REPUBLIC OF THE PHILIPPINES

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

REGION XI

DAVAO DEL NORTE 2ND DISTRICT ENGINEERING OFFICE

TAGUM CITY

C.Y. 2025 PROJECT

DETAILED ENGINEERING DESIGN PLAN FOR

CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE

SECTION	:	SAN JOSE ROAD
LOCATION	:	SANTO TOMAS, DAVAO DEL NORTE
STATION LIMITS	:	STA. 0 + 000.00 - STA. 3 + 020.00
NET LENGTH	:	3,020.00 LN.M. (6.040 LANE-KM., ROAD CONCRETING)

SUBMITTED:

JEZABEL E. TULING, MPA

CHIEF, PLANNING AND DESIGN SECTION

DATE:

RECOMMENDED:

GARRY E. VERANO

OFFICER-IN-CHARGE

OFFICE OF THE ASSISTANT DISTRICT ENGINEER

DATE:

APPROVED:

ARTURO P. LONGYAPON

DISTRICT ENGINEER

DATE:

PROJECT LIMITS:

BEG. OF PROJECT:	STA. 0 + 000.00
END OF PROJECT :	STA. 3 + 020.00
	3,020.00

PROJECT NET LENGTH : **3,020.00 LN.M.**
(ROAD CONCRETING)

LOCATION MAP

N T S

VICINITY PLAN

SCALE 1:8000

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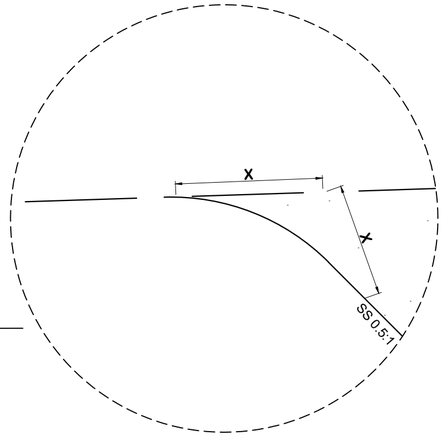
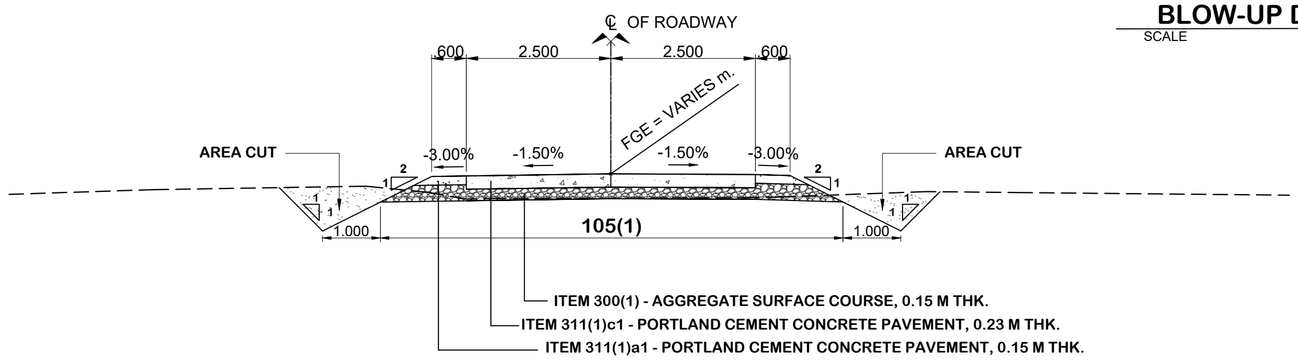
PROJECT NAME AND LOCATION:	SHEET CONTENTS:	DRAFTED:	REVIEWED:	SUBMITTED:	RECOMMENDED:	APPROVED:	SET NO.	SHEET NO.
CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE	LOCATION MAP, VICINITY PLAN, INDEX OF SHEETS AND PROJECT LIMITS	**HERWIN EVAN J. HABABAG** ENGINEER II PREPARED: **WARREN S. PIÑEZ** ENGINEER II	**BENILDA S. PACQUIAO** ENGINEER III DATE:	**JEZABEL E. TULING, MPA** CHIEF, PLANNING AND DESIGN SECTION DATE:	**GARRY E. VERANO** OFFICER-IN-CHARGE OFFICE OF ASSISTANT DISTRICT ENGINEER DATE:	**ARTURO R. LONGYAPON** DISTRICT ENGINEER DATE:	A 1 1	1 11

HEIGHT OF SLOPE (M)	ROUNDING (X)
0 TO 4.50	1.50
OVER 4.50	2.50



SLOPE ROUNDING BLOW-UP DETAIL

SCALE NTS



1/3 **TYPICAL ROADWAY SECTION AT NORMAL CROWN**

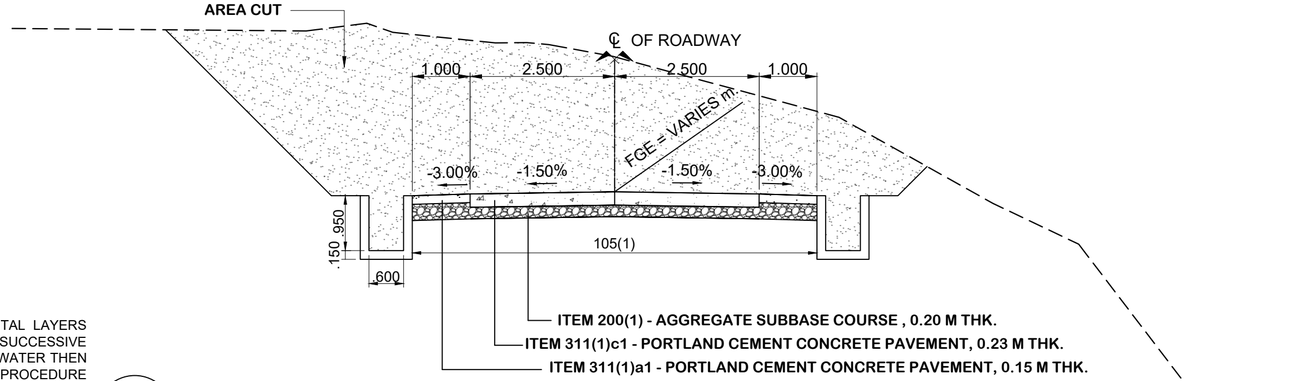
SCALE 1:75

SCHEDULE FOR RULE OF 7

+ e% < 5% = -3%
+ e% > 5% = -2%
+ e% > 6% = -1%
+ e% > 7% = 0%
+ e% > 8% = +1%

CUT/FILL SLOPE SCHEDULE

NATURE OF MATERIAL	CUT SLOPE	FILL SLOPE
COMMON EARTH	1:1	1.5:1
RIPPABLE ROCK	1:2	
SOLID ROCK	1/4:1	



2/3 **TYPICAL ROADWAY SECTION AT NORMAL CROWN WITH RC. LINED CANAL ON BS**

SCALE 1:75

NOTE:
ALL EMBANKMENT SHALL BE COMPACTED IN HORIZONTAL LAYERS NOT EXCEEDING 200mm (LOOSE MEASUREMENT). AFTER FIVE SUCCESSIVE LAYERS. THE FILL/EMBANKMENT SHALL BE SATURATED WITH WATER THEN DRIED BEFORE PLACING THE SUCCEEDING LAYERS. THE PROCEDURE SHALL BE REPEATED UNTIL THE DESIRED ELEVATION IS ATTAINED.

NOTE:
DPWH DESIGN, GUIDELINES CRITERIA AND STANDARDS (DGCS) 2015 EDITION
-FOR THE MINIMUM REQUIREMENT OF ROAD RIGHT OF WAY (RROW) WIDTH
-D.O. 179, S. 2015

DESIGN CONDITIONS :

Design Period	=	20	Years
Actual Loading	=	100 %	(including overloaded trucks)
Design ESAL	=	4,793,103	One direction
Conc. Strength	=	650	psi @ 28 Days

Design CBR: = Mean CBR - ½S

where: $S = \sqrt{((x_i - \bar{x})^2/(n-1))}$

Mean CBR = 3.6500

$S = (0.045 / 1.00)^{0.6} = 0.2121$

CBR = 3.509

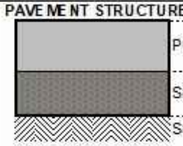
Resilient Modulus of Subgrade: 5,262.87

M_R = CBR * 1500 → M_R = 5,263

Composite Modulus of Subgrade: k_c = 346

Corrected k, (from the graphs): k_{cor} = 123

PAVEMENT STRUCTURE



PCC Thickness, T_{PCC}	=	230 mm
Subbase, Item 200	=	200 mm
Subgrade CBR	=	3.509
(MR, resilient modulus	=	5,263

3/3 **PAVEMENT DESIGN PARAMETERS (230mm)**

SCALE NTS

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TAGUM CITY

PROJECT NAME AND LOCATION:	CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE
SHEET CONTENTS:	TYPICAL ROADWAY SECTIONS
DRAFTED:	HERWIN EVAN J. HABABAG, ENGINEER II
PREPARED:	WARREN S. PIÑEZ, ENGINEER II
REVIEWED:	BENILDA S. PACQUIAO, ENGINEER III, DATE:
SUBMITTED:	JEZABEL E. TULING, MPA, CHIEF, PLANNING AND DESIGN SECTION, DATE:
RECOMMENDED:	GARRY P. VERANO, OFFICER-IN-CHARGE, OFFICE OF ASSISTANT DISTRICT ENGINEER, DATE:
APPROVED:	ARTURO P. LONGYAPON, DISTRICT ENGINEER, DATE:
SET NO.	V / 1 | 1
SHEET NO.	3 / 11

G E N E R A L N O T E S
R O A D W A Y

SPECIFICATIONS

1. All works shall comply with the "DPWH Standard Specifications Volume II, Highways, Bridges and Airports 2013", special provisions and supplemental specifications pertaining to this project.

DIMENSIONS

1. Distances between the horizontal control points including reference points are measured and expressed in meters.
2. Unless otherwise specified, dimensions of pipes, box culverts, bridges and other structures are measured and expressed in millimeters.
3. All other dimensions are expressed in meters.

SURVEY SPECIFICATIONS

1. All project control points are projected in PRS '92 Grid Coordinate System (Zone 5).
2. Survey instrument used, Stonex S900 (Base) SN: S900281940030, Stonex S900 (Rover) SN: S900281940027.
3. Date Surveyed: February 14-17, 2024.
4. Project control points, refer to plan and profile.

ELEVATIONS AND GRADES

1. Finished grade elevation shown on plan and profile sheets refers to finished pavement level as indicated in the typical roadway section.
2. Ground grade shown on the plan and profile sheets refer to the elevation of the original ground along the centerline of the project road.

