

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
BABAK-SAMAL-KAPUTIAN RD - K1506+054 - K1507+633

SECTION : BABAK-SAMAL-KAPUTIAN ROAD LOCATION : IGACOS, DAVAO DEL NORTE STATION LIMITS : K 1506+054.00 - K 1507+633.00

NET LENGTH: 1,573.00 LN.M ASPHALT OVERLAY/3.146 LANE.KM

ROAD SECTION I.D : S00095MN

SUBMITTED:

JEZABEL E. TULING, MPA CHIEF, PLANNING & DESIGN SECTION

DATE:

RECOMMENDED:

GARRY E. VERANO OFFICER-IN-CHARGE

OFFICER-IN-CHARGE
OFFICE OF ASSISTANT DISTRICT ENGINEER
DATE:

APPROVED:

ARTURO P. LONGYAPON DISTRICT ENGINEER

DATE:

PROJECT LIMITS:

RBIA LENGTH:

ROAD ASPHALT OVERLAY:

K 1506 + 000 - K 1507 + 000 = 994.00 LN.M K 1507 + 000 - K 1508 + 000 = 1007.00 LN.M

K 1506 + 054 - K 1507 + 633 = 1,573.00 LN.M. NET LENGTH = 1,573.00 LN.M.

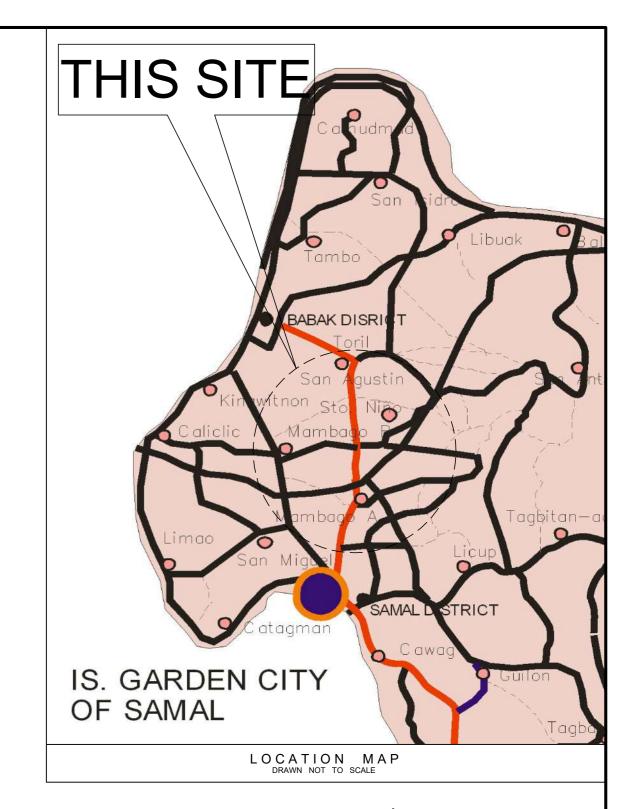
INDEX OF DRAWINGS

BABAK-SAMAL-KAPUTIAN RD -

K1506+054 - K1507+633

DAVAO DEL NORTE 2ND DISTRICT ENGINEERING OFFICE

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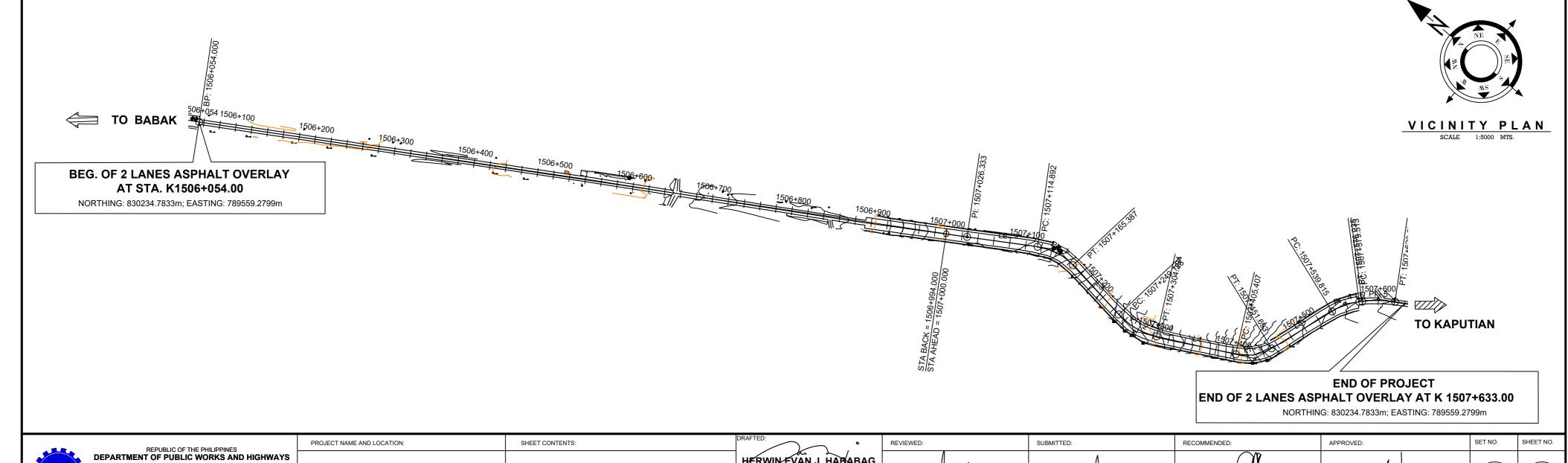


ARTURO P LONGYAPON
DISTRICT ENGINEER

36

GARRY E. XERANO

OFFICE RINGHARGE
OFFICE OF THE ASSISTANT DISTRICT ENGINEER
DATE:



HERWIN EVAN J. HABABAG

WARREN S. PIÑEZ

INDEX OF DRAWINGS, PROJECT LIMITS, VICINITY PLAN, LOCATION MAP

BENILDA S. PACQUIAO

DATE: V

JEZABEL E. TULING, MPA

CHIEF, PLANNING AND DESIGN SECTION

G E N E R A L N O T E S

SPECIFICATIONS

1. All works shall comply with the "DPWH STANDARD SPECIFICATION VOLUME II, HIGHWAYS, BRIDGES AND AIRPORTS 2013", special provision and supplemental specifications pertaining to this project.

DIMENSIONS

- Distance 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 S9111 Plus STNS95321007 (Base), Stonex S9111 Plus STNS95491002 (Rover)
- 3. Date surveyed: January 15 16, 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 refers to the elevation of the original ground along the centerline of the project road.

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 2004 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 (1988).
- 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 (1988). 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.
- 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 located at Mabuhay, Carmen (29.28 km. from the project site). Disposal site is one (1) km. away from project limit.
- 12. Design was based on survey data submitted by the Survey and Investigation Section of the Planning and Design Section of the DPWH-Davao del Norte Engineering Sub-District Office.

SUBBASE AND BASE COURSE

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. In areas 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
- 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. If reinforcing steel bars are used, mortar blocks of approved dimension shall be installed at specific intervals to maintain uniform clearance from the base.
- 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.
- 6. All joints shall be sufficiently sealed with asphalt sealant prior to opening to vehicular traffic.
- The use of type III portland cement meeting the requirements of AASHTO M-85 for high-early strength mix or type I portland cement with accelerating admixtures conforming to the requirements of AASHTO M-194 shall be used.
- 8. The entire surface of the newly placed concrete shall be cured with either one of the curing materials specified in ITEM 708.1 of the DPWH Standard Specificationsm Volume II, 1995.

FOR ASPHALT OVERLAY

- Item 310 shall consist of constructing a bituminous concrete surface course composed of aggregates, mineral
 filler, and bituminous material mixed in a central plant, constructed and laid hot on the prepared base in
 accordance with this specification and in conformity with lanes, grades, thickness and typical cross-section
 shown on the plans.
- Bituminous material shall be either medium curing (MC) cut-back asphalt cement, whichever is called for in the bill of quantities. It shall conform to the requirements of ITEM 702, Bituminous Materials. The penetration grade, type and grade of bituminous material shall be specified in the special provisions.
- 3. Aggregates shall conform to the requirements of ITEM 307, Bituminous Plant Mix Surface.
- 4. The proportion of bituminous material on the basis of total dry aggregate shall be from 5.0 to 0.8 mass percent. The exact percentage to be used shall be fixed by the engineer in accordance with the job-mix formula and the other quality control requirements.
- During the mixing operation, one half to one (0.50 to 1.0) mass percent of hydrated lime, dry aggregate basis shall be added to the mixture. The lower percentage limit is applicable to aggregate which are predominantly calcareous.
- 6. The construction requirements shall be in accordance whenever applicable with SECTION 307.3.
- 7. All deteriorated transverse and longitudinal joints shall be sealed with asphalt prior to laying of asphalt mix.
- All cracks shall be sealed using machine pressurized epoxy injection. Spacing of copper tubes used in epoxy
 injection shall have a minimum and maximum spacing of 100 mm and 150 mm respectively depending on the
 extent of the cracks.
- 9. The contractor shall be responsible for handling materials and performing all parts of the work shall be approved by the engineer as to design, capacity and mechanical condition. The equipment shall be at the jobsite sufficiently ahead of the start of construction operations to be examined thoroughly and approved.
- 10. The Asphalt Overlay must attain an IRI of 3m/km.

EARTHWORK

- 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.
- 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.
- 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.

MISCELLANEOUS STRUCTURES

 The application of paint for pavement markings shall be preferably carried out by a machine specially made for this propose but where brushed are used, only round or oval brushes not exceeding 100mm in width will be permitted. The paint shall be so applied as to produce a uniform, even coating in close contact with the surface being painted.

