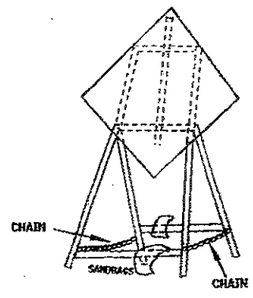


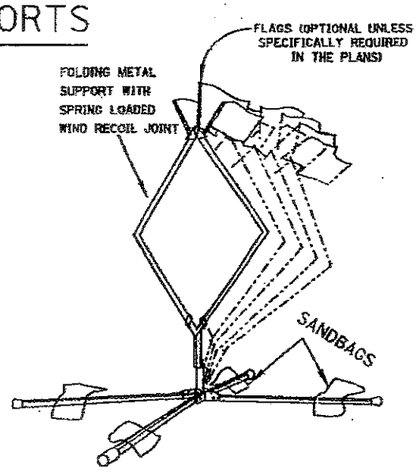
1. ALL BEAM TYPE SUPPORTS WITHOUT BREAKAWAY CONNECTIONS.
2. SUPPORTS SIMILAR TO BUT LARGER THAN PERMITTED FOR CLASS A OR B.
3. THE STEEL DRUM(S) SHOWN BELOW MAY BE USED ONLY WHEN LOCATED BEHIND GUARDRAIL OR BARRIER.

CLASS A SUPPORTS

PORTABLE







NOTES

RAIL MATERIALS:

25 X 203 mm OR 51 X 203 mm COMMON LUMBER
203 mm X (16 mm TO 25 mm) THICK EXTERIOR PLYWOOD
EXTRUDED PLASTIC OR FORMED SHEET METAL WITH A 203 mm WIDE SURFACE AND OF SUFFICENT STIFFNESS TO RESIST TYPICAL WIND LOADS OF UP TO 147 kg/m², BUT HAVING A WEIGHT OF NOT MORE THAN 7.5 kg/m.

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE C & M SPECIFICATIONS AS WELL AS IN ACCORDANCE WITH PART 7 OF THE OMUTCD. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS TO PROVIDE THIS METHOD OF TRAFFIC CONTROL SHALL BE INCLUDED IN THE LUMP SUM BID FOR 614 MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

METRIC

BUREAU OF DESIGN SERVICES
DIVISION OF HIGHWAYS
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC

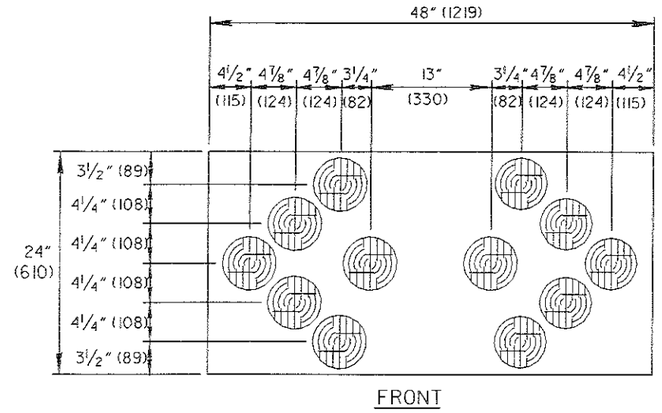
DATE 04/25/94

TEMPORARY SIGN SUPPORT

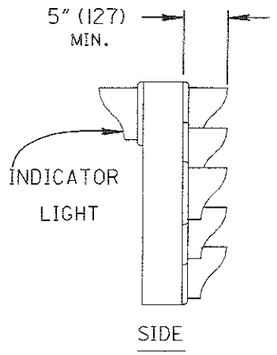
STANDARD CONSTRUCTION DRAWING MT-105.11M