GRADING AND OTHER GENERAL REQUIREMENTS

1. Alignment and grades are subject to adjustments to suit actual field conditions.
2. Distances and elevations are in meter unless otherwise indicated.
3. Grades shown are top of finished pavement.
4. All works shall comply with the Standard Specifications for Highways and Bridges, Revised 2013 and "A Policy on Geometric Design", AASHTO 2011.
5. Where no detours are available, traffic shall be handled in accordance to the provisions of Clause 75 of the DPWH Standard Specifications, Volume 1, Requirements and Conditions of Contract (2013).
6. The contractor shall continuously keep the road undergoing improvement and the section detours in such condition satisfactory to the Engineer that traffic will be accommodated during the entire contract period without any inconvenience to the traveling public in accordance to Clause 38 of the DPWH Standards Specifications, Volume 1, Requirements and Conditions of Contract (2013). The contractor shall bear all expenses for constructing, reconstructing if necessary and maintaining such road detours, approaches, including run-around temporary bridges without compensation.
7. The apparent silence of specifications, plans, special provisions and supplementary specifications, as to any detail or the apparent omission from them of a detailed description concerning any point shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of first class quality are to be used.
8. Roads closed to traffic shall be protected by effective barricades, and obstructions shall be illuminated at night. Suitable warning signs, illuminated at night by lanterns of flares, shall be provided. All lights for this purpose shall be kept burning from sunset to sunrise.
9. The contractor will be required to erect warning signs outside of, and 150m from, each end of the project, and 150m in advance at any place on the project where operations interfere with the use of the road by traffic, and at all intermediate points where the new work crosses or coincides with an existing road.
10. Before the start of actual construction, the As-Staked Plan should be submitted to the Davao del Norte Sub-District Engineering Office in order that immediate steps may be taken to correct or adjust whatever appreciable deviation there may be from the original plan.
11. Quarry site for Item 200 is Mabuhay, Carmen (25.25 km.) and Item 104 is Magwawa, Sto. Tomas (36.00 km.) from the project site. Disposal site is one (1) km outside project limit.
12. Design was based on survey data submitted by the Surveys and Investigation Unit of the Planning and Design Section of the DPWH-Davao del Norte Sub-District Engineering Office.

EARTHWORK

1. All concrete pavement, base course, sidewalks, curbs, gutters, etc., designated for removal shall be broken into pieces, the size of which shall not exceed 300mm (12in) in any dimension and stockpiled at designated locations on the project or as directed by the Engineer.
2. All excavations shall be finished to reasonably smooth and uniform surfaces. No materials shall be wasted without authority of the Engineer. Excavation operations shall be conducted so that material outside of the limit of slopes will not be disturbed.
3. Spoils from demolished/ excavated materials shall not be allowed to be stockpiled at the shoulder or part of the traveled roadway and shall be removed immediately to prevent obstruction. Spoils removed shall be disposed off in designated areas approved by the Engineer.
4. All embankments shall be constructed in accordance with the requirements of Item 104 - Embankment. It shall be compacted in horizontal layers not exceeding 200mm (loose measurement). After five successive layers, the fill/ embankment shall be saturated with water then dried before placing the succeeding layers. The procedure shall be repeated until the desired elevation is attained.
5. Watering and compacting of all embankments shall be considered as subsidiary work pertaining to other contract items. The cost of performance thereof shall be considered to be included in the contract unit bid price for other items.
6. Cut slopes, except in rocks and fill slopes shall be adjusted and warped to flow into each other or into natural ground surface without noticeable break.
7. Approaches and road connections shall be constructed as shown on the plans or as directed by the Engineer in such manners as to ensure proper connections to the riding surfaces.
8. Prior to commencing preparation of the subgrade, all culverts, cross drains, ducts and the like (including their fully completed backfill), ditches, drains and drainage outlets shall be completed. Any work on the preparation of the subgrade shall not be started unless prior work herein described shall have been approved by the Engineer.

SUBBASE AND BASE COURSE

1. Re-preparation and compaction of the existing base/ subbase to the required density shall be done prior to gravel resurfacing in accordance with DPWH Standard Specifications, Volume II, 2004, using vibrating rollers and pneumatic tire rollers. Inareas where the said equipment cannot be used, a portable mechanical compactor shall be used.

SURFACE COURSE

1. Use steel forms for item 311- Portland Cement Concrete Pavement.
2. When concrete is to be placed adjoining a previously constructed lane and mechanical equipment will be operated upon the existing lane, that previously constructed lane shall have attained the strength of fourteen (14) day concrete. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after three (3) days.
3. At transverse construction joints, holes of 60mm dia. and spaced at 300mm (for 230mm and 280mm thick concrete pavement) shall be drilled at one-half (1/2) of the existing concrete pavement thickness so as to permit the load transfer device (28mm dia. plain dowel bars for 230mm thick PCCP; 36mm dia plain dowel bars for 280mm thick PCCP; 36mm dia. for 300mm thick PCCP) to be inserted at one-half (1/2) of its length. The said device shall be installed firmly at the holes and shall be held in position parallel to the surface of the slab. The dowel bars shall be painted with red lead and the surface of one-half (1/2) of the length to be inserted shall be coated with concrete epoxy while the other half shall be coated with \ approved bituminous materials.
   -DO 54, s.2012
4. Transverse contraction joint shall be cut using a concrete saw to the required depth (one-fourth to one-third of the concrete pavement thickness) and width as shown in the approved plans.
5. All joints shall be sufficiently sealed with asphalt sealant prior to opening to vehicular traffic.
6. The Contractor shall prepare the design mix based on the absolute volume method as outlined in the American Concrete Institute (ACI) Standard 211.1, "Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete". The Engineer shall determine from laboratory tests of the materials to be used, the cement content and the proportions of aggregate and water that will produce workable concrete having a slump of between 40 and 75 mm if not vibrated or between 10 and 40 mm if vibrated, and a flexural strength of not less than 3.8 MPa when tested by the third-point method or 4.5 MPa when tested by the mid-point method at fourteen (14) days in accordance with AASHTO T 97 and T 177, respectively; or a compressive strength of 24.1 MPa for cores taken at fourteen (14) days and tested in accordance with AASHTO T 24.

DRAINAGE AND SLOPE PROTECTION STRUCTURES

1. Exact locations, gradients, lengths, top and invert elevations of all drainage structures that are required shall be determined in the field by the Engineer.
2. Extensions and other improvements of existing drainage structures are subject to change and shall be determined in the field by the Engineer in-charge.
3. During construction, any existing pipes found damaged or defectives shall be removed and replaced as directed by the Engineer. The removal of existing structures shall be paid for under Item 101(4)- Removal of Existing Pipe Culvert.
4. Any miscellaneous removal not shown on the plans including removal of headwalls and wingwalls of existing drainage structures that are to be extended or improved and disposal of resulting materials shall be considered subsidiary work pertaining to other contract items. The cost of performance thereof shall be considered to be included in the unit price for those items.

REMOVAL OF EXISTING STRUCTURES AND OBSTRUCTIONS

1. No payment shall be made for removal of other miscellaneous structures that may be required as subsidiary work pertaining to other contract items except for specific items expressly identified for payment.
2. Improvements and other similar structures that will be affected during the implementation of this project shall be paid for under the road right-of-way improvement.

MISCELLANEOUS STRUCTURES

1. Obstructions within the roadway, if not illuminated shall be marked with reflectorized hazard markers (refer to Section 7 of the Highway Safety Design Standards Part 2 May 2012 Edition). For additional emphasis, it is advisable to mark obstructions with no less than five alternating reflectorized black and white stripes.
2. The application of paint for pavement markings shall be preferably carried out by a machine specially made for this purpose but where brushes are used, only round or oval brushes not exceeding 100mm in width shall be permitted. The paint shall be so applied as to produce a uniform, even coating in close contact with the surface being painted.
3. The applied thermoplastic pavement markings shall have a minimum of 2 years of longevity/durability.
4. Materials which are defective or have been applied in an unsatisfactory manner or to incorrect dimensions or in a wrong location shall be removed. The road pavement shall be made good and materials replaced, reconstructed and/or properly located, all at the contractor's expense and to the satisfaction of the Engineer.

CONSTRUCTION REQUIREMENTS

Staking activities shall be included in the construction schedule to be submitted by the contractor. dates and sequence of each staking activity shall be included.

The engineer shall set initial reference lines, horizontal and vertical control points, and shall furnish the data for use in establishing control for the completion of each element of the work. data relating to horizontal and vertical alignments, theoretical slope stake catch points, and other design data shall be furnished.

The contractor shall be responsible for the true settling of the works or improvements and for correctness of positions, levels, dimensions and alignment of all parts of the works. he shall provide all necessary instruments, appliances, materials and supplies, and labor in connection therewith. the contractor shall provide a survey crew supervisor at the project site whenever surveying/staking activity is in progress.

Prior to construction, the engineer shall be notified of any missing initial reference lines, controls, points, or stakes. the engineer shall reestablish missing initial reference lines, controls, points, or stakes.
The contractor for convenient use of government-furnished data shall perform additional calculations. immediate notification of apparent errors in the initial staking or in the furnished data shall be provided.

All initial reference and control points shall be preserved. at the start of construction, all destroyed or disturbed initial reference or control points necessary to the work shall be replaced.

Before surveying and staking, the contractor shall discuss and coordinate the following with the Engineer:

1. SURVEYING AND STAKING METHODS
2. STAKE MARKING/CONCRETE MONUMENTS
3. GRADE CONTROL FOR COURSES OF MATERIAL
4. REFERENCING
5. STRUCTURE CONTROL
6. ANY OTHER PROCEDURES AND CONTROLS NECESSARY FOR THE WORK

REFERENCES:

1. Revised DPWH Manual on Highway Safety Design Standards,May 2013 Edition
   - For road safety planning and design activities as well as road safety maintenance activities such as the proper way of installing, applying road signs, road safety devices and pavement markings
   - D.O. 41,s. 2012
2. Labor Code of the Philippines and its Implementing Rules and Regulations DOLE DO No. 13, s. 1998, Occupational Safety and Health Standards and its Procedural Guidelines.
   - For monitoring, enforcement and implementation of construction safety and health
   - D.O. 56,s. 2005
3. Design References
   - DPWH Design Guidelines,Criteria & Standards(DGCS),2015 Edition
   - Guidelines for the preparation of Cost Estimates for Traffic Management and Safety & Health Requirements for the Construction and Maintenance of Roads, Bridges and Safety & Health Requirements for School Buildings, 2018
   - AASHTO, A Policy on Geometric Design Standard of Highways and Streets, 2011 6th Edition
   - AASHTO, Guide on Pavement Design, 1993 Edition
   - Highway Safety Design Standards: Part 1 - Road Safety Design, and Part 2 - Road Signs and Pavement Markings, 2012 Edition

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CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE	GENERAL NOTES (ROADWAY 1)	**HERWIN EVAN J. HABABAG** ENGINEER II PREPARED: **WARREN S. PIÑEZ** ENGINEER II	**BENILDA S. PACQUIAO** ENGINEER III DATE:	**JEZABEL E. TULING, MPA** CHIEF, PLANNING AND DESIGN SECTION DATE:	**GARRY E. VERANO** OFFICER-IN-CHARGE OFFICE OF ASSISTANT DISTRICT ENGINEER DATE:	**ARTURO R. LONGYAPON** DISTRICT ENGINEER DATE:	C 1 1	4 11

GENERAL NOTES

1. DESIGN STANDARDS

A. ALL WORKS SHALL COMPLY WITH THE DPWH DESIGN GUIDLINES CRITERIA AND STANDARDS (DGCS), VOLUME IV - 2015 EDITION, AASHTO - A POLICY ON GEOMETRIC DESIGN STANDARD OF HIGHWAYS AND STREETS, 2011, 6TH EDITION AND AASHTO GUIDE ON PAVEMENT DESIHN, 1993 EDITION.

B. THE PROVISION FOR ROADWAY SAFETY SHALL COMPLY WITH THE HIGHWAY SAFETY DESIGN STANDARDS: PART 1 - ROAD SAFETY DESIGN, AND PART 2 - ROAD SIGNS AND PAVEMENT MARKINGS, 2012 EDITION

1. DESIGN SPECIFICATIONS:

- FOR GEOMETRIC DESIGN CRITERIA (IN GENERAL)

A. THE DESIGN MUST BE SUITABLE FOR THE TRAFFICE VOLUME, BOTH DAILY AND AT THE DESIGN PEAK HOUR, FOR THE DESIGN SPPED AND FOR THE CHARACTER OF THE VEHICLES TO USE THE FACILITY.