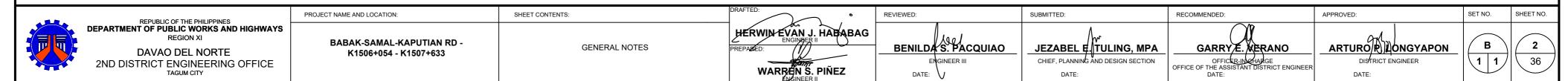
REFERENCES:

- 1. Revised DPWH Manual on Highway Safety Design Standards, May 2012 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
- 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

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 and Investigation Unit

	LEGEND				
SYMBOLS	DESCRIPTION	SYMBOLS	DESCRIPTION		
СН	CONCRETE HOUSE	•	BENCH MARK		
Р	PUROK	CEP	CONCRETE ELECTRIC POST		
WH	WOODEN HOUSE	WEP	WOODEN ELECTRIC POST		
H	EXISTING RCC PIPE		CENTERLINE		
Θ	SIDE SHOT REMARK		EDGELINE		
	JUNCTION ROAD		SHOULDER LINE		
* *	VARIOUS TREES		RROW LINE		
RP-2 RP-2	REFERENCE POINTS		GRAVEL		
	WATER FLOW DIRECTION		ASPHALT OVERLAY		
()	WATERWAY		REBLOCKING		
	RCC PIPE PROFILE	<u></u>	CYLINDRICAL MONUMENT		
	FENCE	PI	POINT OF INTERSECTION		
	HEADWALL		BARBWIRE FENCE		
\bigcirc	TURNING POINTS		REMOVAL OF EXISTING ASPI		



ITEM NO.	DESCRIPTION	UNIT	QUANTITY	REMARKS
Part B	Other General Requirement			
B.4(1)	Construction Survey and Staking	km	1.57	
B.5	Project Billboard/Signboard	ea	4.00	COA & DPWH Billboard
B.7(2)	Occupational Safety and Health Program	ls	1.00	
B.8(2)	Traffic Management	Is	1.00	
B.9	Mobilization and Demobilization	ls	1.00	
Part C	Earthworks			
101(2)	Removal of Structures and Obstructions	ea	526.00	SEE SCHEDULE
101(3)b3	Removal of Actual Structures/Obstruction (0.23m thk. PCCP-Unreinforced)	sq.m.	2,164.00	SEE SCHEDULE
101(3)c1	Removal of Actual Structures/Obstruction (0.05m thk ACP)	sq.m.	98.00	SEE SCHEDULE
101(10)	Removal of Existing Road Signages	ea	4.00	SEE SCHEDULE
102(1)	Unsuitable Excavation	cu.m	541.00	322 301 123 32E
103(1)b	Structure excavation (Soft Rock)	cu.m	49.00	
103(3)	Foundation Fill	cu.m	2.00	
105(1)a	Subgrade Preparation (Soft Rock Material)	sq.m.	2,163.98	
Dart C	Subbase and Pase Course			
Part C 200(1)	Subbase and Base Course Aggregate Subbase Course	cu.m	433.00	
Part E	Surface Course			
300(1)	Gravel Surface Course	cu.m	264.00	
302(2)	Emulsified Asphalt	sq.m.	19,190.60	
310(1)b	Bituminous Concrete Surface Wearing Course, Hot Laid (40 mm. thk.)	sq.m.	10,339.74	
310(2)b	Bituminous Concrete Surface Binder Course, Hot Laid (40 mm. thk.)	sq.m.	11,265.34	
311(1)e1	PCC Pavement (Unreinforced), 0.28m thk. 14 days	sq.m.	2,163.98	
Part G	Drainage and Slope Protection Structures			
404 (1)a	Reinforcing Steel (Grade 40)	kg	212.78	
404 (1)b	Reinforcing Steel (Grade 60)	kg	1058.36	
405 (1)a2	Structural Concrete, Class "A", 14days	cu.m	18.78	
TUJ (1)a2	Structural Concrete, Class A , ITuays	Cu.III	10.70	
Part H	Miscellaneous Structures		1.00	CEE DETAIL C AND COLLEGE
605 (1)g2	Warning Signs; 600mm-1B, Intersection and junction signs cross road	ea.	1.00	SEE DETAILS AND SCHEDULE
605 (1)I2	Warning Signs; 600mm-W2-6B (Intersection and Junction Signs Side Road Junction L or R)	ea.	1.00	SEE DETAILS AND SCHEDULE
605 (1)ai1	Warning Signs; 600mm x 600mm; W6-1B (Pedestrian and School Sign Pedestrian Crossing Ahead)	ea.	2.00	SEE DETAILS AND SCHEDULE
605 (2)q1	Regulatory Sign; 600mm thick (R6-9B) Miscellaneous Signs School Children Crossing	ea.	1.00	SEE DETAILS AND SCHEDULE
605 (2)ai2	Regulatory Signs; 600mm thck (R6-8B) - Miscellaneous Signs Pedestrian Crossing	ea.	4.00	SEE DETAILS AND SCHEDULE
605 (2)aj2	Regulatory Signs; 600mm thck (R6-9B) - Miscellaneous Signs School Children Crossing	ea.	2.00	SEE DETAILS AND SCHEDULE
607 (3)a1	Internally Illuminated (Solar) Pavement Levelled Marker/Stud Flush Type (Mono-directional)	ea.	263.00	SEE DETAILS AND SCHEDULE
612 (1)	Reflectorized Thermoplastic Pavement Markings (White)	sq.m.	586.44	SEE DETAILS AND SCHEDULE
612 (2)	Reflectiorized Thermoplastic Pavement Marking (Yellow)	sq.m	48.00	SEE DETAILS AND SCHEDULE
613 (1)	Concrete Joint Sealant (Hot-Poured Elastic Type)	kg	84.08	SEE DETAILS AND SCHEDULE
624 (9)b1	Single arm solar LED roadway lighting; 8M-pole-80W-125W	ea.	12.00	SEE DETAILS AND SCHEDULE

NOTE: THE QUANTITIES OF ALL WORK ITEMS INVOLVED ARE SUBJECT TO INCREASE/ DECREASE AS PER ACTUAL FIELD REQUIREMENTS.

PROJECT NAME AND LOCATION:

SHEET CONTENTS:

RECOMMENDED:

APPROVED:

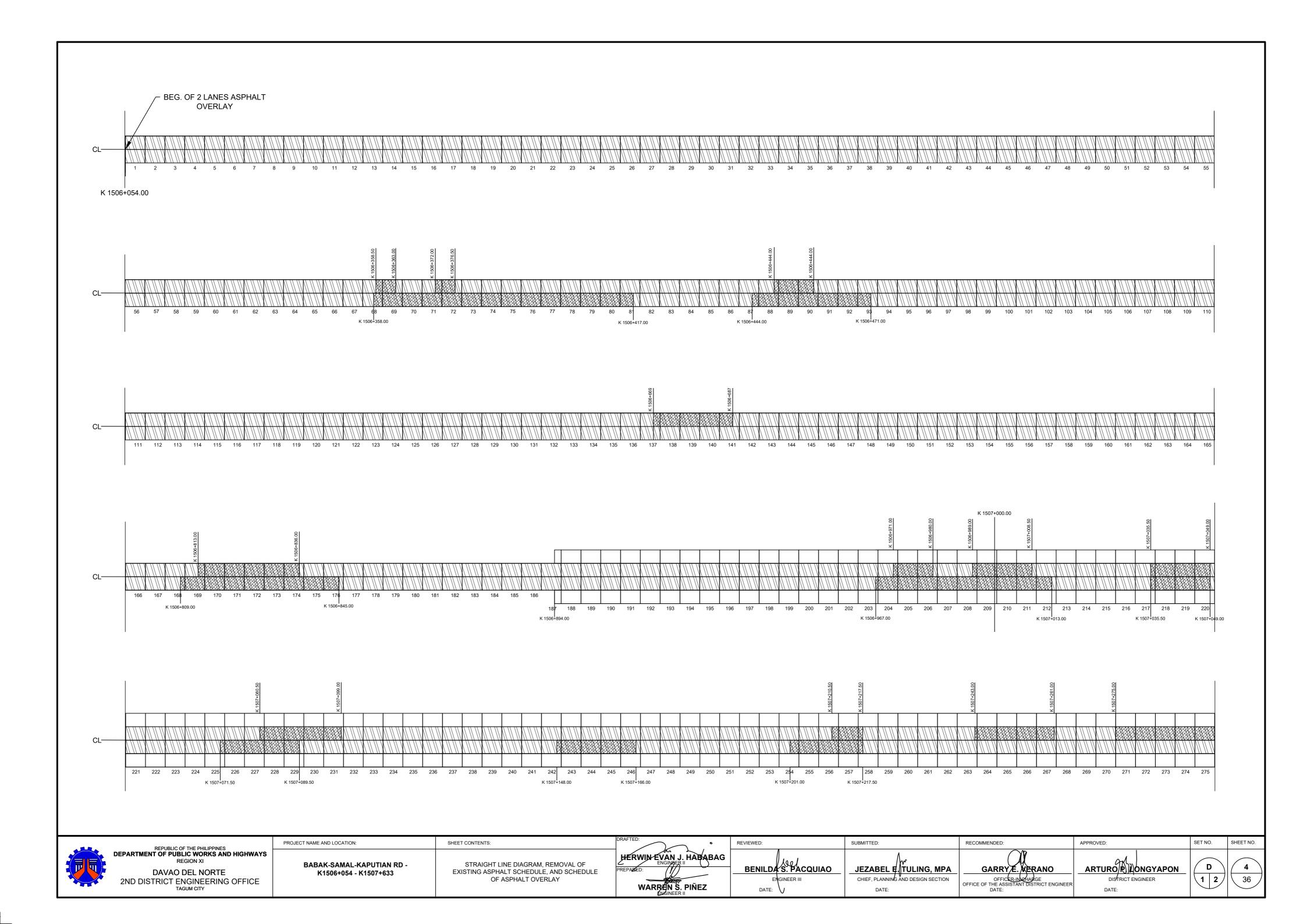
ARTURO R LONGYAPON
DISTRICT ENGINEER DATE:

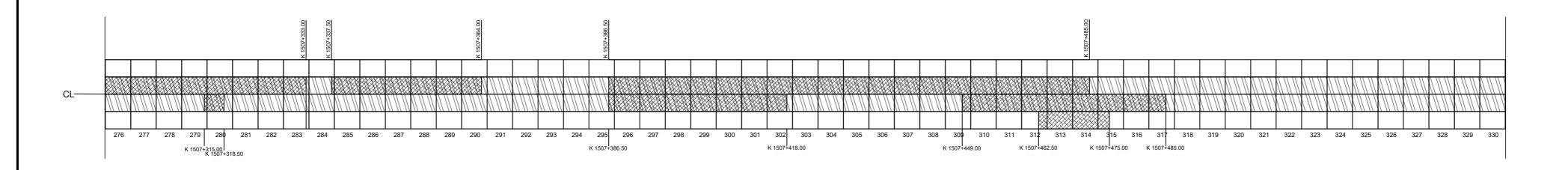
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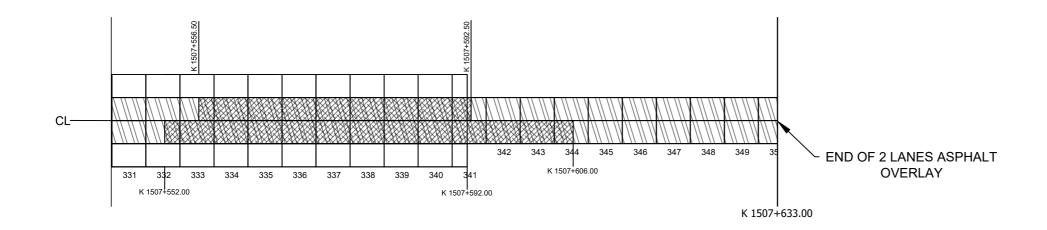
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LENGTH (m) WIDTH (m) BLOCKS AREA (sq.m.) REMARKS