APPROVED _____ ENGR. OF DESIGN SERVICES

WCC

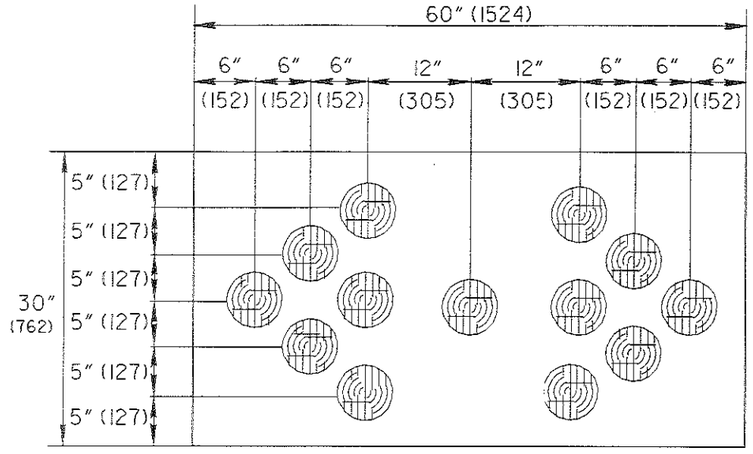


FRONT

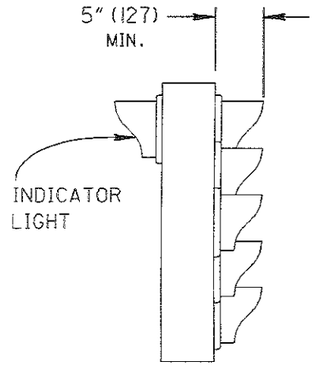


SIDE

TYPE A PANEL

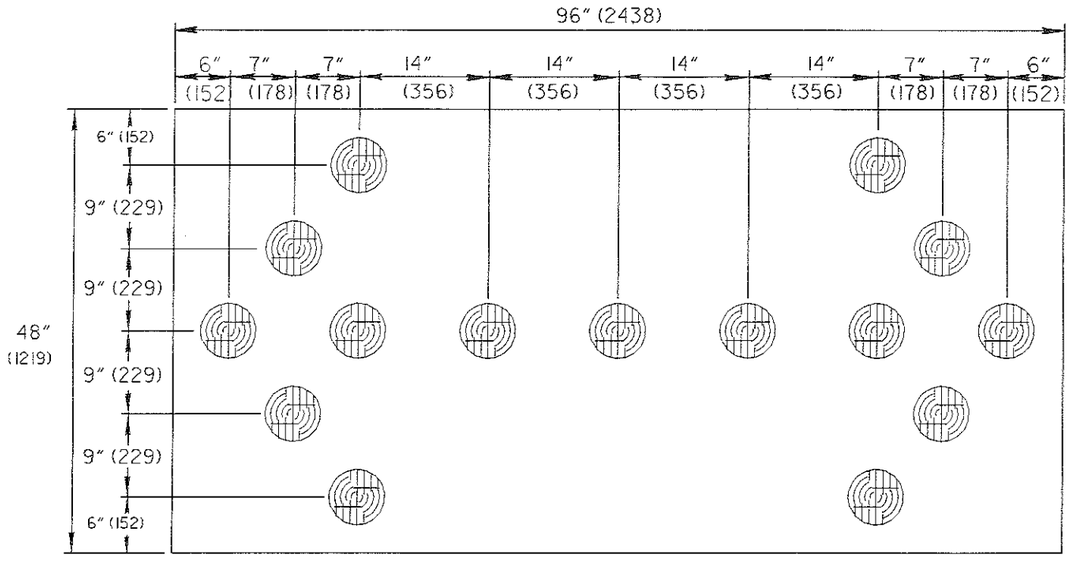


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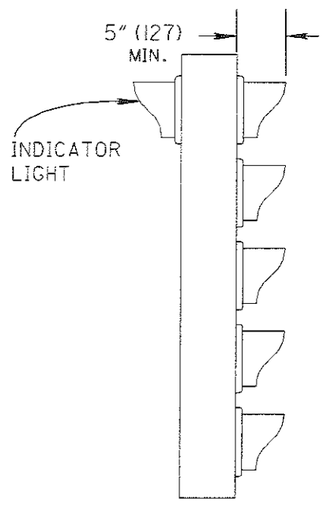


SIDE

TYPE B PANEL



FRONT



SIDE

TYPE C PANEL

ALL DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS NOTED OTHERWISE.

4-20-01

FLASHING ARROW PANEL

OFFICE OF TRAFFIC ENGINEERING

MT-35.10

FLASHING ARROW PANEL

The flashing arrow panel shall consist of the following components:

A. flasher panel

B. lamps

C. controls

D. power supply

E. mounting

A. Flasher panel

The flasher panel shall be of exterior type plywood or corrosion resistant metal construction of adequate design and strength. The panel finish shall be flat black.