B. THE DESIGN MUST BE CONSISTENT AND MUST AVOID SURPRISE CHANGES IN ALIGNMENT, GRADE AND SIGHT DISTANCE, AND MUST BE PLEASING TO THE USER AND TO THOSE WHO LIVE ALONG IT.

C. THE DESIGN MUST BE COMPLETE HOWEVER, FOR THE DESIGNER TO BE ABLE TO ENSURE THE EFFECTIVENESS OF HIS DESIGN TO A LARGE DEGREE, THE NECESSARY ROADSIDE TREATMENT AND THE PROVISION OF CONTROL DEVICES, SUCH AS LANE MARKERS AND SPECIAL SIGNS, ARE TAKEN INTO ACCOUNT.

D. THE DESIGN SHALL BE AS SIMPLE AS POSSIBLE FROM THE STANDPOINT OF THE BUILDER. EXCESSIVE CHANGES IN CROSS SECTIONAL DESIGN OR THE USE OF VARIETY OF TYPES WITHIN A PROJECT WILL IN MANY CASES INCREASE THE COST AND DIFFICULTY OF CONSTRUCTION BEYOND THE COMMENSURATE VALUE OF SUCH "UNIQUENESS".

E. THE DESIGN SHOULD BE SUCH THAT THE FINISHED ROAD CAN BE MAINTAINED AT THE LEAST COST, AND MUST BE SAFE FOR DRIVING AND SHOULD ENSURE CONFIDENCE FOR MOTORIST.

- FOR GEOMETRIC DESIGN CRITERIA (HORIZONTAL ALIGNMENT AND CONTROLS)

A. FOR THE DESIGN SPEEDOF 30KPH, THE MINIMUM RADIUS IS 30M AND A SUPERELEVATION OF 6% - 8%.

B. THE RECOMMENDED MINIMUM LENGTH OF TANGENT BETWEEN REVERSED CURVES SHOULD BE 50M.

C. IN NO CASES SHALL THE TANGENT LENGTH BE LESS THAN 30M. THE TANGENT IS NECESSARY TO EFFECT THE TRANSITION FROM SUPERELEVATION IN ONE DIRECTION TO SUPERELEVTATION IN THE OPPOSITE DIRECTION

D. A SUPERELEVATED SECTION IS PROCEESED BY A TRANSITION SECTION. THE VALUES OD SUPERELEVATION ARE DETERMINED FROM THE AASHTO POLICY ON GEOMETRIC DESIGN AND ARE A FUNCTION OF THE RATE OF SUPERELEVATION AND THE CURVE RADIUS.

E. SUPERELEVATION IS USUALLY NOT PROVIDED ON LOCAL STREETS IN RESIDENTIAL AND COMMERCIAL AREAS WHERE WIDE PAVEMENTS, PROXIMITY OF ADJACENT DEVELOPMENT, CONTROL OF CROSS SLOPE, DRAINAGE PROFILES, FREQUENCY OF CROSS STREETS, AND OTHE URBAN FEATURES MAKE ITS USE IMPRACTICAL.

F. ON SIMPLE CURVES, WIDENING SHOULD BE APPLIED ON THE INSIDE EDGE ONLY WITH A RECOMMENDED MINIMUM WIDTH OF 0.60 METERS.

G. ON CURVE DESIGN WITH SPIRAL, WIDENING MAY BE PLACES ON THE INSIDE OR DIVIDED EQUALLY BETWEEN THE INSIDE AND OUTSIDE CURVE.

H. CURVE WIDENING SHOULD BE ATTAINED GRADUALLY OVER A LENGTH SUFFICIENT TO MAKE THE WHOLE OF THE TRAVELED WAY FULLY USABLE.

I. ALIGNMENT SHOULD BE AS DIRECTIONAL AS POSSIBLE BUT SHOULD BE CONSISTENT WITH THE TOPOGRAPHY AND WITH PRESERVING DEVELOPED PROPERTIES.

J. ALIGNMENT SHOULD BE CONSISTENT AND SHARP CURVES SHOULD NOT BE INTRODUCED AT THE LONG TANGENTS

K. FOR SMALL DEFLECTION ANGLE, CURVES SHOULD BE SUFFICIENTLY LONG TO AVOID THE APPEARANCE OF KINK.

L. TANGENTS OR FLAT CURVATURE SHOULD BE USED ON HIGH, LONG FILLS.

A. CAUTION SHOULD BE EXERCISED IN THE USE OF COMPOUND CURVE. WHERE TOPOGRAPHY OR RROW RESTRICTIONS MAKE THEIR USE NECESSARY, THE RADIUS OF THE FLATTER CURVE SHOULD NOT BE MORE THAN 50% GREATER THAN THE RADIUS OF THE SHARPER CURVE.

B. ANY ABRUPT REVERSAL IN ALIGNMENT SHOULD BE AVOIDED. THE REVERSION LENGTH OF TANGENT BETWEEN REVERSED CURVES SHOULD BE 50 METERS AND IN NO CASE SHOULD BE LESS THAN 30 METERS.

C. THE "BROKEN-BACK" OR "FLAT-BACK" ARRANGEMENT OF CURVE (HAVING A SHORT TANGENT BETWEEN TWO CURVES IN THE SAME DIRECTION) SHOULD BE AVOIDED EXCEPT WHEN VERY UNUSUAL TOPOGRAPHICAL OR R-O-W DICTATE OTHERWISE.

D. TO AVOID THE APPEARANCE OF INCONSISTENT DISTORTION, THE HORIZONTAL ALIGNMENT SHOULD BE COORDINATED CAREFULLY WITH THE PROFILE DESIGN.

E. ENDING A CURVE ON A BRIDGE IS UNDESIRABLE, UNSIGHTLY AND ADDS NEEDLESS COMPLICATIONS TO DESIGN AND CONSTRUCTION. LIKEWISE CURVES BEGINNING OR ENDING NEAR A BRIDGE SHOULD BE PLACED SUCH THAT NO PART OF THE SUPPERELEVATION TRANSITION EXTENDS ON TO THE BRIDGE. COMPOUND CURVES ON A BRIDGE ARE EQUALLY UNDESIRABLE. IF CURVATURE IS UNAVOIDABLE, THE BRIDGE SHOULD BE ENTIRELY ON A SIMPLE CURVE AS FLAT AS PHYSICAL CONDITIONS PERMIT.

- FOR GEOMETRIC DESIGN CRITERIA (VERTICAL ALIGNMENT AND CONTROLS)

A. IN AREAS SUBJECTED TO INUNDATION, GRADES SHOULD BE ESTABLISHED 0.50M. ABOVE WATER LEVEL.

B. GRADES OF BRIDGES SHOULD ALLOW 1.50M FREEBOARD ABOVE THE MAXIMUM FLOOD WATER ELEVATION.

C. MAXIMUM GRADES OF 5% ARE CONSIDERED APPROPRIATE FOR A DESIGN SPEED OF 110KPH. FOR A DESIGN OF 50KPH MAXIMUM GRADES ARE GENERALLY IN THE RANGE OF 7 TO 12%, DEPENDING ON TOPOGRAPHY. IN THE PHILIPPINES THE MAXIMUM GRADE WIDELY USED ID 6%.

D. ON THROUGH CUT SECTION, GRADES SHOULD AT LEAST BE 0.50% TO PROVIDE LONGITUDINAL DRAINAGE.

E. A MINIMUM OF 0.35% MAY BE USED ON HIGH TYPE PAVEMENTS AND ACCURATELY CROWNED TO FACILITATE DRAINAGE DISCHARGE.

F. THE FOLLOWING CRITICAL LENGTH OF UPGRADES WHEN APPROACHED BY A LEVEL SECTION SHOULD NOT BE USED A CONTROL BUT REFERRED TO AS A GUIDE:

CRITICAL LENGTH (m)	UPGRADE (%)
500	3
340	4
240	5
200	6
170	7
150	8

G. THE MINIMUM REQUIREMENT OF VERTICAL CURVE LENGTH IS 60M.

H. A SMOOTH GRADE LINE WITH GRADUAL CHANGES SHOULD BE SOUGHT FOR IN PREFERENCE TO A LINE WITH NUMEROUS BREAKS/SHORT LENGTH OF GRADES.

I. THE "ROLLER COASTER" OR THE HIDDEN-DIP TYPE OF PROFILE SHOULD BE AVOIDED.

J. A "BROKEN-BACK" GRADE LINE SHOULD BE AVOIDED.

K. ON LONG GRADES, IT MAY PREFERABLE TO PLACE THE STEEPEST GRADES AT THE BOTTOM AND FLATTER THE GRADES NEAR THE TOP OF THE ASCENT.

L. WHERE AT-GRADE INTERSECTIONS OCCUR ON ROADWAY SECTORS WITH MODERATE TO STEEP GRADES, IT IS DESIRABLE TO REDUCE THE GRADES THROUGH THE INTERSECTION.

M. SAG VERTICAL CURVES SHOULD BE AVOIDED IN CUTS UNLESS ADEQUATE DRAINAGE CAN BE PROVIDED.

- FOR GEOMETRIC DESIGN CRITERIA (CROSS SECTIONS)

A. FOR MULTILANE HIGHWAY, THE TWO LANES ADJACENT TO THE CROWN LINE SHOULD BE PITCHED AT THE NORMAL MINIMUM SLOPE, AND ON EACH SUCCESSIVE PAIR OF LANES OR PORTION THEREOF OUTWARD, THE RATE MAY BE INCREASED BY ABOUT 0.50 TO 1%. THE FOLLOWING CROSS-SLOPE RATING SHALL BE APPLIED FOR EACH SURFACE TYPE:

SURFACE TYPE	CROSS SLOPE RATING
HIGH	1.50 - 2.0%
INTERMEDIATE	2.00 - 3.0%
LOW	3.00 - 4.0%

B. DESIRABLE LANE WIDTH IS 3.65M WHICH ALLOWS LARGE VEHICLES TO PASS WITHOUT EITHER VEHICLE HAVING TO MOVE SIDEWAYS TOWARDS THE EDGE OF PAVEMENT.

C. LANE WIDTH AS LOW AS 2.75M MAY BE USED ON GROUNDS OF ECONOMY.

D. ROADS WITH PAVEMENT WIDTHS LESS THAN 5.5M SHOULD REGARDED AS SINGLE LANE.

E. PAVEMENT WIDTH GREATER THAN 7.32M FOR 2-WAY MOVEMENT IS NOT RECOMMENDED FOR 2-LANE ROADS AS SOME DRIVERS WILL ATTEMPT TO TRAVEL THREE VEHICLES ABREAST ON WIDE PAVEMENT.

F. SHOULDERS ON FILL PREFERABLY SHOULD BE WIDER THAN IN CUTS ALTHOUGH THE PRESENT PRACTICE IS TO MAKE THEM EQUAL.

G. REGARDLESS OF THE WIDTH, SHOULDERS SHOULD BE CONTINUOUS.

H. ALTHOUGH, IT IS DESIRABLE THAT SHOULDER BE WIDE ENOUGH FOR A VEHICLE TO BE DRIVEN COMPLETELY OFF THE TRAVEL WAY, NARROWER SHOULDERS ARE BETTER THAN NONE AT ALL.

I. SHOULDER WIDTH OF 0.60M MAY BE CONSIDERED ON DIFFICULT TERRAIN AND ON LOW-VOLUME HIGHWAY.

J. PAVING OF SHOULDERS WITH A MINIMUM WIDTH OF 1.5M SHALL BE CONSIDERED WHEN AADT IS GREATER THAN 1,250 VEHICLES, WHEN CLOSELY SPACED DRIVEWAYS AND/OR FREQUENT TURNING MOVEMENTS AFFECT MAINTENANCE, ON HIGH EMBANKMENT SECTIONS, ON CURVED ALIGNMENT WITH MORE THAN 7% SUPERELEVATION, WHERE PEDESTRIANS ARE NORMALLY CONCENTRATED, AND IN AREAS WITH STEEP (>6%) AND LONG (>100M) GRADIENTS.