179.95

13.73

27.45

54.90

109.80

70.15

41.18

54.90

56.43

54.90

50.33

21.35

54.90

176.90

10.68

80.83

96.08

259.25

109.80

46.25

109.80

2163.98

R/S

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SHEET CONTENTS:

SCHEDULE OF REBLOCKING

3.05

3.05

3.05

3.05 3.05

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3.05

PROJECT NAME AND LOCATION:

2

59.00

4.50

9.00

18.00

36.00

23.00

40.00

13.50

13.50

18.00

18.50

18.00

16.500

58.00

3.50

26.50

31.50

85.00

36.00

12.50

36.00

STATION K 1506+358.00 - K 1506+417.00

K 1506+358.00 - K 1506+363.00

K 1506+372.00 - K 1506+376.50

K 1506+444.00 - K 1506+471.00

K 1506+449.00 - K 1506+458.00

K 1506+669.00 - K 1506+687.00

K 1506+809.00 - K 1506+845.00

K 1506+813.00 - K 1506+836.00

K 1506+967.00 - K 1507+013.00

K 1506+971.00 - K 1506+980.00

K 1506+989.00 - K 1507+008.50

K 1507+035.50 - K 1507+049.00

K 1507+035.50 - K 1507+049.00

K 1507+071.50 - K 1507+089.50

K 1507+080.50 - K 1507+099.00

K 1507+148.00 - K 1507+166.00

K 1507+201.00 - K 1507+217.50

K 1507+210.50 - K 1507+217.50

K 1507+243.00 - K 1507+261.00

K 1507+275.00 - K 1507+333.00

K 1507+315.00 - K 1507+318.50

K 1507+337.50 - K 11507+364.00

K 1507+386.50 - K 1507+418.00

K 1507+386.50 - K 1507+471.50

K 1507+449.00 - K 1507+485.00

K 1507+462.50 - K 1507+475.00

K 1507+552.00 - K 1507+606.00

K 1507+556.50 - K 1507+592.50

TOTAL=

STRAIGHT LINE DIAGRAM

LEGEND:

FOR NEW ASPHALT OVERLAY FOR REBLOCKING/RECONSTRUCTION

SCHEDULE OF ASPHALT OVERLAY					
TEM 302(2) - Emulsified Asphalt					
STATION LENGTH (m) AREA (sq.m.) REMARKS					
K 1506+054.00 - K1507+633.00	1573.00	19,190.60	2 LANES		
TOTAL 1573.00 19,190.60					

SCHEDULE OF ASPHALT OVERLAY						
TEM 310(2)b - Bituminous Concrete Surface Binder Course, Hot Laid (40 mm. thk.) - 1st Layer						
STATION	LENGTH (m)	AREA (sq.m.)	REMARKS			
K 1506+054.00 - K 1507+633.00	1573.00	10,339.74	2 LANES			
TOTAL	1573.00	10339.74				

SCHEDULE OF ASPHALT OVERLAY					
ITEM 310(1)b - Bituminous Concrete Surface Wearing Course, Hot Laid (40 mm. thk.) - 2nd Layer					
STATION LENGTH (m) AREA (sq.m.) REMARKS					
K 1506+054.00 - K 1507+633.00	1573.00	11,265.340	2 LANES		
TOTAL	1573.00	11265.34			

ITEM 101(10) - SCHEDULE OF REMOVAL OF EXISTING ROAD SIGNAGES			
DESCRIPTION	STATION	LENGHT/NO.	
ITEM 605(2)ai2 - REGULATORY SIGNS; 600mm THICK (R6-8B) - MISCELLANEOUS	K1506+633.00	2.00	
SIGN PEDESTRIAN CROSSING	K1506+842.00	2.00	

ITEM 101(3)c1 - SCHEDULE OF ACTUAL STRUCTURES/OBSTRUCTION				
(0.05m THK ACP)				
DESCRIPTION STATION LENGHT/NO.				
2 LANES ASPHALT K1507+617.00 - K1507+633.00 16.00				

ITEM 101(2) REMOVAL OF STRUCTURES AND OBSTRUCTION				
DESCRIPTION	STATION	LENGHT/NO.		
RAISED STUDS		263.00		
SOLAR STUDS		263.00		

DAVAO DEL NORTE 2ND DISTRICT ENGINEERING OFFICE

REPUBLIC OF THE PHILIPPINES

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

TAGUM CITY

BABAK-SAMAL-KAPUTIAN RD -K1506+054 - K1507+633

STRAIGHT LINE DIAGRAM, REMOVAL OF EXISTING ASPHALT SCHEDULE, AND SCHEDULE OF ASPHALT OVERLAY

DRAFTED:	REVIEWED:
HERWIN EVAN J. HABABAG	
PREPARÉD:	BENIL
WARREN S. PIÑEZ	DA

EVIEWED:	SUBMITTED:
BENILDA'S. PACQUIAO	JEZABEL I
ENGINEER III	CHIEF, PLANNIN
DATE: V	DATE:

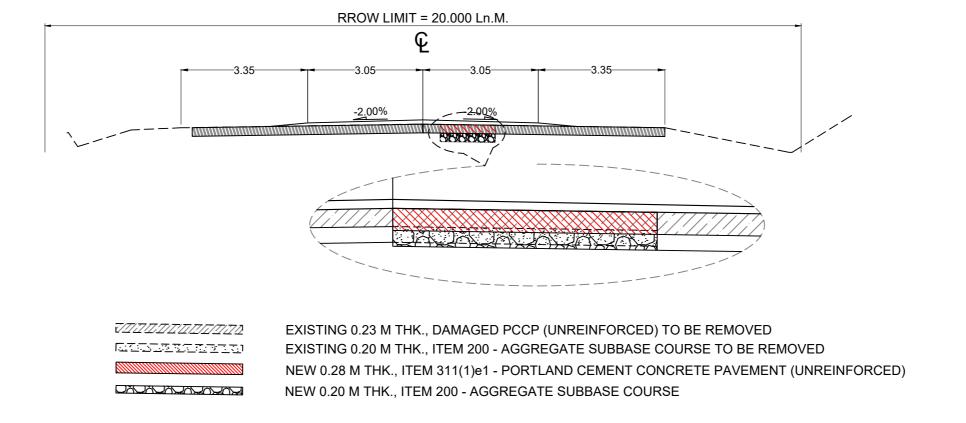
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DESIGN SECTION	OFFICE OF

RECOMMENDED:				
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PPROVED:	SET NO.
ARTURO P) LONGYAPON	D
DISTRICT ENGINEER	
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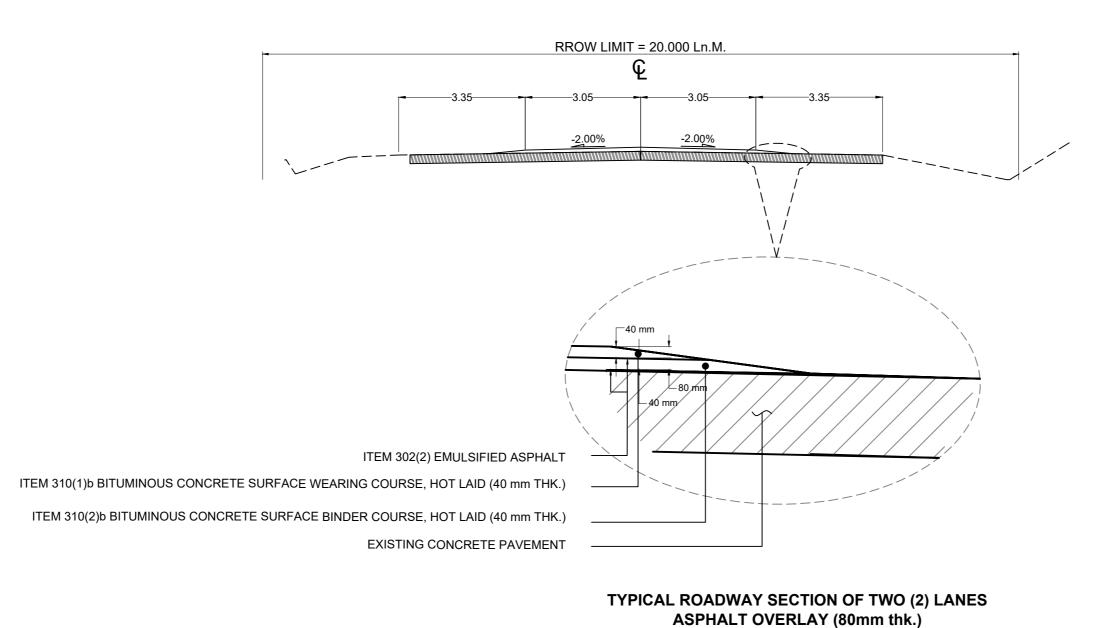
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TYPICAL ROADWAY SECTION OF TWO (2) LANES WITH REBLOCKING AT RIGHT LANE

1 : 100 M.