A flasher panel shall be one of three sizes. The type A panel shall be a nominal 24" (610 mm) high by 48" (1219 mm) wide. Type B shall be a nominal 30" (762 mm) high by 60" (1524 mm) wide. Type C shall be a nominal 48" (1219 mm) high by 96" (2438 mm) wide.

Flashing arrow panels shall normally utilize high output (4412A and 4415A) lamps powered by an engine driven generator when permitted by the plans. The contractor may also furnish units powered by a solar array and batteries or only batteries. However, these units shall not be used where the approaching traffic would be on a horizontal curve in excess of 3 degrees. These units shall not be used if the approaching traffic, closer tha 1 mile (1.6 km) [1/2 mile (.8 km) where speed limits are less than 40 MPH], is more than 5½ degrees horizontally or 2 degrees vertically from the central axis of the lens units.

B. Lamps

For engine powered generator units, lamps shall be ANSI Number 4412a (PAR 46) for type B and C and 4415a (PAR 36) for type A. The lamp shall be fitted with an upper hood of not less than 180° at least 5 " (127 mm) long. Arrow panels may use a lower power (wattage) lamp than the standard arrow panels. The lamps shall be approximately 5" (127 mm) diameter with a parabolic reflector. The lamp shall provide improved light distribution control by means of high quality reflectors and refractors. The light output from each lamp of the arrow shall not be less than shown in figure 1 when operating at full daytime brightness.

The lamps shall be securely mounted and positioned in the panel perpendicular to the panel face and oriented so that the lamp location lug (on back of the lamp) is on the horizontal center line through the lens. The lug will be on the right side of the lamp as viewed from the front.

The lamps shall be wired in circuits that can be switched to display any one of the folowing messages: left arrow, right arrow, left and right, and caution bar. A minimum of three indicator lights shall be placed on the back of the panel to indicate which message mode is in operation.

Each panel shall contain the following number of lamps as a minimum: type A-12 lamps, type B-13 lamps, type C-15 lamps.

CANDLE POWER CHART

				100					4°
		100	150	200	150	100			2°
100	150	200	250	350	250	200	150	100	0° HORIZONTAL
		100	150	200	150	100			- 2°
				100					- 4°
10°	7.5°	5°	2.5°	0°	2.5°	5°	7.5°	10°	
LEFT				CENTER				RIGHT	

(1) Measurements expressed in candela.
(2) Color of output light shall be yellow to light yellow.

Figure 1

C. Controls

Each flashing arrow panel shall contain a flasher control and a dimmer control unit housed in a cabinet which can be locked.

1. Flasher control

The flash rate for the sign panel shall be 25 to 40 flashes per minute. The flasher shall not cause electromagnetic interference. The lamps shall have a minimum "on time" of 50% and a maximum of 66%.

2. Dimmer control

Lamp intensity shall be variable by means of a photoelectrically controlled circuit which shall reduce lamp output during low ambient light conditions. Lamp intensity shall be at the nighttime level whenever the ambient illumination is in or below the range 2 foot-candle (21 lux) to 5 foot-candle (54 lux) and shall be at daytime level when ambient illumination is in or above the range 5 foot-candle (54 lux) to 10 foot-candle 108 (lux). If controls provide for continuous adjustment of lamp intensity with respect to ambient illumination, then lamp intensity shall increase linearly from nightime intensity at 5 foot-candle (54 lux) to daytime intensity at 3250 foot-candle (35,000 lux). A time delay shall be built into the control to prevent false operation due to light flashes. The photoelectric control shall contain a switch which shall override the photoelectric control.

D. Power supply

The flashing arrow panel shall operate from power sources capable of continuously furnishing the proper voltage to the lamps a minimum of 24 hours without attendance.

D. Cont.

Motor generators, if used shall be of modern design to provide low emission of pollutants and shall be properly muffled. The motor generator shall be enclosed in a mesh enclosure which can be locked. The fuel tank shall have a cap which can be locked. Motor generators supplying power to a flashing arrow sign shall not be used to supply power to other equipment. Gasoline fueled engines shall not be used.

Battery and solar/battery units shall have a no-charge-life of not less than 15 days. No-charge-life is the number of consecutive days that the system can continue to function (double arrow mode, normal dimming during 12 hour night, full output during 12 hour day) starting with a full battery charge and with no additional charge being provided by the solar cells. The no-charge-life may be based upon calculations providing that manufacturer's ratings and efficiency calculations are furnished for each major component.