THIS IS TO CERTIFY THAT THE DETAILED ENGINEERING SURVEYS AND DESIGNS HAVE BEEN CONDUCTED ACCORDING TO THE PRESCRIBED AGENCY STANDARDS AND SPECIFICATIONS IN CONFORMANCE WITH THE PROVISIONS OF ANNEX"A" OF THE REVISED IMPLEMENTING RULES AND REGULATIONS OF RA 9184, AND THAT THE DETAILED ENGINEERING OUTPUTS ARE ADEQUATE FOR THE PROCUREMENT AT HAND.

WARREN S. PIÑEZ
HEAD, SURVEY & INVESTIGATION UNIT

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
REGION XI
DAVAO DEL NORTE
2ND DISTRICT ENGINEERING OFFICE
TAGUM CITY

PROJECT NAME AND LOCATION:	SHEET CONTENTS:	DRAFTED:	REVIEWED:	SUBMITTED:	RECOMMENDED:	APPROVED:	SET NO.	SHEET NO.
CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE	GENERAL NOTES (ROADWAY 2)	**HERWIN EVAN J. HABABAG** ENGINEER II PREPARED: **WARREN S. PIÑEZ** ENGINEER II	**BENILDA S. PACQUIAO** ENGINEER III DATE:	**JEZABEL E. TULING, MPA** CHIEF, PLANNING AND DESIGN SECTION DATE:	**GARRY E. VERANO** OFFICER-IN-CHARGE OFFICE OF ASSISTANT DISTRICT ENGINEER DATE:	**ARTURO R. LONGYAPON** DISTRICT ENGINEER DATE:	D 1 1	5 11

ABBREVIATIONS

ABUTMENT	ABUT
AHEAD STATIONING	AH STA
AND	&
AREA	A
ASPHALT CONCRETE PAVEMENT	ACP
AT	@
AZIMUTH	AZIM.
BACK STATION	BK. STA.
BARANGAY	BRGY.
BEGINNING OF CIRCULAR CURVE	BCC
BEARING	BRG.
BEGINNING	BEG.
BELOW MEAN SEA LEVEL	BMSL
BENCHMARK	BM
BETWEEN	BET.
BORE HOLE	BH
BOTH SIDES	BS
BOTH WAYS	BW
BOTTOM	BOT.
BRIDGE	BR.
SUBDIVISION OF DECREASED PROPERTY BY BUREAU OF LANDS SURVEYORS	BSD.
BUREAU OF LANDS LOCATION MONUMENT	BLLM
CENTER	CTR.
CENTERLINE	℄
CENTIMETER	cm
CONCRETE HOLLOW BLOCK	CHB
CLEAR	CLR
COLUMN	COL.
CONCRETE	CONC.
CONCRETE HOLLOW BLOCK	CHB
CONCRETE MONUMENT	CONC. MON.
CONSTRUCTION	CONST.
CORNER	COR.
COVER	COV.
CROSS PIPE	CP
CUBIC METER	cu. m. / m3
CYLINDRICAL	CYL.
DEGREE OF CURVE	D
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS	DPWH
DETAIL	DET.
DIAMETER	DIA. / Ø
DIAPHRAGM	DIAP.
DISTANCE	DIST.
DRAWING	DRWG.
EAST	E
ELEVATION	ELEV. / EL.
END OF CIRCULAR CURVE	ECC
END OF PAVEMENT	EOP
ENGINEER	ENGR.
EQUATION	EQ.
EXCAVATION	EXCA.
EXISTING	EXIST. / EXTG.
EXPANSION	EXPN.
EXTENSION	EXTN.
EXTERIOR	EXTR.
EXTERNAL DISTANCE / EASTING	E
FINISHED	FIN.
FINISHED GRADE	FG.
FINISHED PAVEMENT LEVEL	FPL
GENERAL	GEN.
GROUND LEVEL	GL
HEAD WALL(s)	HW / HWS
HIGH FLOOD LEVEL	HFL
HIGH TIDE LEVEL	HTL
HIGH WATER LEVEL	HWL
HORIZONTAL	HOR.
INCHES	IN.
INTERSECTION ANGLE	I
INSIDE DIAMETER	ID
INTERIOR	INT.
KILOGRAM	KG.
KILOMETER	km.
KILOMETER PER HOUR	KPH
LEFT	Lt.
LENGTH OF CIRCULAR CURVE	LC
LENGTH OF VERTICAL CURVE	VC
LONGITUDUNAL	LONGIT.
MAXIMUM	MAX.
MAXIMUM FLOOD LEVEL	MFL
MEAN SEA LEVEL	MSL
METER	m
MILLIMETER	mm
MINIMUM	MIN.
MONUMENT	MON
NORTHING	N
NOT APPLICABLE	NA
NUMBER	NO.
ORDINARY WATER LEVEL	OWL
ORIGINAL GROUND LEVEL	OGL
OUTSIDE DIAMETER	bc.
PAVEMENT WIDTH	PW

PAVEMENT WIDTH	PW
PERCENT	%
PHILIPPINES	PHIL.
PIECES	PCS.
PLUS / MINUS	±
PUBLIC LAND SUBDIVISION	PLS
POINT OF INTERSECTION	PI
POINT OF CURVATURE	PC
POINT OF VERTICAL CURVE	PVC
POINT OF VERTICAL INTERSECTION	PVI
POINT OF VERTICAL TANGENT	PVT
POINT OF TANGENT	POT
PORTLAND CEMENT CONCRETE PAVEMENT	PCCP
PROJECT	PROJ.
PROJECT ROAD	PROJ. RD
PRIVATE SURVEY	P.S.
RADIUS	R
REFERENCE POINT	RP
REINFORCED CONCRETE BOX CULVERT	RCBC
REINFORCED CONCRETE PIPE CULVERT	RCPC
RETAINING WALL	RET. WALL
RIGHT OF WAY	ROW
ROAD	RD
SOUTH	S
SIDEWALK	SDWK
SUBDIVISION OF UNDECREASED PROPERTY	Csd
SQUARE	SQ.
SQUARE METER	sq. m. / m2
STANDARD	STD.
STATION	STA.
STRAIGHT	STR.
STREET	ST.
STRUCTURE	STRUCT.
TANGENT DISTANCE	T
TEMPERATURE	TEMP.
TEMPORARY BENCH MARK	TBM
VERTICAL	VERT
WIDTH	w
WITH	w/

LEGENDS AND SYMBOLS

DRAWING SYMBOLS

SYMBOL	ABBREVIATION	DESCRIPTION
	℄	ROADWAY CENTERLINE
		NORTH SIGNS
ELEV		ELEVATION CALLOUT
WATER LINE		WATER LEVEL
FLOW		WATER FLOW
PI-No.		POINT OF INTERSECTION
MATCH LINE STA. 0+000		MATCH LINE
N 000000 E 000000		GRID COORDINATES
AZIM = DIST. =	AZIM.	AZIMUTH
PROJECT STA. 0+000 N E ELEV.:		PLAN AND PROFILE CALLOUT
STA. 0+000 000 000 m		RCPC INVERSE ELEVATION PROFILE CALLOUT
DIRECTION		DIRECTION
DRWG. NO. DRAWING TITLE SCALE TOTAL SHT. NO. SHT. NO. ft		MAIN DRAWING TITLE
No. DRWG. NO. DRAWING TITLE SCALE ft		SECONDARY DRAWING TITLE
VIEW TARGET SHT. NO. SHT. NO.		CROSS SECTION SYMBOL (COMPLEX)
VIEW TARGET		CROSS SECTION SYMBOL (COMPLEX)
DETAIL TARGET SHT. NO. SHT. NO.		DETAIL CALLOUT

DRAWING SYMBOLS

SYMBOL	ABBREVIATION	DESCRIPTION
	BH	BORE HOLE
		CROSS SECTION MONUMENT
	BM	BENCH MARK
	IBM	INTERMEDIATE BENCH MARK
	PBM	PERMANENT BENCH MARK
	TP	TEST PIT
	GPS	GLOBAL POSITIONING SYSTEM
		TRAVERSE POINT
T-No.		TRAVERSE STATION AND LINE

TOPOGRAPHIC FEATURES, INFRASTRUCTURE AND UTILITIES

SYMBOL	ABBREVIATION	DESCRIPTION
155.50 155.50		MAJOR CONTOUR
154.00		MINOR CONTOUR
		EDGE OF ROAD (EXISTING)
		EDGE OF ROAD (PROPOSED)
		ASPHALT CONCRETE PAVEMENT
	PCCP	PORTLAND CEMENT CONCRETE PAVEMENT
		CHB/GROUTED/CONCRETE/ EARTH CANAL
2 (G301)		NATIONAL HIGHWAY
		EXISTING CANAL (PLAN)
		EXISTING CANAL (PROFILE)
	BR.	BRIDGE
		CROSS-DRAIN
		LATERAL PIPE
		RCBC
		MANHOLE
		GUARDRAIL
		CHB WALL FENCE
		WOOD OR BARBED WIRE FENCE
		CYCLONE FENCE
		CONCRETE SLOPE PROTECTION
		GROUTED RIPRAP SLOPE PROTECTION
		RIVER / CREEK

TOPOGRAPHIC FEATURES, INFRASTRUCTURE AND UTILITIES

SYMBOL	ABBREVIATION	DESCRIPTION
		TREES
		COCONUT
		BANANA PLANTATION
SC		SCHOOL
		CHURCH
AH		AMAKAN HOUSE
CH		CONCRETE HOUSE
WS		WOODEN STORE
MIX		COMBINATION OF CONCRETE AND WOODEN HOUSE
S		STORE
SB	SB	SIGN BOARD
SP	SP	STEEL POST
SEP	SEP	STEEL ELECTRIC POST
CP	CP	CONCRETE POST
CEP	CEP	CONCRETE ELECTRIC POST
	WEP	WOODEN ELECTRIC POST
	LP	LAMP POST

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PROJECT NAME AND LOCATION:
CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE

SHEET CONTENTS:
ABBREVIATIONS, LEGENDS AND SYMBOLS

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PREPARED:
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ENGINEER II

REVIEWED:
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DATE:

SUBMITTED:
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RECOMMENDED:
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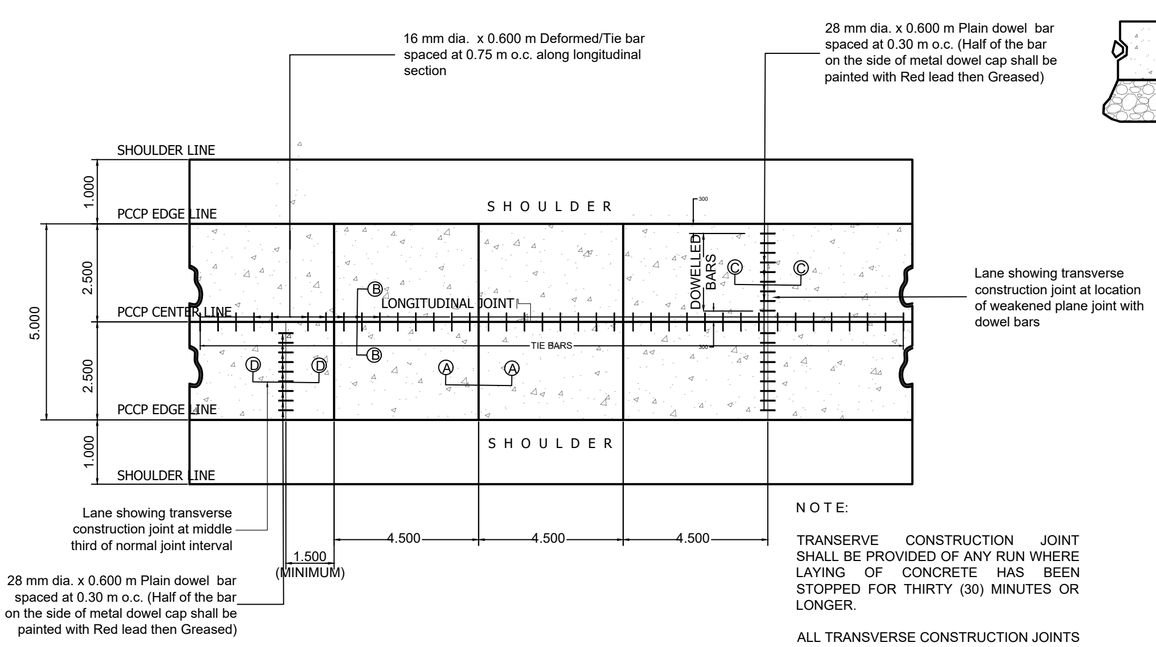
OFFICE OF ASSISTANT DISTRICT ENGINEER
DATE:

APPROVED:
ARTURO P. LONGYAPON
DISTRICT ENGINEER
DATE:

SET NO. E 1 1

SHEET NO. 6 11



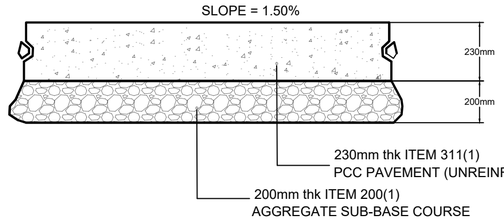
NOTE:

TRANSERVE CONSTRUCTION JOINT SHALL BE PROVIDED OF ANY RUN WHERE LAYING OF CONCRETE HAS BEEN STOPPED FOR THIRTY (30) MINUTES OR LONGER.

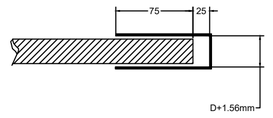
ALL TRANSVERSE CONSTRUCTION JOINTS SHOULD BE BUTT JOINTS WITH DOWEL.

TYPICAL BAR LAYOUT "T" THICK PAVEMENT

TYPICAL PLAN OF TWO-LANE DOWELLED PAVEMENT
NOT TO SCALE



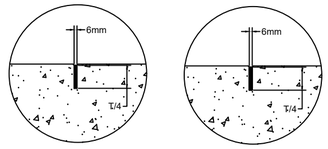
PAVEMENT SECTION
SCALE NTS



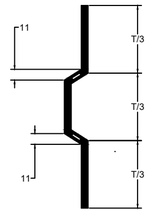
METAL CAP DOWEL DETAIL
SCALE NTS

TABLE SPACING OF TIE BARS (L=600 mm)		
SLAB THICKNESS (mm)	SPACING S1 (mm)	
	12 mm dia.	16 mm dia.
230	600	750
240	600	750
250	600	750
260	500	750
270	500	750
280	500	750
290	500	750
300	500	750
310	400	750
320	400	750
330	400	750
340	400	750

BASED ON AASHTO GUIDE FOR DESIGN OF PAVEMENT STRUCTURES 1993



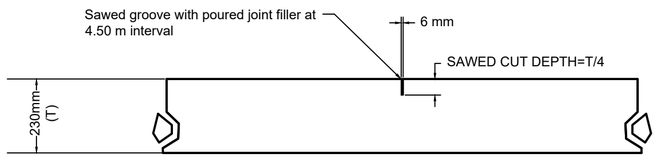
WEAKENED GROOVE DETAIL
SCALE NTS



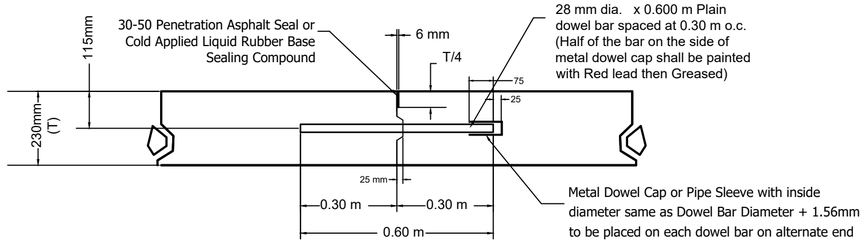
METAL SIDE FORM (KEYED JOINT)
DETAIL OF SIDE FORMS
SCALE NTS

TABLE SPACING OF PLAIN DOWEL BARS (L=600 mm)		
SLAB THICKNESS (mm)	DIAMETER,D (mm)	SPACING, S2(mm)
230	28	300
240	30	300
250	32	300
260	32	300
270	34	300
280	36	300

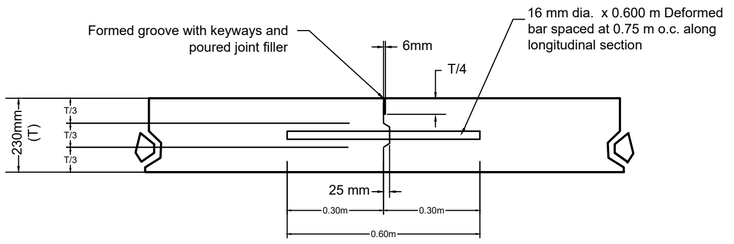
NOTE:
DIAMETER AND SPACING OF PLAIN DOWEL BARS MAY BE MODIFIED AS LONG AS THE EQUIVALENT STEEL AREA IS SUSTAINED.



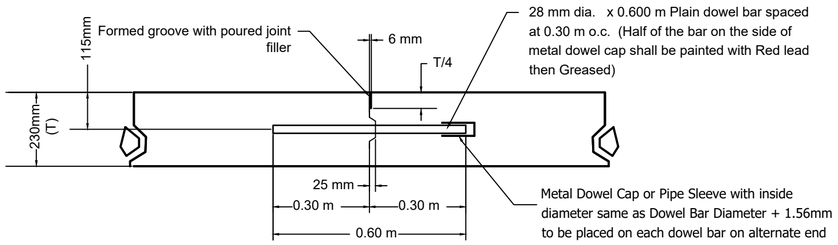
SECTION A - A
CONTRACTION JOINT SECTION
SCALE 1 : 20 M.



SECTION C - C
DOWELLED EXPANSION JOINT DETAIL
SCALE 1 : 20 M.



SECTION B - B
LONGITUDINAL CONSTRUCTION JOINT
SCALE 1 : 20 M.



SECTION D - D
BUTT TRANSVERSE CONSTRUCTION OR CONTACT JOINT
SCALE 1 : 20 M.

1. Materials and workmanship shall conform with the DPWH Standard Specification for Highways, Bridges and Airport, 2013
2. Contraction joints are formed when concrete on one side of the joint is poured ahead and allowed to set before pouring on the other side, No construction joint shall be placed within 1.50 m. from the weakened plane joint.
3. At construction joint (longitudinal or transverse) care should be taken that no concrete from the last slab placed overhangs any portion of the first slab.
4. Tie bars should be deformed steel bars. All dowel bars shall be smooth round steel bar free from rust and other defects which might restrict their movement.
5. Type of weakened plane joint to be used shall be as specified in the plans and only one type should be used for the whole project.
6. Material for the metal side form shall be brand new sheet metal Gauge no. 15 of black iron free from rust and links.
7. At least six (6) successive dowelled butt joints at normal joint spacing shall be provided before or after an expansion joint.
8. The groove or cracks above joints (longitudinal or transverse) shall be sealed with 30-50 penetration asphalt seal or cold applied liquid rubber compound after the concrete had been cured and before opening pavement to traffic. Asphalt sealed should be poured in such manner that spalling shall be prevented/ eliminated, thus, provide a smooth leveling/ riding surface.
9. All transverse joints except construction joint shall be continuous from edge to edge.
10. All longitudinal joints shall meet at intersections with no gaps or offset.
11. All dimensions are in millimeters unless otherwise specified.
12. Avoid stoppage of formworks along curves.
13. Construct expansion joint at every 90 meters and/or every adjacent existing structures.

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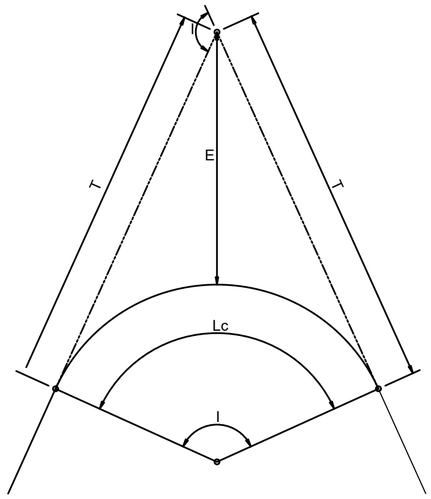


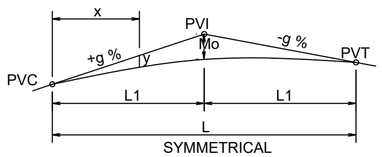
HORIZONTAL CURVE (CIRCULAR)

LEGEND: (HORIZONTAL CIRCULAR CURVE)

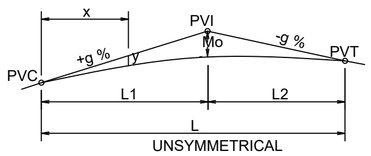
PI	=	POINT OF INTERSECTION
I	=	INTERSECTION ANGLE (CENTRAL ANGLE)
T	=	TANGENT DISTANCE
R	=	RADIUS
Lc	=	LENGTH OF CURVE
E	=	TOTAL EXTERNAL DISTANCE
PC	=	POINT OF CURVATURE
PT	=	POINT OF TANGENCY

NOTE:

1. NO HORIZONTAL CURVE IS REQUIRED WHEN THE INTERSECTION (CENTRAL ANGLE) I IS LESS THAN ONE DEGREE (1°00').
2. LENGTH OF CIRCULAR CURVE, Lc = (pi)RI/180.



SYMMETRICAL



UNSYMMETRICAL

VERTICAL PARABOLIC CURVE

LEGEND: (HORIZONTAL CIRCULAR CURVE)

PVI	=	POINT OF VERTICAL INTERSECTION
PVC	=	POINT OF VERTICAL CURVATURE
PVT	=	POINT OF VERTICAL TANGENCY
L	=	LENGTH OF VERTICAL CURVE
g	=	GRADE IN PERCENT
Mo	=	MIDDLE ORDINATE
x	=	DISTANCE FROM PVC OR PVT TO ANY POINT OF CURVE
y	=	VERTICAL OFFSET IN METERS
A	=	ALGEBRAIC DIFFERENCE OF GRADES

NOTE:

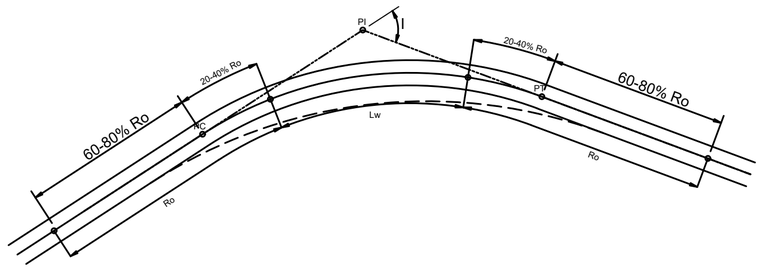
1. NO VERTICAL CURVE IS REQUIRED WHEN THE ALGEBRAIC DIFFERENCE IN GRADES IS LESS THAN 0.50% IN ANY VERTICAL PARABOLIC CURVE.