SCALE



SCALE

SET NO. SHEET NO. REVIEWED: RECOMMENDED: APPROVED: HERWIN EVAN J. HABABAG JEZ



BABAK-SAMAL-KAPUTIAN RD -
K1506+054 - K1507+633

PROJECT NAME AND LOCATION:

TYPICAL ROADWAY SECTION

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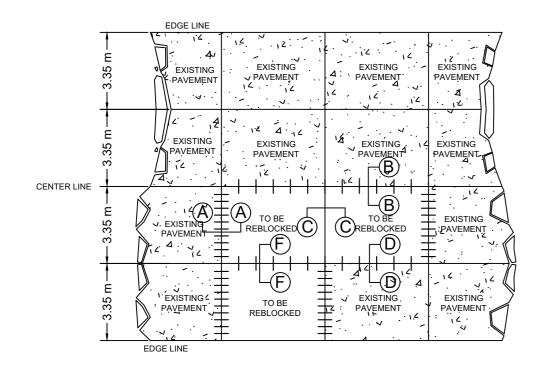
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JEZABEL E TULING, MPA
CHIEF, PLANNING AND DESIGN SECTION
DATE:

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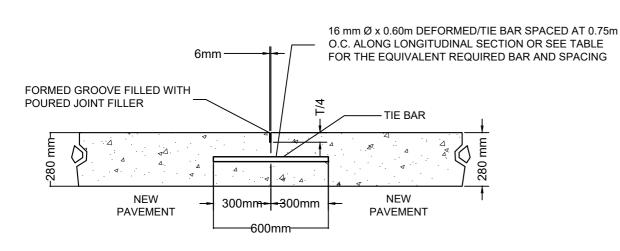
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DISTRICT EI	NGINEER	١
DATE:		



TYPICAL PLAN OF PCCP (4 LANES) - FOR REBLOCKING

SCALE

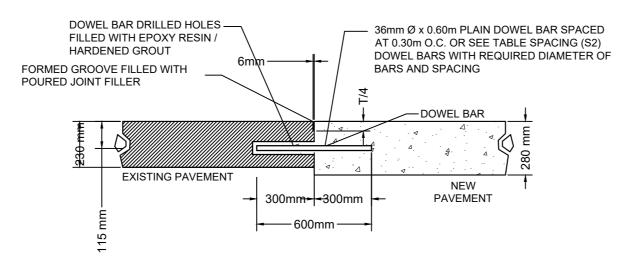
NTS



F LONGITUDINAL CONSTRUCTION JOINT (SECTION F - F)

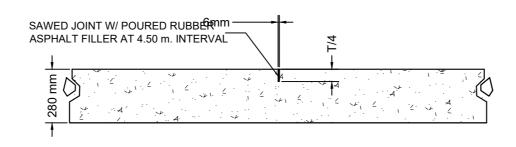
TABLE SPACING OF TIE BARS (L=600 mm)		
SLAB THICKNESS	SPACING S1 (mm)	
(mm)	12 mm dia.	16 mm dia.
230	600	750
240	600	750
250	600	750
260	500	750
270	500	750
280	500	750
290	500	750
300	500	750
310	400	750
320	400	750
330	400	750
340	400	750

BASED ON AASHTO GUIDE FOR DESIGN OF PAVEMENT STRUCTURES 1993. NOTE: THE BAR SPACING WILL BE BASED FROM THICKNESS OF THE NEW PAVEMENT



(TO BE USED FOR CONNECTIONS WITH EXISTING PAVEMENT AND NEW PAVEMENT WITH DIFFERENT THICKNESS)

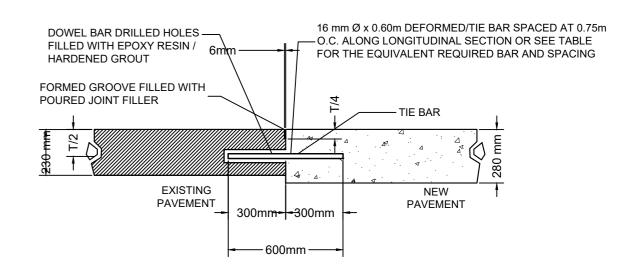




C TRANSVERSE CONTRACTION JOINT (SECTION C-C)

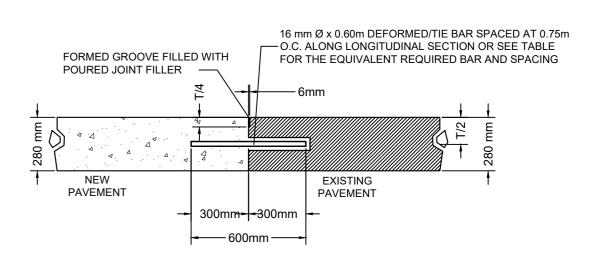
NOTE:

- 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.
- 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 doweled 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.



(TO BE USED FOR CONNECTIONS WITH EXISTING PAVEMENT AND NEW PAVEMENT WITH DIFFERENT THICKNESS)





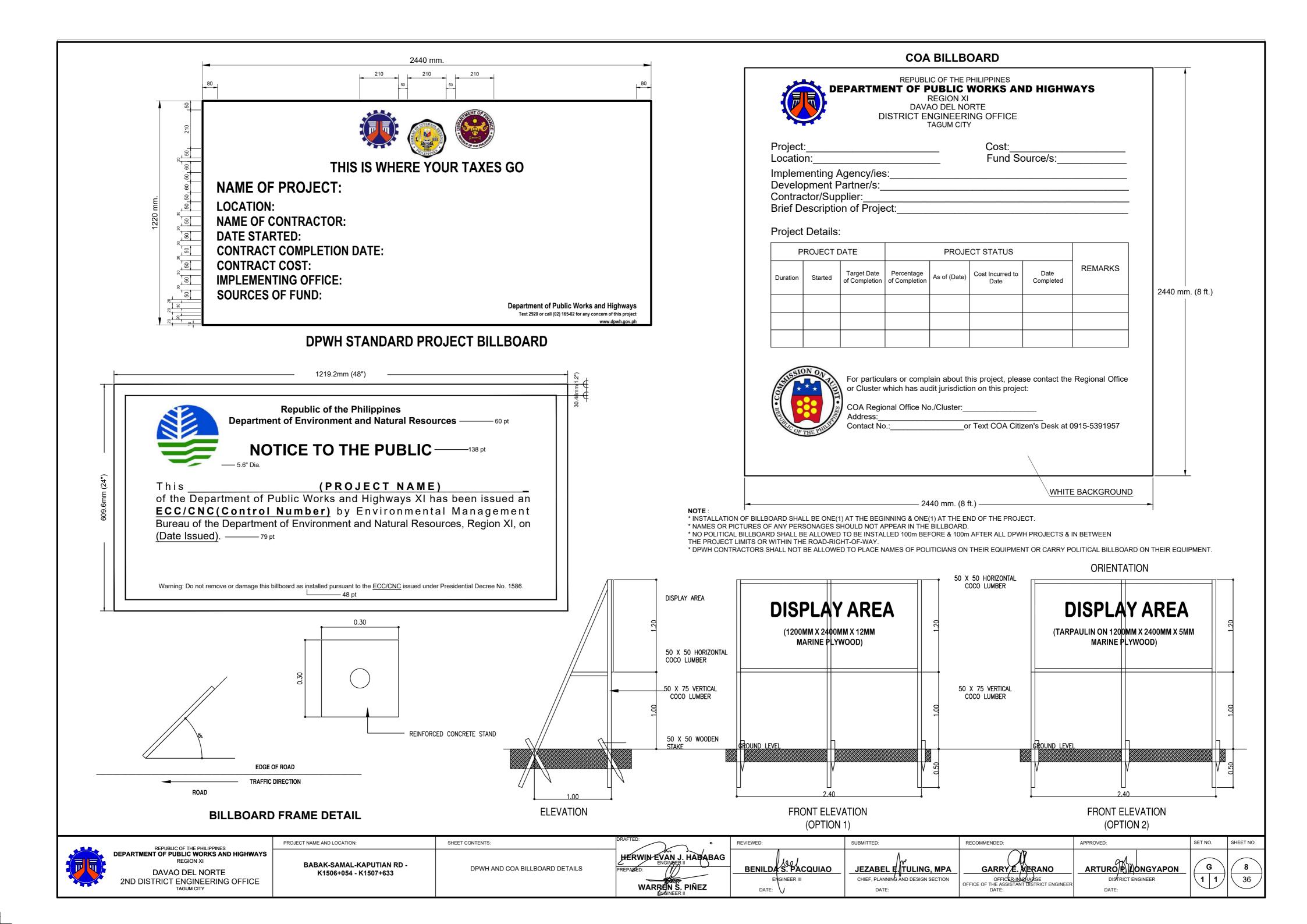
(TO BE USED FOR CONNECTIONS WITH EXISTING PAVEMENT AND NEW PAVEMENT WITH SAME THICKNESS)