E. Mounting

The flashing arrow panel may be trailer or vehicle mounted or mounted on a rigid supporting device suitable for maintaining it in the designated position. Each of the mounting methods shall be suitably stable such as to prevent movement due to high winds or passage of large vehicles.

When a trailer is used, construction shall be such as to transport the flashing arrow panel and appurtances adequately and legally as well as support them properly during operation. The trailer shall be equipped with devices which shall provide leveling and stability during operation.

Minimum arrow panel mounting height shall be 7 feet (2.1 m) above the pavement surface (measured to the bottom of the panel).

Use and operation

The flashing arrow panel shall be located as shown in the maintainence of traffic drawings or as directed by the Engineer and operated continuously during traffic maintained periods. The Contractor shall supply all fuel, lubricants and parts necessary to obtain continuous operation and shall provide all service. The Contractor shall inspect the operation of the unit daily, including weekends and holidays. The Contractor shall arrange with the Engineer, an acceptable method of obtaining service for a malfunctioning panel within 30 minutes of a reported malfunction. Lamp intensity shall be adjusted to provide minimum legibility distances of ½ mile (.8 km) type A, ¾ mile (1.21 km) type B and 1 mile (1.6 km) type C.

Type C panels shall be used for stationary operations on high speed 55 MPH or greater, high volume roadways. Type B shall be used for stationary operations on intermediate speed 40-50 MPH facilities, and type A on low speed 20-35 MPH facilities.

In addition, type B panels shall be used for moving operations on freeways and expressways and type A for moving operations on other facilities.

Battery and solar/battery units shall be fully charged when first set up. They shall have gauges to indicate approximate battery charge remaining. The Contractor shall verify daily that the unit is operating satisfactorily and the remaining battery charge is sufficient for at least 2 more days.

Flashing arrow panels are not to be used on two lane-two way roadways.

When left unattended the control cabinet, motor generator enclosure and fuel tank shall be locked.

Type A and type B panels used in moving operations may be powered by the vehicle's electrical system but shall not be left unattended when so powered.

When not in use, the flashing arrow panel shall be stored at a location which will not be hazardous to traffic or pedestrians.

The panels shall be designed for operation in 100% humidity and temperatures from -20 to + 130 degrees Fahrenheit (-29 to + 54 degrees Celsius).