SYMMETRICAL

$$Mo = \frac{AL}{800} \qquad y = \frac{x^2(Mo)}{(L/2)^2}$$

UNSYMMETRICAL

$$Mo = \frac{AL_1L_2}{200L} \qquad y = \frac{x^2(Mo)}{(L)^2_1 \text{ or } (L)^2_2}$$



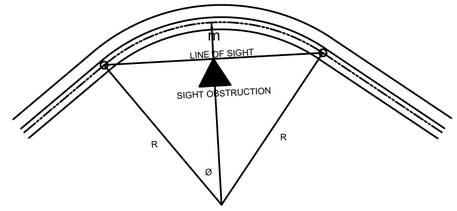
$$m = R \text{ vers } Ø$$

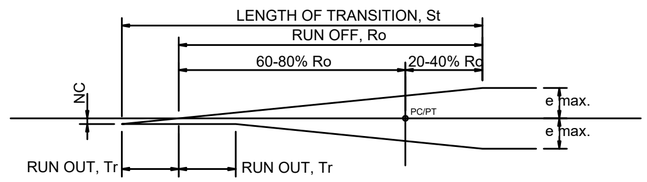
$$m = \frac{1145.92}{D} \text{vers} \frac{SD}{40}$$

$$m = R \text{ vers} \frac{28.65\ S}{R}$$

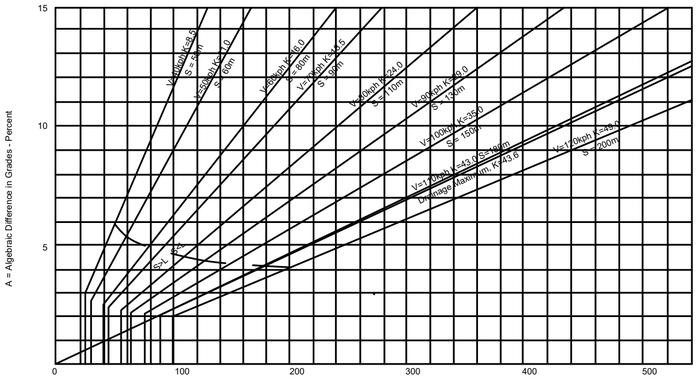
$$S = \frac{R}{28.65} \cos^{-1} \frac{R-m}{R}$$

D	=	DEGREE OF CURVE
R	=	RADIUS OF CURVE
V	=	ASSUMED DESIGN SPEED
S	=	STOPPING SIGHT DISTANCE
m	=	MIDDLE ORDINATE
Ø	=	1/2 OF INTERSECTION ANGLE



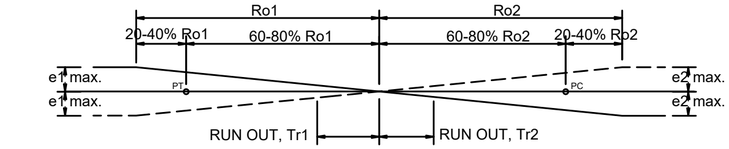


SHOWING HALF OF TRANSITION/EASEMENT - HORIZONTAL CURVATURE AND SUPERELEVATION
(DIAGRAMMATIC PROFILE - PAVEMENT REVOLVED ABOUT CENTERLINE)



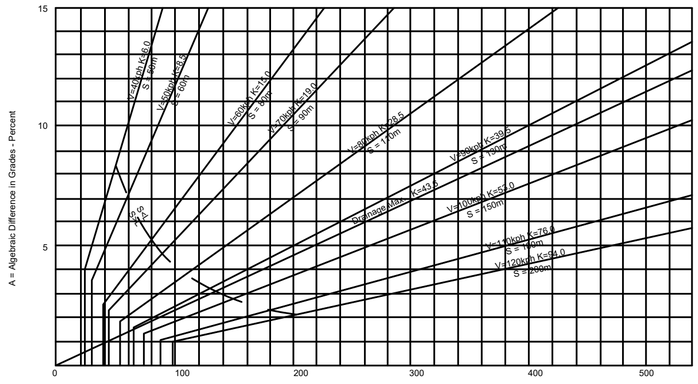
L=MINIMUM LENGTH OF VERTICAL CURVES - METERS

DESIGN CONTROLS FOR SAG VERTICAL CURVE
BASED ON MINIMUM STOPPING SIGHT DISTANCE, (HEADLIGHT DISTANCE)



SHOWING HALF OF TRANSITION/EASEMENT - REVERSED HORIZONTAL CURVATURE AND SUPERELEVATION
(DIAGRAMMATIC PROFILE - PAVEMENT REVOLVED ABOUT CENTERLINE)

Notes: Values shown are for WB-19 design vehicle and represent widening in meters; for other design vehicles use adjustments in Table 3-23
Values less than 0.6m may be disregarded.
For 3-lane roadways, multiply above values by 1.5.
for 4-lane roadways, multiply above values by 2
Source: Table 3-26a in AASHTO, 2011. A Policy on Geometric Design of Highways and Streets 6th Edition. Used by Permission.



L = KA

K $\frac{s^2}{426}$ (K ROUNDED)

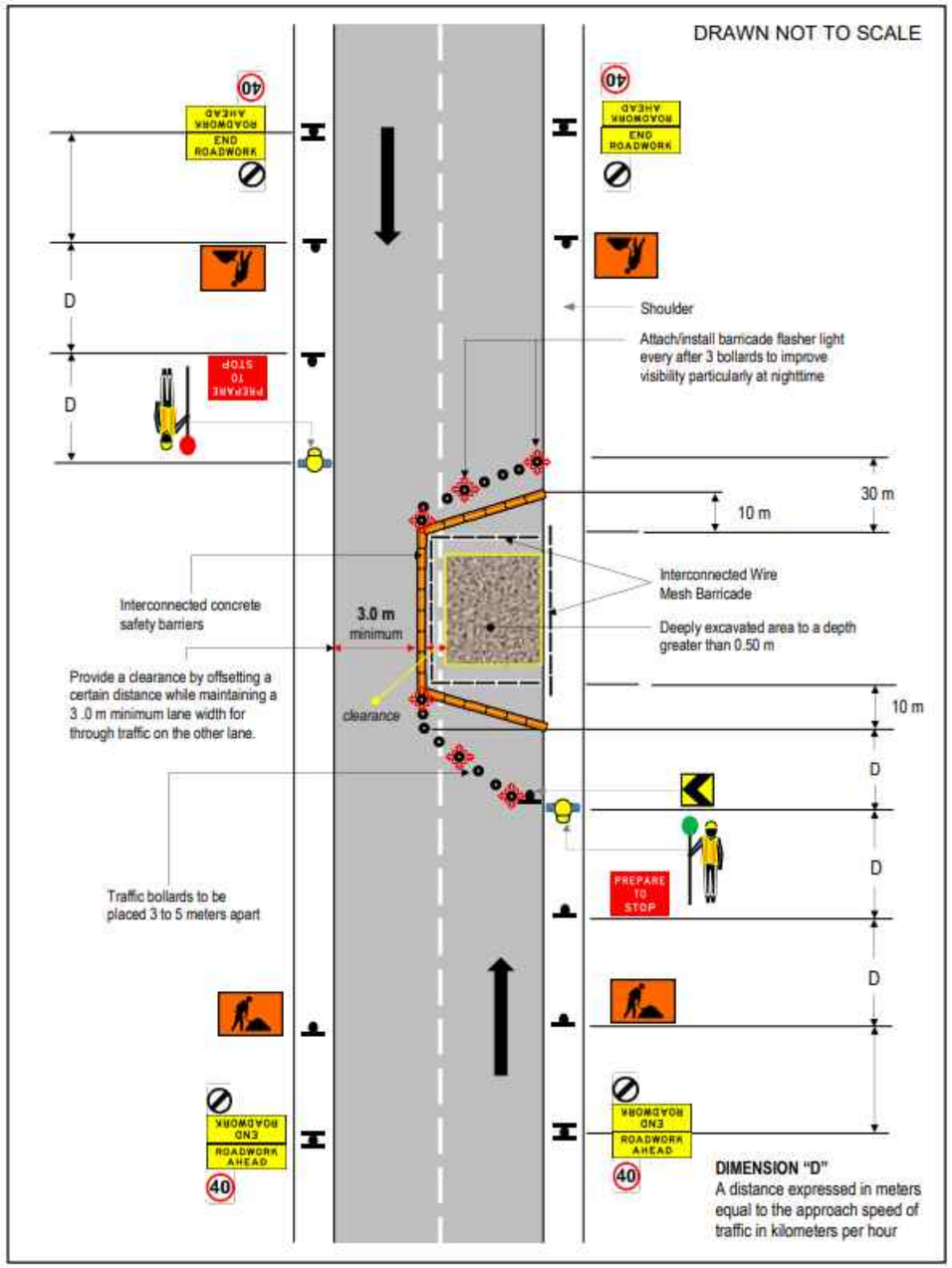
L=MINIMUM LENGTH OF VERTICAL CURVES - METERS

DESIGN CONTROLS FOR CREST VERTICAL CURVE
BASED ON MINIMUM STOPPING SIGHT DISTANCE, (S)

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
REGION XI
DAVAO DEL NORTE
2ND DISTRICT ENGINEERING OFFICE
TAGUM CITY

PROJECT NAME AND LOCATION:	CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE
SHEET CONTENTS:	DESIGN REQUIREMENTS OF CURVES
DRAFTED:	**HERWIN EVAN J. HABABAG** ENGINEER II
PREPARED:	**WARREN S. PIÑEZ** ENGINEER II
REVIEWED:	**BENILDA S. PACQUIAO** ENGINEER III DATE:
SUBMITTED:	**JEZABEL E. TULING, MPA** CHIEF, PLANNING AND DESIGN SECTION DATE:
RECOMMENDED:	**GARRY L. VERANO** OFFICER-IN-CHARGE OFFICE OF ASSISTANT DISTRICT ENGINEER DATE:
APPROVED:	**ARTURO R. LONGYAPON** DISTRICT ENGINEER DATE:
SET NO.	H 1 1
SHEET NO.	8 11

LAYOUT 7 (Case 2) – Part Lane Closure – 2 Lane, 2 Way Road, High Speed, Long Term (Works involving deep excavations)



ROAD & BRIDGE WORK SITE TEMPORARY SIGNAGE		SIGN No.	SIZE (mm) (WidthxHeight)
LEGEND:			
40	SPEED RESTRICTION	R4-10	600X800
CAUTION ROAD WORKS AHEAD	ROADWORK AHEAD	T1-1	1800x600
END ROADWORK	END ROADWORK	T2-16	1800x600
	END SPEED RESTRICTION	R4-2	600x800
	WORKMEN AHEAD (SYMBOLIC)	T1-5	900x600
PREPARE TO STOP	PREPARE TO STOP	T1–18	900x600
ROAD MACHINERY AHEAD	HEAVY MACHINERY AHEAD		1600x600
	TEMPORARY HAZARD MARKER	T5-5	550x450
	TEMPORARY BOLLARDS		
	TEMPORARY BOLLARDS WITH FLASHER		

USE OF TRAFFIC CONTROLLERS (FLAGMEN)

1. THE TRAFFIC CONTROLLER USES A POTABLE STOP/SLOW HAND SIGN OR RED AND GREEN STOP/GO FLAG TO CONTROL THE TRAFFIC.

2. WHEN CONTROLLING TRAFFIC. A TRAFFIC CONTROLLER SHOULD ENSURE THAT A SYMBOLIC WORKMAN SIGN AND PREPARE TO STOP SIGN AND ADDITIONAL SIGNS AND DEVICES REQUIRED FOR THE OVERALL WORKSITE TRAFFIC MANAGEMENT SCHEME ARE IN PLACE TO PROVIDE ADVANCE WARNING AND INFORMATION TO ROAD USERS

3. THE TRAFFIC CONTROLLER SHOULD STAND APPROXIMATELY 30METERS IN ADVANCE OF WORK AREA

4. THE TRAFFIC CONTROLLER SHOULD BE VISIBLE TO THE APPROACHING ROAD USER AND STAND ON THE CURE SIDE OF SHOULDER CLEAR OF THE TRAVELLED PATH TO THE VIEW BOTH THE WORKSITE AND ONCOMING TRAFFIC.