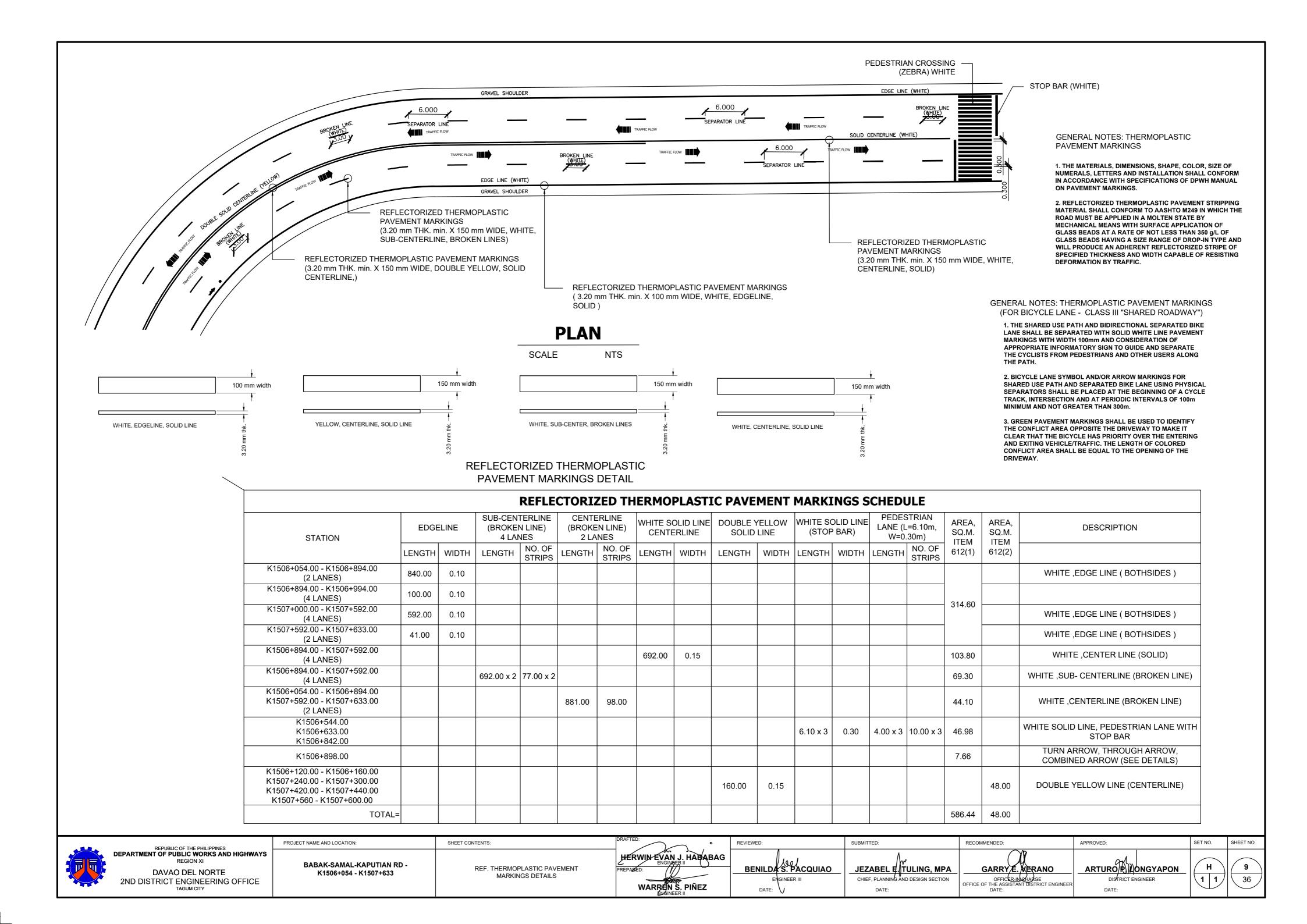


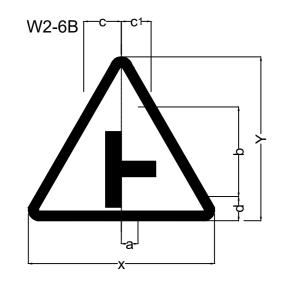
	TABLE SPACING (S2) OF DOWEL BARS (L=600mm)				
SLAB DEPTH, (T) (mm)	SPACING FOR 36mm. dia, DOWEL BAR (mm)	SPACING FOR 32mm. dia, DOWEL BAR (mm)	SPACING FOR 28mm. dia, DOWEL BAR (mm)	SPACING FOR 25mm. dia, DOWEL BAR (mm)	
280	300	250	190	160	
290	290	230	170	140	
300	270	210	160	130	
310	250	200	150	120	
320	230	190	140	110	
330	220	180	130	110	
340	200	170	130	100	

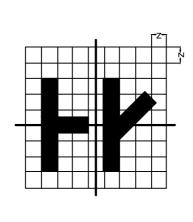
BASED ON AASHTO GUIDE FOR DESIGN OF PAVEMENT STRUCTURES 1993. NOTE: THE BAR SPACING WILL BE BASED FROM THICKNESS OF THE NEW PAVEMENT

PROJECT NAME AND LOCATION: SHEET CONTENTS: REVIEWED: RECOMMENDED: APPROVED: SET NO. SHEET NO. REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS HERWIN EVAN J. HABABAG BABAK-SAMAL-KAPUTIAN RD -BENILDA'S. PACQUIAO STANDARD PORTLAND CEMENT CONCRETE JEZABEL E. TULING, MPA GARRY E. MERANO ARTURO R LONGYAPON DAVAO DEL NORTE K1506+054 - K1507+633 OFFICER-INCHARGE
)FFICE OF THE ASSISTANT DISTRICT ENGINEER
DATE: PAVEMENT JOINTS 36 DISTRICT ENGINEER 2ND DISTRICT ENGINEERING OFFICE CHIEF, PLANNING AND DESIGN SECTION WARREN S. PIÑEZ DATE: V DATE:

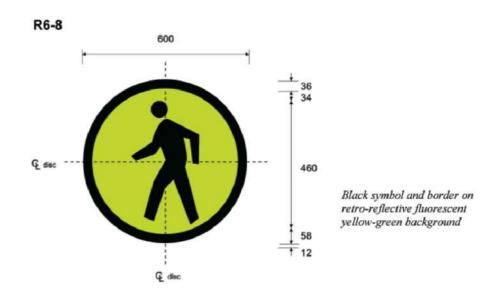


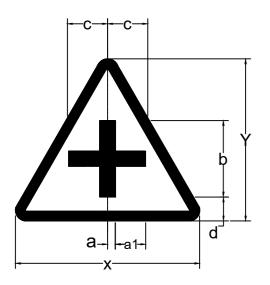


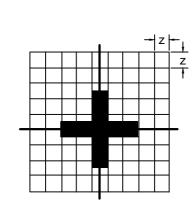




600
520
50
300
150
50
50







Х	750
Υ	650
а	31
b	312
С	156
d	94
Z	60

Q disc

600

430

Black symbol and border on retro-reflective fluorescent yellow-green background.

ROAD SIGN SCHEDULE

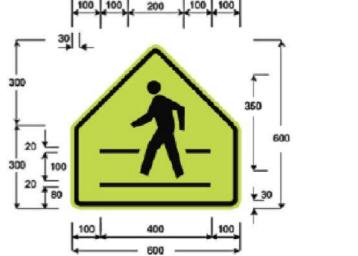
TYPE	QUANTITY	LOCATION / STATION
W 2 - 6B	1	K 1506+592.00 @ RIGHT SIDE
W 2 - 1B	1	K 1506+792.00 @ RIGHT SIDE
W6-1B	2	K 1506+404.00 @ RIGHT SIDE K 1506+504.00 @ LEFT SIDE
R3 - 16A	1	K 1506+974.00 @ LEFT SIDE
R6 - 8B	2	K 1506+663.00 @ BOTH SIDE K 1506+842.00 @ BOTH SIDE
R6 - 9B	2	K 1506+544.00 @ BOTH SIDE

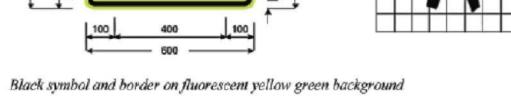
W2-1B



SIGN NO.	SIZE	(mm)
01014140.	SYMBOL	BORDER & BAR
R3-16A	600	50

W6-1 (B size illustrated)





ITEM 605(2)aj2 - REMOVAL AND REINSTALL

	2	K 1506+633.00
R6 - 9B	2	K 1506+842.00

REPUBLIC OF THE PHILIPPINES	PROJECT NAME AND LOCATION:	SHEET CONTENTS:	DRAFTED:	REVIEWED:	SUBMITTED:	RECOMMENDED:	APPROVED:	SET NO.	SHEET NO.
IENT OF PUBLIC WORKS AND HIGHWAYS REGION XI DAVAO DEL NORTE DISTRICT ENGINEERING OFFICE TAGUM CITY	BABAK-SAMAL-KAPUTIAN RD - K1506+054 - K1507+633	ROAD SIGNS DETAILS AND SCHEDULE	PREPARED: WARREN S. PIÑEZ ENGINEER II	BENILDA S. PACQUIAO ENGINEER III DATE:	JEZABEL E. TULING, MPA CHIEF, PLANNING AND DESIGN SECTION DATE:	GARRY E. WERANO OFFICE-INCHARGE OFFICE OF THE ASSISTANT DISTRICT ENGINEER DATE:	ARTURO R LONGYAPON DISTRICT ENGINEER DATE:	1 2	10 36

GENERAL NOTES FOR WARNING SIGNS

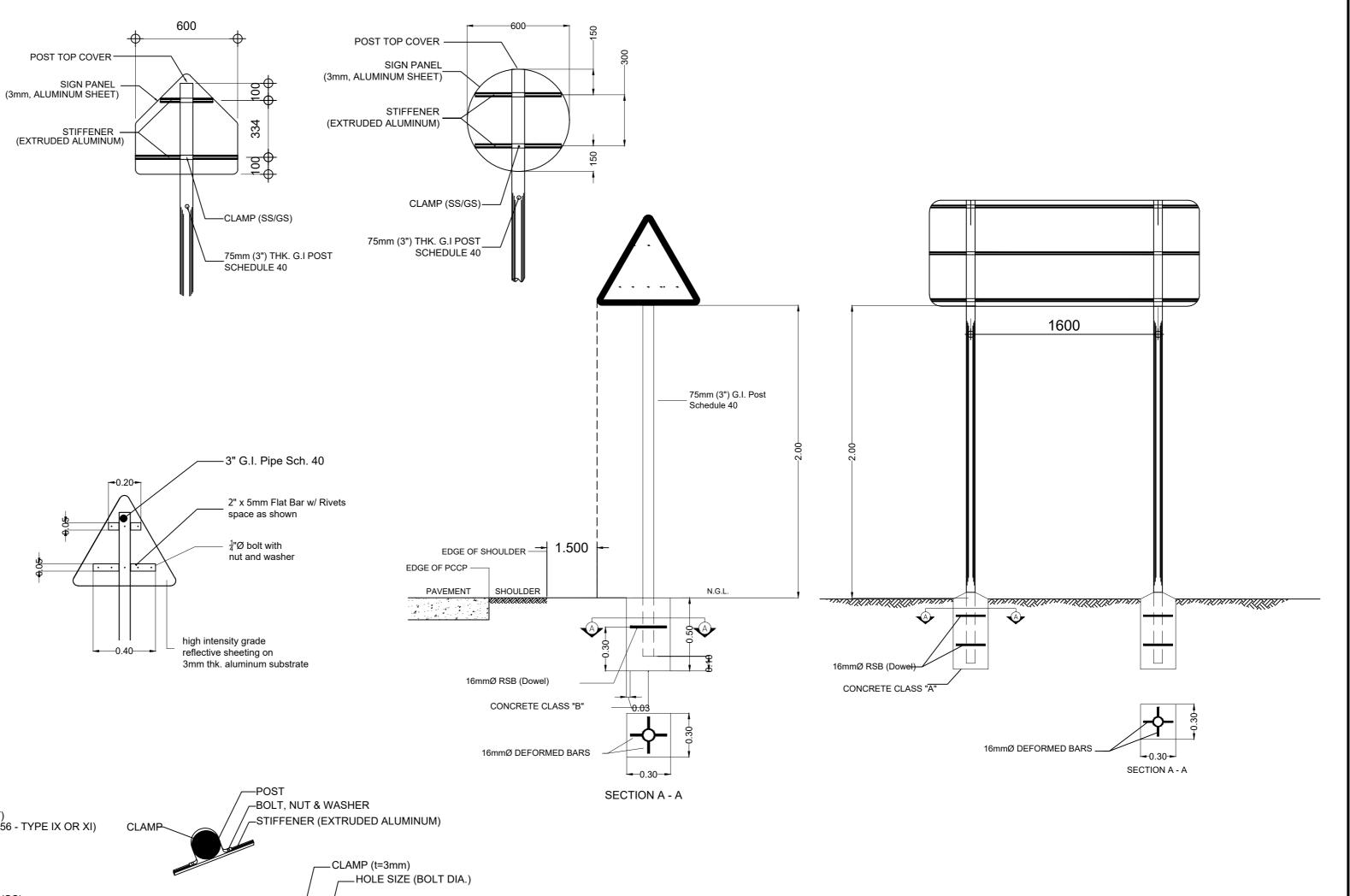
- 1. ALL POST SHALL BE THOROUGHLY CLEANED, FREE FROM GREASE, SCALE AND RUSTS BE GIVEN ONE COAT OF RUST-INHIBITING PRIMING PAINT AND TWO COATS OF INTERNATIONAL ORANGE IN ACCORDANCE WITH ITEM 411, PAINT DPWH STANDARD SPECIFICATION.
- 2. ALL DETAILS SHALL COMPLY WITH THE DPWH STANDARD SPECIFICATIONS FOR ROAD SIGN, DO. 158, S. 2015