JAM

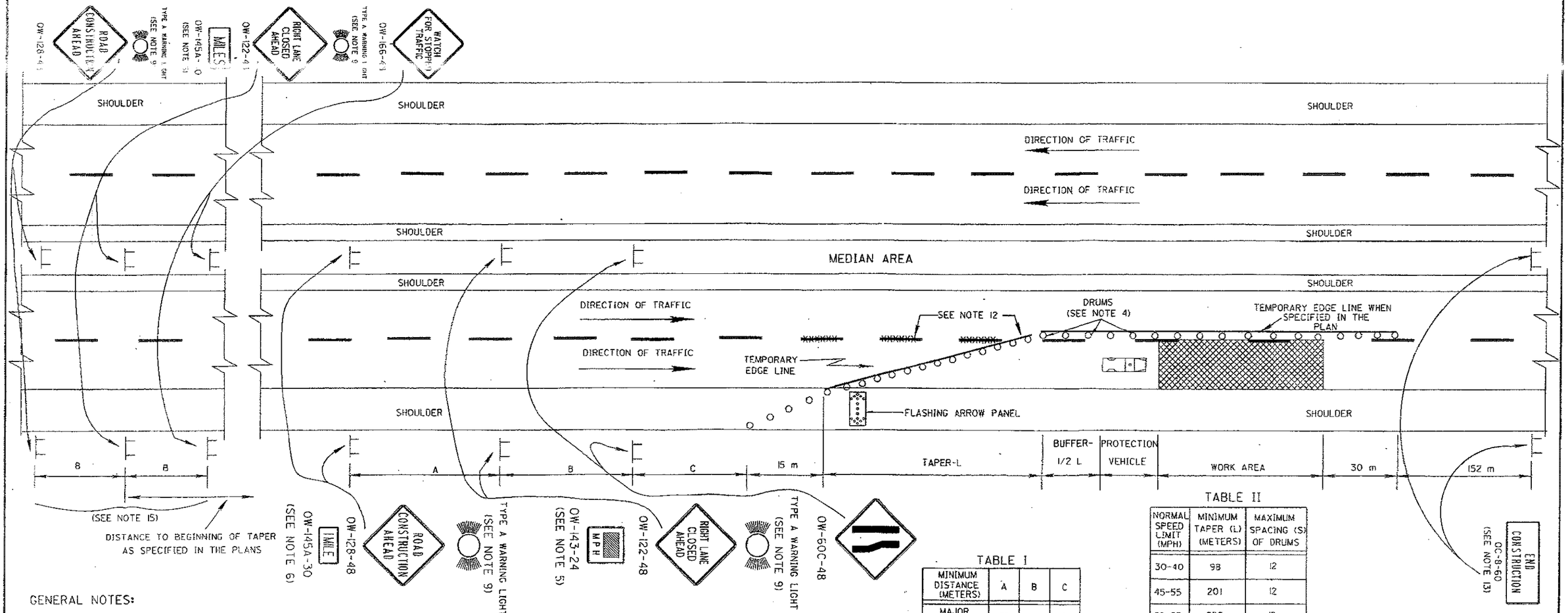


TABLE I

MINIMUM DISTANCE (METERS)	A	B	C
MAJOR STANDARD	152	152	152
URBAN FREEWAY & EXPRESSWAY	152 TO 305	152 TO 305	152 TO 305
RURAL FREEWAY & EXPRESSWAY	792	488	305

TABLE II

NORMAL SPEED LIMIT (MPH)	MINIMUM TAPER (L) (METERS)	MAXIMUM SPACING (S) OF DRUMS
30-40	98	12
45-55	201	12
60-65	238	18

GENERAL NOTES:

1. THE LOCATION OF THE MERGING TAPER AND THE ADVANCE WARNING SIGNS SHOULD BE ADJUSTED TO PROVIDE FOR ADEQUATE SIGHT DISTANCE FOR THE EXISTING VERTICAL AND HORIZONTAL ROADWAY ALIGNMENT.

2. THE SPACING BETWEEN PROPOSED SIGNS SHOULD BE ADJUSTED TO NOT CONFLICT WITH AND TO PROVIDE A MINIMUM OF 61m CLEARANCE TO EXISTING SIGNS.

3. THE TAPER LENGTH (L) AND SPACING (S) OF DRUMS SHALL CONFORM TO TABLE II. DRUM SPACING (S) SHALL BE USED FOR THE MERGING TAPER, THE BUFFER AREA AND FOR THE FIRST 305 m OF THE WORK AREA AND AT OTHER HAZARDOUS LOCATIONS AS DIRECTED BY THE ENGINEER. THE MAXIMUM DRUM SPACING FOR THE BALANCE OF THE WORK AREA IS TO BE TWO TIMES THE SPACING (S) IN TABLE II. A MINIMUM OF 5 DRUMS SHALL BE USED TO CLOSE THE SHOULDER.

4. CONES HAVING A MINIMUM HEIGHT OF 0.7 m MAY BE SUBSTITUTED FOR DRUMS FOR DAYTIME LANE CLOSURES. PROVISIONS SHALL BE MADE TO SAFELY STABILIZE THE CONES TO PREVENT THEM FROM BLOWING OVER. IF THIS CANNOT BE ACHIEVED, DRUMS SHALL BE USED.

5. THE ADVISORY SPEED SIGN OW-143 SHALL BE USED WHEN SPECIFIED IN THE PLAN.

6. THE DISTANCE PLATE OW-145A SHALL INDICATE THE DISTANCE TO THE BEGINNING OF THE MERGING TAPER (L). DISTANCES LESS THAN ONE MILE MAY BE EXPRESSED IN FEET. THE PLAQUE MAY BE OMITTED IF EXTRA ADVANCE SIGN GROUPS ARE NOT USED.

7. THE PROTECTION VEHICLE, LOCATED CLOSE TO THE WORK, SHALL BE IN PLACE AND UNOCCUPIED WHENEVER WORKERS ARE IN THE WORK AREA. THIS VEHICLE SHALL BE REMOVED FROM THE PAVEMENT WHENEVER WORKERS ARE NOT IN THE WORK AREA. THE VEHICLE SHALL BE EQUIPPED WITH A 360 DEGREE ROTATING OR FLASHING AMBER BEACON CLEARLY VISIBLE A MINIMUM OF 402 m. OTHER PROTECTIVE DEVICES MAY BE USED IN LIEU OF THE PROTECTION VEHICLE SHOWN WHEN APPROVED BY THE ENGINEER.