5. TRAFFIC CONTROLLER WILL NEED TO USE TWO-WAY RADIOS TO ENSURE ADEQUATE COMMUNICATION OVER LONG DISTANCE OR WHERE THERE IS LIMITED VISIBILITY.

NOTE :
ALL PERSONNEL WORKING ON OR ADJACENT TO A ROADWORK SITE SHALL WE APPROPRIATE ROAD SAFETY MATERIALS SUCH AS HIGH VISIBILITY VEST(MADE FROM FLOURESCENT REDIORANGE MATERIAL), HARDHAT AND SAFETY SHOES.

REFERENCES:
- D.O NO.13,SERIES 2018-GUIDELINE FOR THE PREPARATION OF COST ESTIMATES FOR THE TRAFFIC MANAGEMENT AND SAFETY AND HEALTH REQUIREMENTS FOR THE CONSTRUCTION AND MAINTENANCE OF ROADS, BRIDGES AND SAFETY AND HEALTH.

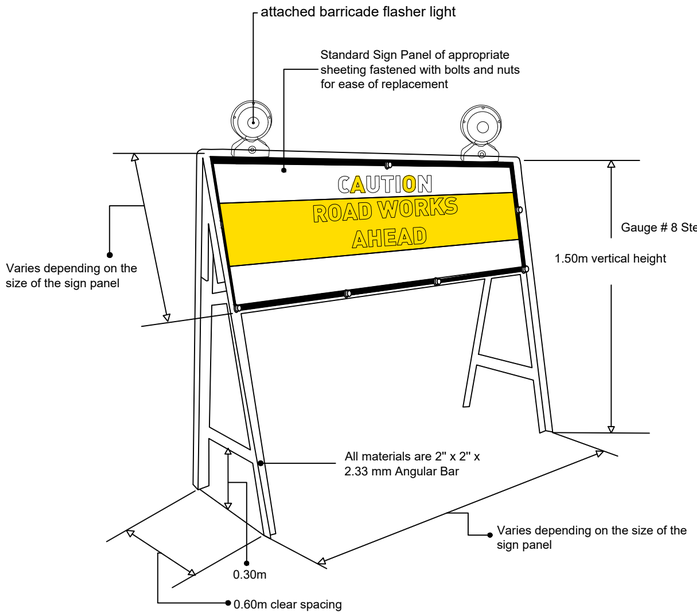
- ROAD SAFETY MANUAL 2004

- PART 2: ROAD SAFETY AND PAVEMENT DESIGN MANUAL 2012

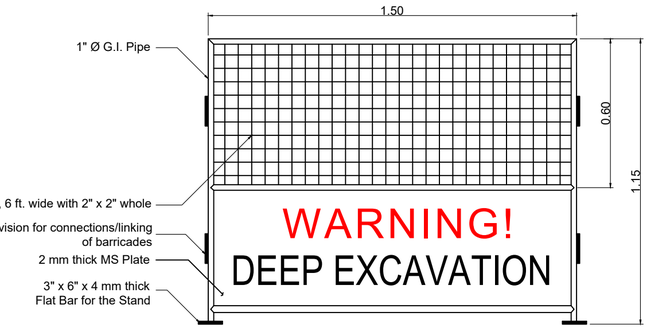
TRAFFIC MANAGEMENT LAYOUT
NOT TO SCALE

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
REGION XI
DAVAO DEL NORTE
2ND DISTRICT ENGINEERING OFFICE
TAGUM CITY

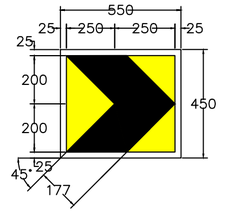
PROJECT NAME AND LOCATION:	SHEET CONTENTS:	DRAFTED:	REVIEWED:	SUBMITTED:	RECOMMENDED:	APPROVED:	SET NO.	SHEET NO.
CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE	TRAFFIC MANAGEMENT LAYOUT	HERWIN EVAN J. HABABAG, ENGINEER II PREPARED: WARREN S. PIÑEZ, ENGINEER II	BENILDA S. PACQUIAO, ENGINEER III DATE:	JEZABEL E. TULING, MPA, CHIEF, PLANNING AND DESIGN SECTION DATE:	GARRY P. VERANO, OFFICER-IN-CHARGE, OFFICE OF ASSISTANT DISTRICT ENGINEER DATE:	ARTURO P. LONGYAPON, DISTRICT ENGINEER DATE:	K 1 1	9 11



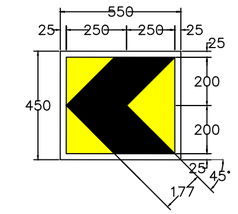
DETAILS OF THE TWO SIDED SIGN FRAMES



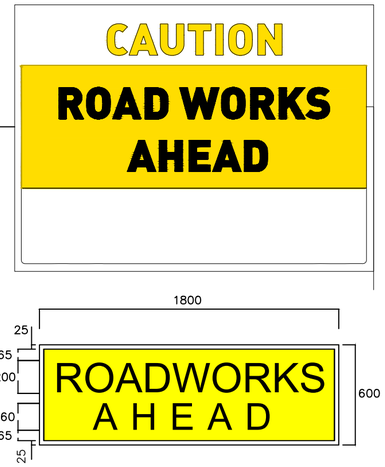
CONSTRUCTION SAFETY FENCE DETAIL



OR

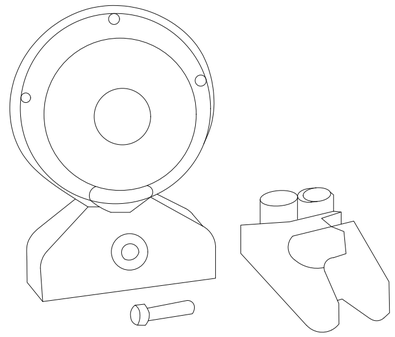


NOTE: BLACK SYMBOLS AND BORDER ON A YELLOW RETRO-REFLECTIVE BACKGROUND



NOTE: BLACK LETTERS AND BORDER ON A YELLOW RETRO-REFLECTIVE BACKGROUND

ROAD WORK AHEAD DETAIL

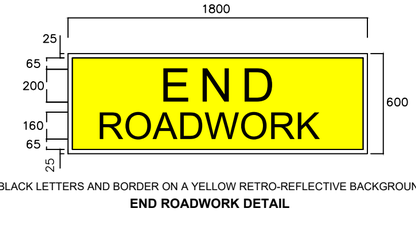


NOTE: FLASHER LIGHT 3 VOLTS, BATTERY OPERATED, AMBER COLOR W/ LIFESPAN CONSIDERATION OF 6 MONTHS

FLASHER LIGHT

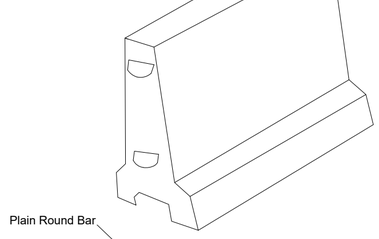
NOTE: BLACK NUMERALS ON A WHITE RETRO-REFLECTIVE BACKGROUND AND RED REFLECTORIZED CIRCLE

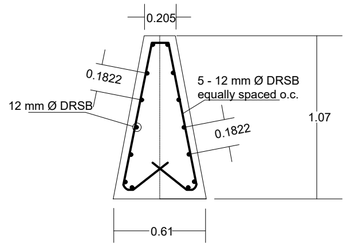
SPEED RESTRICTION

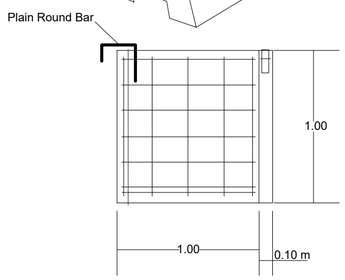


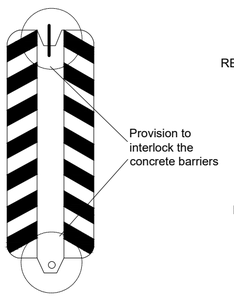
NOTE: BLACK LETTERS AND BORDER ON A YELLOW RETRO-REFLECTIVE BACKGROUND

END ROADWORK DETAIL

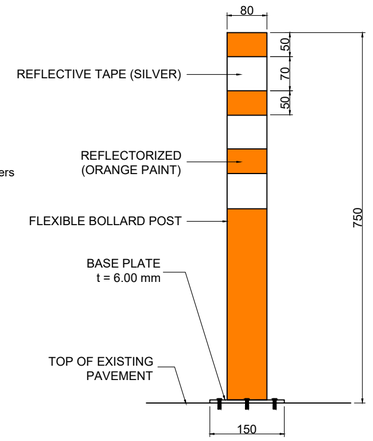








CONCRETE BARRIER DETAIL



NOTE :

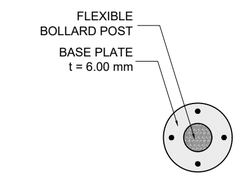
1. TEMPORARY BOLLARD SHALL BE FLUORESCENT RED OR ORANGE PLASTIC THAT IS RESILIENT TO IMPACT & WILL NOT DAMAGE VEHICLES WHEN HIT AT LOW SPEED.

2. THE HEIGHT OF BOLLARDS IS UP TO 1 METER.

3. FOR NIGHT TIME OPERATION THE BOLLARDS MUST BE FITTED WITH REFLECTIVE TAPE WITH A MINIMUM BANDWIDTH OF 250mm.
(See Lay-out Plan for the Standard Spacing)

REFERENCES

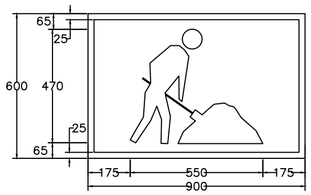
- ROAD SAFETY MANUAL 2004
- PART 2: ROAD SAFETY AND PAVEMENT DESIGN MANUAL 2012



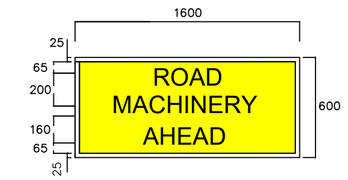
BOLLARD DETAIL

NOTE: SYMBOL 600 DIA BLACK ON A WHITE RETRO-REFLECTORIZED BACKGROUND

END SPEED RESTRICTION

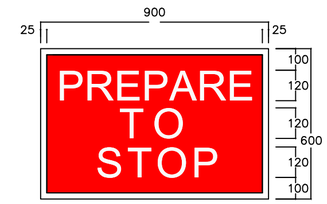


NOTE:
BLACK SYMBOLS AND BORDER
- RED/ORANGE FLOURESCENT BACKGROUND FOR DAYTIME USE (SHORT TERM)
- RED/ORANGE RETRO-REFLECTIVE BACKGROUND FOR NIGHTTIME USE (LONG TERM)



NOTE: BLACK LETTERS AND BORDER ON A YELLOW RETRO-REFLECTIVE BACKGROUND

ROAD MACHINERY AHEAD DETAIL



NOTE: WHITE LETTERS ON A RED RETRO-REFLECTIVE BACKGROUND

PREPARE TO STOP DETAIL

LAYOUT 7 (Case 2) – Part Lane Closure – 2 Lane, 2 Way Road, High Speed, Long Term