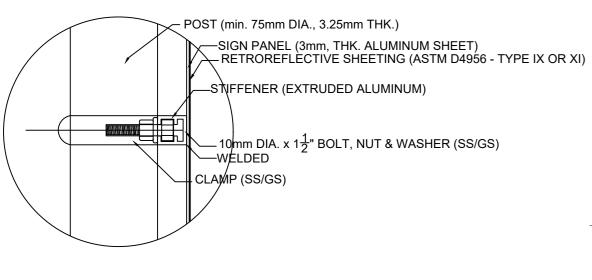
DESIGN

- 3. IN GENERAL, WARNING SIGNS ARE TRIANGULAR IN SHAPE (WITH ONE ANGLE VERTICAL), WITH A BLACK SYMBOL, REFLECTORIZED RED BORDER ON A RETRO-REFLECTIVE WHITE, OR FLUORESCENT YELLOW GREEN BACKGROUND.
- 4. THE SIDE OF ONE SIDE OF EQUILATERAL TRIANGULAR SHAPED SIGNS SHALL NOT BE LESS THAN 600 mm. FOR HIGH-SPEED EXPRESSWAYS, LARGER SIGNS (UP TO 1200 mm) ARE USUALLY ADOPTED.

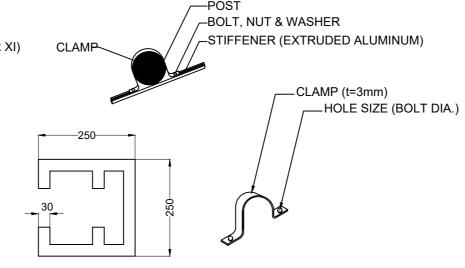
LOCATION

- 5. AS WARNING SIGNS ARE PLACED PRIMARILY FOR THE PROTECTIONOF THE DRIVER WHO IS NOT FAMILIAR WITH THE ROAD, IT IS VERY IMPORTANT THAT THEIR LOCATION AND INSTALLATION MUST BE UNDERTAKEN WITH CARE.
- 5.1 TEST RUNS SHOULD BE MADE BY DAY AND BY NIGHT FROM BOTH DIRECTIONS TO CHECK THE LOCATION AND MOUNTING OF EACH INSTALLATION.
- 5.2 A WARNING SIGN SHOULD BE GENERALLY BE INSTALLED ON THE RIGHT SIDE OF THE ROAD AND BE POSITIONED SO THAT IT WILL CONVEY ITS MESSAGE WITHOUT RESTRICTING LATERAL CLEARANCE OR SIGHT DISTANCE.
- 5.3 IN URBAN AREAS, ADVANCE WARNING SIGN SHOULD BE PLACED AT NOT LESS THAN 30.0 m. IN ADVANCE OF THE HAZARDOUS AREA.
- 5.4 EXACT LOACTION OF ALL WARNING SIGNS TO BE INSTALLED SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.









		STIFFENI	ER AND CLAMP	DETAILS
		SCALE		NTS

SHEET CONTENTS:



REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

DAVAO DEL NORTE 2ND DISTRICT ENGINEERING OFFICE BABAK-SAMAL-KAPUTIAN RD -K1506+054 - K1507+633

PROJECT NAME AND LOCATION:

ROAD SIGNS DETAILS AND SCHEDULE

HERWIN EVAN J. HABABAG	leel
PREPAKED: ////	BENILDA'S. PACQUIAO
Com	ENGINEER III
WARREN S. PIÑEZ	DATE: V

REVIEWED:

WARREN S. PIÑEZ

JEZABEL É.ÍTULING, MPA CHIEF, PLANNING AND DESIGN SECTION

GARRY E. WERANO OFFICER-INCHARGE

OFFICE OF THE ASSISTANT DISTRICT ENGINEER

DATE:

RECOMMENDED:

ARTURO RILONGYAPON
DISTRICT ENGINEER 2 2

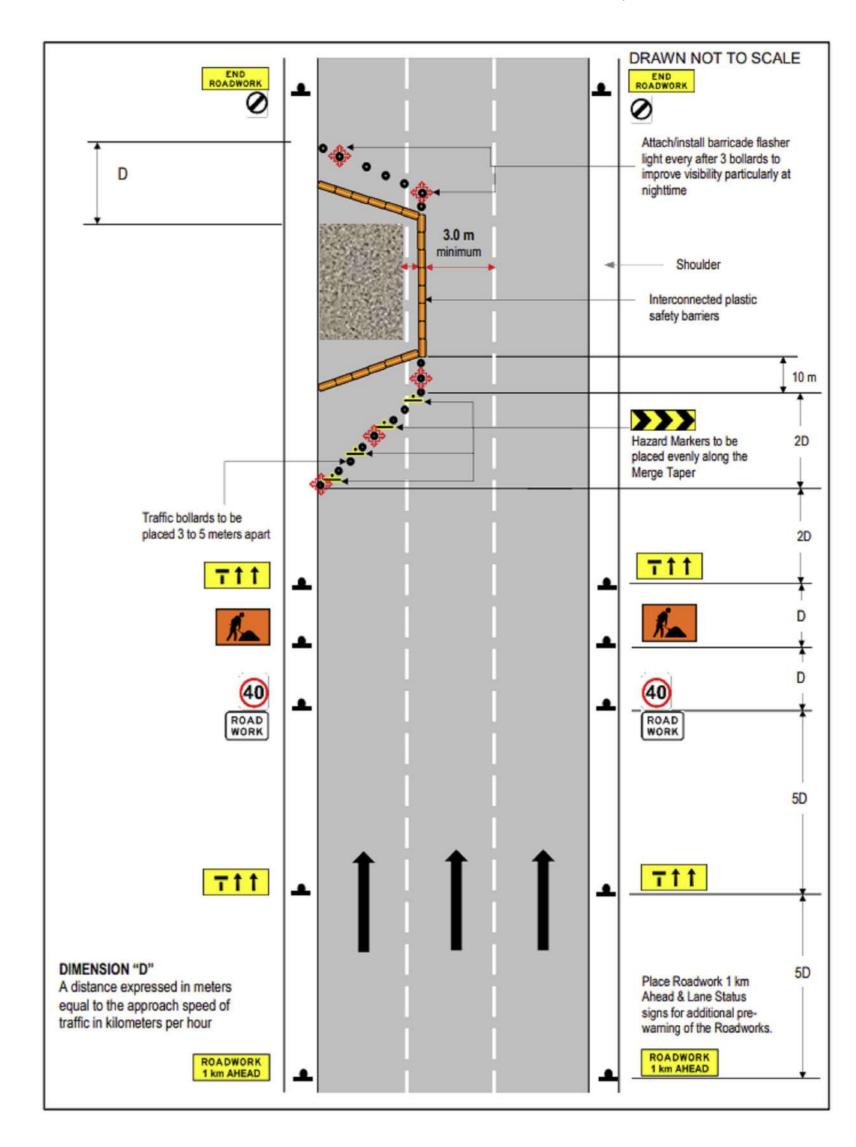
SET NO.

SHEET NO.

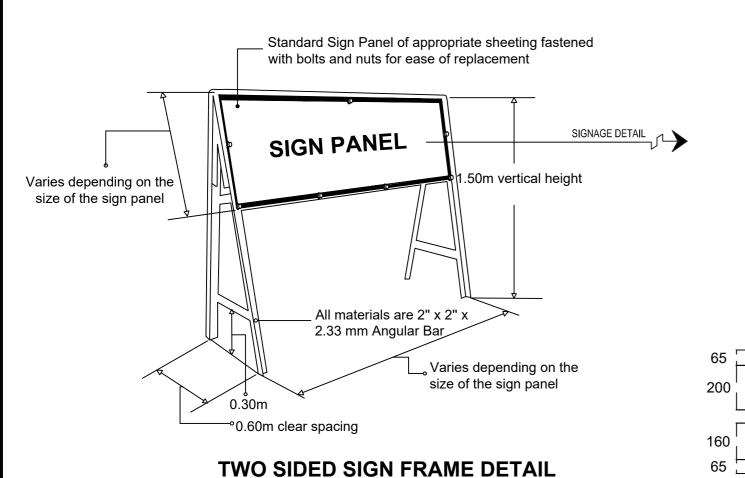
11

ROAD & BRIDG	ROAD & BRIDGE WORK SITE		SIGNAGE DESCRIPTION						
TEMPORARY SIGNAGE		SIGN NO.	SIZE (mm) (WIDTH x HEIGHT)	LETTERS/SYMBOLS	BACKGROUND				
ADVANCE WA	RNING SIGNS								
ROADWORKS	DOADWORK ALIFAD	T1-1	4900 v 600	LINE 1 - BLACK 200 DM	VELLOW REFLECTORIZED				
AHEAD	ROADWORK AHEAD	1 1-1	1800 x 600	LINE 1 - BLACK 160 DM	YELLOW REFLECTORIZED				
END	END ROADWORK	T2-16	1800 x 600	LINE 1 - BLACK 200 DM	YELLOW REFLECTORIZED				
ROADWORK	END ROADWORK	12-10	1000 X 000	LINE 1 - BLACK 160 DM	TELLOW REFLECTORIZED				
	WORKMEN AHEAD (SYMBOLIC) T1-5 900 x 600		BLACK	RED ORANGE/REFLECTORIZED FOR NIGHT USE					
	LANE STATUS	T2-6-2	1800 x 900	BLACK 600 HIGH	YELLOW REFLECTORIZED				
40	SPEED RESTRICTION	R4-3	600 x 800 (SIZE B)	BLACK 240 DN	WHITE REFLECTORIZED				
40	SPEED RESTRICTION	K4-3	000 X 000 (SIZE B)	CIRCLE - 600 DIA. RED	RED CIRCLE REFLECTORIZED				
	TEMPORARY HAZARD MARKER	T5-4	1500 x 450	CHEVRONS	WHITE REFLECTORIZED				
TEMPORARY HAZARD MARKER		10-4	1300 X 430	BLACK 177 WIDE AY 45°	WHITE REFLECTORIZED				
END SPEED RESTRICTION		R4-2	600 x 800 (SIZE B)	SYMBOL - 600 DIA. BLACK	WHITE REFLECTORIZED				
ROAD	ROAD WORK	R4-3	600 x 400 (SIZE B)	LINE 1 - BLACK 100 EM	WHITE BEEL ECTORIZED				
WORK	RUAD WURK	K4-3	000 X 400 (SIZE D)	LINE 2 - BLACK 100 EM	- WHITE REFLECTORIZED				