8. THE FLASHING ARROW PANEL SHALL MEET REQUIREMENTS OF STANDARD CONSTRUCTION DRAWING TC-35.10M.

9. TYPE A FLASHING WARNING LIGHTS SHOWN ON THE OW-128 AND OW-122 - (123) SIGNS ARE REQUIRED WHENEVER A NIGHT LANE CLOSURE IS NECESSARY

10. WHEN WORK IS BEING PERFORMED IN THE LANE ADJACENT TO THE MEDIAN ON A DIVIDED HIGHWAY, OW-123 SIGNS SHALL BE SUBSTITUTED FOR THE OW-122 SIGNS AND OW-60D SIGNS SHALL BE SUBSTITUTED FOR THE OW-60C SIGNS.

11. 36 INCH WARNING SIGN SIZES MAY BE USED ON DIVIDED ROADWAYS THAT ARE NOT CLASSIFIED AS FREEWAYS OR EXPRESSWAYS.

12. IF THE CONSTRUCTION OPERATION REQUIRES THE LANE CLOSURE FOR MORE THAN ONE DAY THEN THE EXISTING CONFLICTING PAVEMENT MARKINGS AND REFLECTORS FROM THE RAISED PAVEMENT MARKERS (RPMS) SHALL BE REMOVED AND THE APPROPRIATE COLOR TEMPORARY EDGE LINES SHALL BE APPLIED ALONG THE TAPER. TEMPORARY EDGE LINES WHICH WOULD CONFLICT WITH FINAL TRAFFIC LANES SHALL BE REMOVABLE (740.05 TYPE C) TAPE UNLESS

12. CONT. THE AREA WILL BE RESURFACED IN THE NEXT WORK PHASE. AFTER COMPLETION OF THE WORK, PAVEMENT MARKINGS OTHER THAN 740.05 TYPE C SHALL BE REMOVED IN ACCORDANCE WITH 641.10. THE ORIGINAL MARKINGS AND PAVEMENT MARKER REFLECTORS SHALL BE RESTORED AT NO ADDITIONAL COST.

13. THE OC-8 SIGNS ARE ONLY REQUIRED FOR LANE CLOSURES OF MORE THAN ONE DAY AND MAY BE OMITTED IF THEY FALL WITHIN THE LIMITS OF A CONSTRUCTION PROJECT.

14. OW-128 SIGNS SHALL BE PROVIDED ON ENTRANCE RAMPS AND/OR SIDE ROADS LOCATED WITHIN THE WORK LIMITS OR THE ADVANCE WARNING SIGN GROUP. WITHIN THE LENGTH OF CLOSURE, PROVISION SHALL BE MADE TO CONTROL TRAFFIC ENTERING FROM INTERSECTING STREETS AND DRIVEWAYS. THREE DRUMS SHALL BE PLACED ON EACH SIDE ACROSS THE CLOSED LANE AT EACH INTERSECTION AND DRIVEWAY.

15. EXTRA ADVANCE WARNING SIGN GROUPS CONSISTING OF OW-128, OW-122 AND OW-166 SIGNS PLUS DISTANCE PLATES MAY BE SPECIFIED IN THE PLANS OR REQUIRED TO BE ERECTED AT THE DIRECTION OF THE ENGINEER.

16. ALL MATERIAL AND EQUIPMENT SHALL BE REMOVED FROM THE CLOSURE AND THE WORK AREA WHEN NO WORK IS BEING DONE.

METRIC

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE C & M SPECIFICATIONS AS WELL AS IN ACCORDANCE WITH PART 7 OF OMUTCD. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS TO PROVIDE THIS METHOD OF TRAFFIC CONTROL SHALL BE INCLUDED IN THE LUMP SUM BID FOR 614 MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

BUREAU OF DESIGN SERVICES
DIVISION OF HIGHWAYS
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC

DATE 04/25/94

CLOSING RIGHT OR LEFT LANE OF A MULTI-LANE DIVIDED HIGHWAY WITH DRUMS

STANDARD CONSTRUCTION DRAWING MT-95.30M

APPROVED _____ ENGR. OF DESIGN SERVICES

WCC