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
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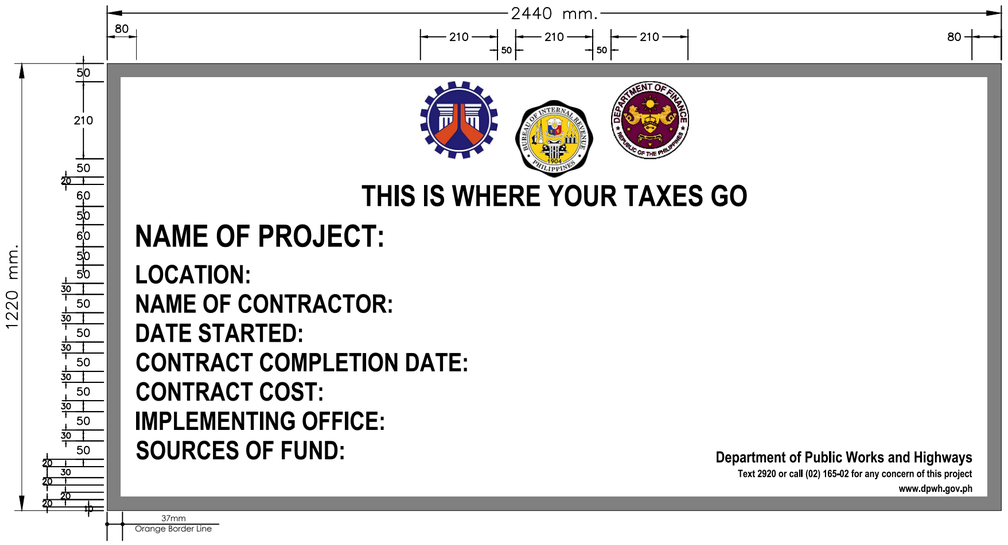
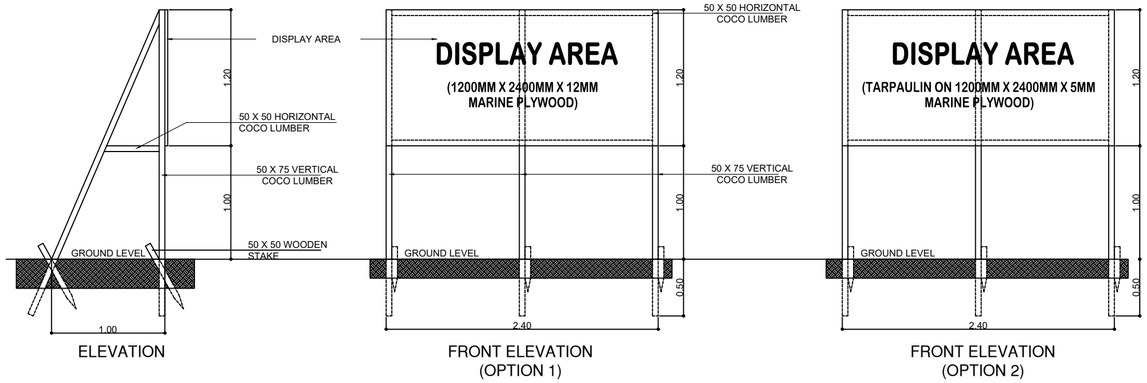
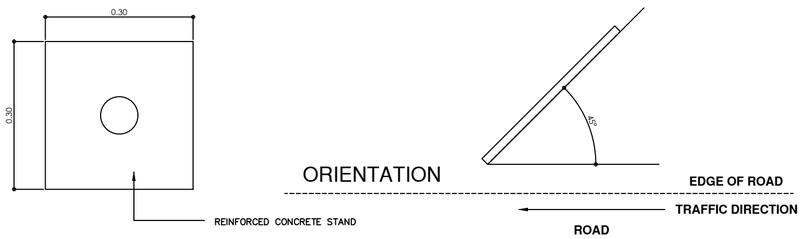
DAVAO DEL NORTE
2ND DISTRICT ENGINEERING OFFICE
TAGUM CITY

PROJECT NAME AND LOCATION:	SHEET CONTENTS:	DRAFTED:	REVIEWED:	SUBMITTED:	RECOMMENDED:	APPROVED:	SET NO.	SHEET NO.
CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE	TRAFFIC SIGN DETAILS	**HERWIN EVAN J. HABABAG** ENGINEER II PREPARED: **WARREN S. PIÑEZ** ENGINEER II	**BENILDA S. PACQUIAO** ENGINEER III DATE:	**JEZABEL E. TULING, MPA** CHIEF, PLANNING AND DESIGN SECTION DATE:	**GARRY E. VERANO** OFFICER-IN-CHARGE OFFICE OF ASSISTANT DISTRICT ENGINEER DATE:	**ARTURO R. LONGYAPON** DISTRICT ENGINEER DATE:	O 1 1	10 11



DPWH STANDARD PROJECT BILLBOARD





BILLBOARD FRAME DETAIL

COA BILLBOARD

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DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
REGION XI
DAVAO DEL NORTE
2ND DISTRICT ENGINEERING OFFICE
TAGUM CITY

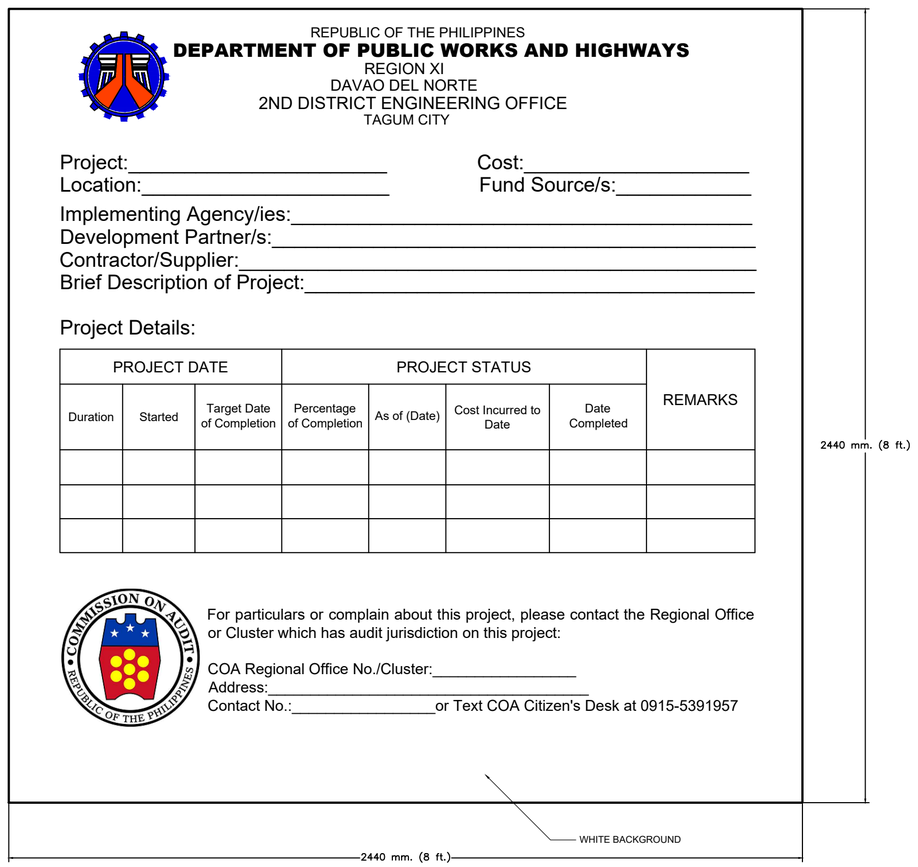
Project:_____ Cost:_____
Location:_____ Fund Source/s:_____
Implementing Agency/ies:_____
Development Partner/s:_____
Contractor/Supplier:_____
Brief Description of Project:_____

Project Details:

PROJECT DATE			PROJECT STATUS				REMARKS
Duration	Started	Target Date of Completion	Percentage of Completion	As of (Date)	Cost Incurred to Date	Date Completed	

For particulars or complain about this project, please contact the Regional Office or Cluster which has audit jurisdiction on this project:

COA Regional Office No./Cluster:_____
Address:_____
Contact No.:_____or Text COA Citizen's Desk at 0915-5391957



NOTE :

1. THE NEW BILLBOARD DESIGN LAYOUT, DIMENSION AND LETTER SIZES ON WHITE BACKGROUND, AS SHOWN ON THE ATTACHED DRAWING, SHALL BE DEPICTED ON A STANDARD BILLBOARD MEASURING 1200mm. x 600mm. (2ft. x 4ft.) USING 12.50mm. (1/2 INCH) THICK MARINE PLYWOOD OR TARPAULIN OF THE SAME SIZE POSTED ON 5mm. (3/16 INCHES) MARINE PLYWOOD.
2. ALL EXISTING BILLBOARDS OF ON-GOING PROJECTS SHALL BE REPLACED WITH NEW ONE ADOPTING THE ABOVE GUIDELINES.
3. FOR EACH BUILDING PROJECT, THE BILLBOARD SHALL BE INSTALLED IN FRONT OF THE PROJECT.
4. FOR EACH ROAD/ BRIDGE/ FLOOD CONTROL PROJECT, TWO BILLBOARD SHALL BE INSTALLED, ONE AT THE BEGINNING AND ONE AT THE END OF PROJECT.
5. NAME(S) AND/ OR PICTURE(S) OF ANY PERSONAGE SHOULD NOT APPEAR IN THE BILLBOARD.
6. NO OTHER BILLBOARDS SHALL BE ALLOWED TO BE INSTALLED 100 METERS BEFORE AND 100 METERS AFTER ALL DPWH PROJECT AND IN-BETWEEN THE PROJECT LIMITS OR WITHIN THE ROAD RIGHT-OF-WAY.
7. DPWH CONTRACTORS SHALL NOT BE ALLOWED TO PLACE NAMES OF POLITICIANS OR CARRY POLITICAL BILLBOARD ON THEIR EQUIPMENT.

-DO #21, S.2017

NOTE :

* INSTALLATION OF BILLBOARD SHALL BE ONE(1) AT THE BEGINNING & ONE(1) AT THE END OF THE PROJECT.
* NAMES OR PICTURES OF ANY PERSONAGES SHOULD NOT APPEAR IN THE BILLBOARD.
* NO POLITICAL BILLBOARD SHALL BE ALLOWED TO BE INSTALLED 100m BEFORE & 100m AFTER ALL DPWH PROJECTS & IN BETWEEN THE PROJECT LIMITS OR WITHIN THE ROAD-RIGHT-OF-WAY.
* DPWH CONTRACTORS SHALL NOT BE ALLOWED TO PLACE NAMES OF POLITICIANS ON THEIR EQUIPMENT OR CARRY POLITICAL BILLBOARD ON THEIR EQUIPMENT.

REPUBLIC OF THE PHILIPPINES
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PROJECT NAME AND LOCATION:	SHEET CONTENTS:	DRAFTED:	REVIEWED:	SUBMITTED:	RECOMMENDED:	APPROVED:	SET NO.	SHEET NO.
CONSTRUCTION OF ROAD WITH BRIDGE, SITIO BULAHAN TO PUROK 2, BARANGAY SAN JOSE, SANTO TOMAS, DAVAO DEL NORTE	DPWH AND COA STANDARD BILLBOARD	**HERWIN EVAN J. HABABAG** ENGINEER II PREPARED: **WARREN S. PIÑEZ** ENGINEER II	**BENILDA S. PACQUIAO** ENGINEER III DATE:	**JEZABEL E. TULING, MPA** CHIEF, PLANNING AND DESIGN SECTION DATE:	**GARRY E. VERANO** OFFICER-IN-CHARGE OFFICE OF ASSISTANT DISTRICT ENGINEER DATE:	**ARTURO R. LONGYAPON** DISTRICT ENGINEER DATE:	M 1 1	11 11