TRAFFIC MANAGEMENT LAY-OUT (LAY-OUT 9, CLOSURE OF INNER LANE, MULTILANE ROAD, HIGH SPEED, LONG TERM)



 REPUBLIC OF THE PHILIPPINES	PROJECT NAME AND LOCATION:	SHEET CONTENTS:	DRAFTED:	REVIEWED:	SUBMITTED:	RECOMMENDED:	APPROVED:	SET NO.	SHEET NO.
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS REGION XI DAVAO DEL NORTE 2ND DISTRICT ENGINEERING OFFICE TAGUM CITY	BABAK-SAMAL-KAPUTIAN RD - K1506+054 - K1507+633	TRAFFIC MANAGEMENT LAYOUT	PREPARED: WARREN S. PIÑEZ ENGINGER II	BENILDA S. PACQUIAO ENGINEER III DATE:	JEZABEL E. TULING, MPA CHIEF, PLANNING AND DESIGN SECTION DATE:	-I 	ARTURO PLONGYAPON DISTRICT ENGINEER DATE:	J 1 3	36



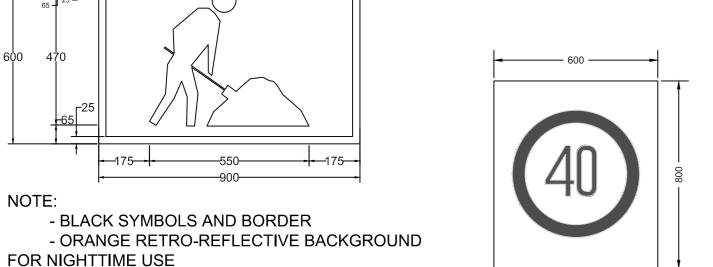
1800 END 200 **ROADWORK**

NOTE: BLACK LETTERS AND BORDER ON A YELLOW RETRO-REFLECTIVE BACKGROUND **END ROADWORK DETAIL**

1800 **ROADWORKS** AHEAD

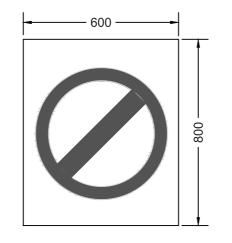
> NOTE: BLACK LETTERS AND BORDER ON A YELLOW RETRO-REFLECTIVE BACKGROUND

ROAD WORK AHEAD DETAIL

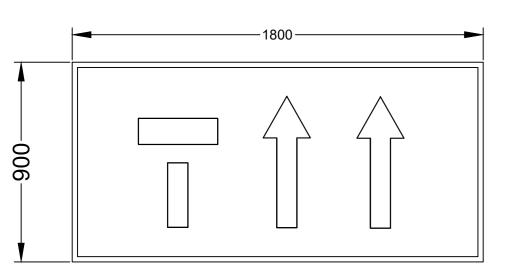


NOTE: BLACK NUMERALS ON A WHITE REFLECTORIZED

BACKGROUND AND RED CIRCLE REFLECTORIZED

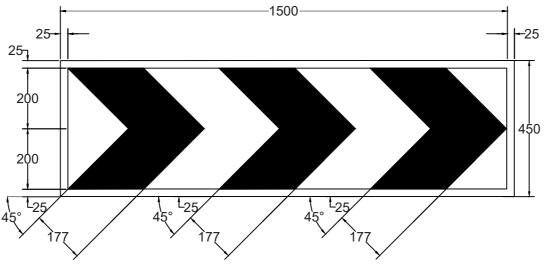


NOTE: BLACK SYMBOL ON A WHITE REFLECTORIZED BACKGROUND (600 DIA.)



NOTE:

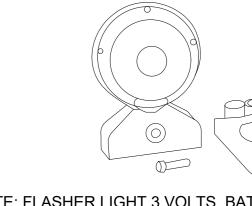




NOTE: BLACK SYMBOLS AND BORDER ON A YELLOW RETRO-REFLECTIVE BACKGROUND

600 100 400

ROADWORK DETAIL



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

FLASHER LIGHT



80⊢

-150-

REFLECTORIZED

TAPE (SILVER)

FLEXIBLE BOLLARD

POST

REFLECTORIZED ORANGE PAINT

BASE PLATE

t= 6mm.

ANCHOR BOLT

10mm.Ø x 100mm.

W/ NUTS AND WASHER

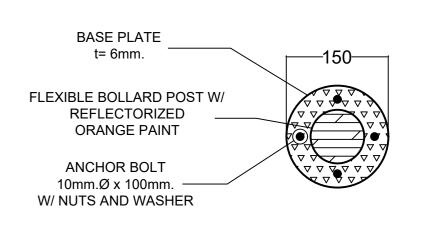
TOP OF THE EXIST

PAVEMENT

50

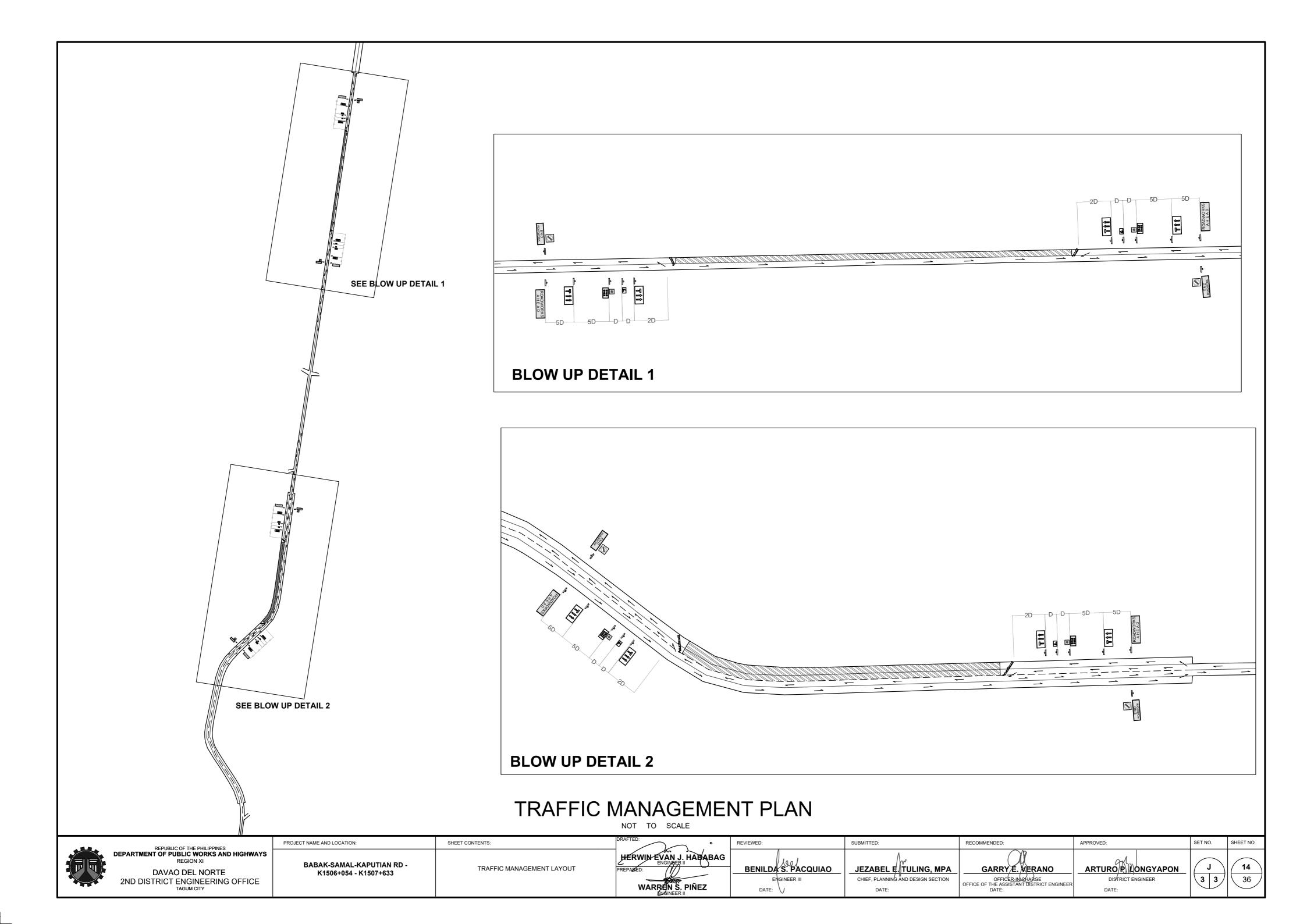
NOTES:

- 1. Temporary bollards shall be fluorescent red or orange plastic that is resilient to impact and 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)



FLEXIBLE BOLLARD POST

ABRA	REPUBLIC OF THE PHILIPPINES	PROJECT NAME AND LOCATION:	SHEET CONTENTS:	DRAFTED:	REVIEWED:	SUBMITTED:	RECOMMENDED:	APPROVED:	SET NO.	SHEET NO.
	DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS REGION XI DAVAO DEL NORTE 2ND DISTRICT ENGINEERING OFFICE TAGUM CITY	BABAK-SAMAL-KAPUTIAN RD - K1506+054 - K1507+633	TRAFFIC MANAGEMENT LAYOUT	PREPARED: WARREN S. PIÑEZ ENGINGER II	BENILDA'S. PACQUIAO ENGINEER III DATE:	JEZABEL E. TULING, MPA CHIEF, PLANNING AND DESIGN SECTION DATE:	GARRY E. WERANO OFFICER-INCHARGE OFFICE OF THE ASSISTANT DISTRICT ENGINEER DATE:	ARTURO R LONGYAPON DISTRICT ENGINEER DATE:	J 2 3) 13 36



GENERAL NOTES

- 1. ALL ELECTRICAL WORKS SHALL BE DONE IN ACCORDANCE WITH THE PROVISION OF THE LATEST EDITION OF THE PHILIPPINE ELECTRICAL CODE PART I AND II. THE LAWS AND ORDINANCES OF THE LOCAL CODE ENFORCING AUTHORITIES AND THE REQUIREMENTS OF THE LOCAL POWER COMPANY
- 2. THE ELECTRICAL WORK SHALL BE DONE UNDER THE DIRECT AND IMMEDIATE SUPERVISION OF A DULY REGISTERED ELECTRICAL ENGINEER.
- 3. PERFORMANCE OF THE ROAD LIGHT SUCH AS ILLUMINANCE LEVEL SHALL COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATION.
- 4. THE ELECTRICAL CONTRACTOR SHALL SECURE ALL PERMITS AND PAY ALL FEES REQUIRED FOR THE WORK AND FURNISH THE OWNER THROUGH THE ENGINEERS FINAL CERTIFICATE OF ELECTRICAL INSPECTION AND APPROVAL FROM PROPER GOVERNMENT AUTHORITIES FOR COMPLETE
- 5. THE ELECTRICAL MATERIALS TO BE USED AND EQUIPMENT TO BE INSTALLED SHALL BE BRAND NEW AND SHALL BE OF THE APPROVED TYPES FOR THE PARTICULAR LOCATION AND PURPOSE INTENDED.
- 6. ALL ROAD LIGHTS AND WARNING LIGHTS SHALL BE POWERED FROM SOLAR PHOTOVOLTAIC (PV) SYSTEM WITH STORAGE BATTERY.
- 7. ALL BOXES SHALL BE OF STEEL AND ZINC CHROMATED PROTECTED.
- 8. ALL UNDERGROUND CONDUIT PIPES AND CONDUIT RUN EMBEDDED IN CONCRETE SHALL BE UNPLASTICIZED POLYVINYL CHLORIDE CONDUIT (uPVC).
- 9. UNDERGROUND CONDUIT RUNS SHALL BE BURIED AT A MINIMUM OF 600mm BELOW GROUND LEVEL CONDUIT RUN CROSSING STREET SHALL BE ENCASED IN CONCRETE WITH STEEL BAR REINFORCED, 2500psi CONCRETE WITH MINIMUM 75mm (3 INCHES) COVER ALL AROUND
- 10. UNPROTECTED CONDUIT RISERS AND EXPOSED CONDUIT RUNS SHALL BE INTERMEDIATE METAL CONDUITS. (IMC)
- 11. ALL STREET LUMINAIRE ASSEMBLY INCLUDES LED LUMINAIRE, PV POWER SUPPLY EQUIPMENT, CONTROL AND BATTERY PANEL, AND FOUNDATION SHALL WITHSTAND UP TO 340KPH PER HOUR GUSTING WINDS WITHOUT PERMANENT DEFORMATION.
- 12. ALL SPARE PIPES INCLUDING PULL BOXES EMBEDDED IN THE STRUCTURE WALL SHOWN ON THE STRUCTURE DRAWINGS WILL BE USED AS CONDUIT. IN CASE THAT THE ROAD LIGHT IS POWERED FROM ELECTRIC UTILITY COMPANY (EC) IN FUTURE OR EMERGENCY, THE SPARE PIPES, PULL WIRE AND PULL BOXES SHALL BE INSTALLED BY THE ELECTRICAL WORKS
- 13. FOR EXISTING CABLE RUNS WHICH WILL BE REPLACED BEFORE REMOVING THE CABLE SHALL BE TESTED IF FREE FROM GROUND AND CAN STILL BE RE-USED. IF FOUND GROUNDED, THESE CABLES SHALL BE REMOVED AND TURN-OVER TO THE CLIENT.

DESIGN GUIDELINES FOR ROADWAY LIGHTING

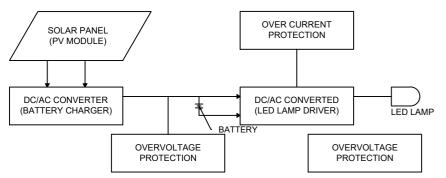
SECTION 1

THESE GUIDELINES SET OUT FACTORS THAT NEED TO BE TAKEN INTO ACCOUNT IN DESIGNING ROADWAY LIGHTING SOLAR-POWERED SYSTEMS USED. TO ILLUMINATE ROADWAYS SUCH AS PRIMARY, SECONDARY, AND TERTIARY ROADS AS WELL AS ROADS THAT IS MODIFIED, EXTENDED, EXPANDED, OR ADDED TO EXISTING ROADWAY INSTALLATIONS.

MINIMUM TECHNICAL REQUIREMENTS

SECTION 2.1 ELECTRICAL SYSTEM (SOLAR-POWERED)

- 1. THE ILLUMINATION SHALL BE UNIFORM WITHOUT DARK BANDS OR ABRUPT VARIATIONS, AND SHOULD BE SOOTHING TO THE EYE. THE LIGHT OUTPUT FROM THE WHITE LIGHT-EMITTING DIODE (LED) LIGHT SOURCE SHOULD BE ALMOST CONSTANT AND HIGHER LIGHT OUTPUT WILL BE PREFERRED. THE ACCEPTABLE LEVELS OF LUMINANCE SHALL BE ACHIEVED UNDER NORMAL OPERATIONS.
- 2. COLOR TEMPERATURE FOR LED CAN VARY BETWEEN "WARM WHITE" AND "WARM YELLOW" THE USED OF LEDS WHICH EMITS ULTRAVIOLET LIGHT SHALL NOT BE PERMITTED
- 3. THE LAMPS SHALL BE HOUSED IN AN ASSEMBLY SUITABLE FOR OUTDOOR USE AND SHALL BE RATED AS IP 65 RATED PER IEC WITH A REFLECTOR ON ITS BACK. THE LED HOUSING SHALL BE MADE OF CORROSION-RESISTANT PRESSURE DIE-CAST ALUMINUM WITH A POWDER COATED FINISH OF A NEUTRAL COLOR HAVING A SUFFICIENT AREA FOR HEAT DISSIPATION AND HEAT RESISTANT TOUGHENED CLEAR GLASS / HIGH-QUALITY POLYCARBONATE FITTED WITH PRESSURIZED DIE-CAST ALUMINUM FRAME WITH SCREWS. THE TEMPERATURE OF THE HEAT SINK SHOULD NOT INCREASE MORE THAN 30°C ABOVE AMBIENT TEMPERATURE EVEN AFTER 48 HOURS OF CONTINUOUS OPERATION. THE DUTY CYCLE OF THE LED SHOULD COMPLY WITH THE DUSK TO DAWN OPERATION OF THE LAMPS WHILE THE BATTERY OPERATES AT ANY VOLTAGE BETWEEN THE LOAD DISCONNECT AND CHARGE REGULATION SET POINT. LEDS SHALL BE PROCURED FROM A MANUFACTURER WHO HAS TEST REPORTS FROM IESNA LM80-08 AND TM-21-11 QUALIFIED FOR RELEVANT LED PRODUCT TESTING, PARTICULARLY FOR ROADWAY LIGHTING
- 4. THE ELECTRIC CABLE SHALL BE TWIN CORE PVC INSULATED WATER AND UV RESISTANT COPPER CABLE OF 1.5 MM DIAMETER MINIMUM SIZE.
- 5. THE CHARGE CONTROLLER SHALL HAVE AN AUTOMATIC DUSK UNTIL DAWN CIRCUIT BASED ON A SOLAR PHOTOVOLTAIC MODULE AS A SENSOR FOR SWITCHING ON/OFF THE STREET LIGHT WITHOUT MANUAL INTERVENTION AND AS SPECIFIED OPERATION PROFILE DURING PROJECT ANALYSIS. ALL THIS CONTROL SHOULD KEEP THE SYSTEM OPERATING AT PEAK PERFORMANCE SHALL INCREASE THE SYSTEM'S LIFESPAN, AND SHOULD OPERATE AS ILLUSTRATED IN THE FIGURE BELOW



- 6. THE PHOTOELECTRIC CONTROL'S OPERATING CONDITION SHALL TURN ON AT A NOMINAL LIGHT LEVEL SETTING OF 10.76 LUX WHICH IS WITHIN THE LIMITS OF 5.38LUX TO 21.52LUX AT RATED VOLTAGE OF 240VOLTS, 60HERTZ. THE RATIO OF THE TURN-OFF TO THE TURN-ON LIGHT LEVEL SHALL BE DESIGNED WITH A FAIL-ON FAILURE MODE AND SHALL BE INSTALLED AT EACH LIGHTING POST FOR INDIVIDUAL LAMP CONTROL. THE EYE OF THE CELL SHOULD BE ORIENTED TO FACE NORTH, CONTROL CONDUCTOR AND THE NECESSARY CONNECTION SHALL BE MADE FOR COMPLETE SATISFACTORY OPERATION OF THE STREET LUMINAIRE
- 7. THE BATTERY SHALL BE LITHIUM-ION OR DEEP CYCLE, LEAD-ACID TYPE ELECTROLYTE PLATE LEAD ACID WITH LOW ANTIMONY LEAD ALLOY PLATES, AND CERAMIC VENT PLUGS AND SHALL BE CATEGORIZED BY LOW MAINTENANCE REQUIREMENTS, LONG SERVICE LIFE, AND EXCELLENT CAPACITY PERFORMANCE EVEN IN HIGH-TEMPERATURE
- 8. THE SOLAR PHOTO VOLTAIC MODULE MUST BE MADE OF CRYSTALLINE HIGH POWER/EFFICIENCY CELLS AND SHALL BE USED AND MUST BE WARRANTED FOR OUTPUT WATTAGE, WHICH MUST BE GREATER THAN 90% AFTER 10 YEARS AND LESS THAN 80% AFTER 25 YEARS. THE PROJECT WILL ONLY USE INDIGENOUS MODULES FROM REPUTABLE BRANDS.

THE TERMINAL BOX ON THE MODULE MUST BE DESIGNED FOR LONG-TERM OUTDOOR OPERATION IN HARSH ENVIRONMENTS, WITH AN OPENING FOR REPLACING THE CABLE IF NECESSARY. HENCE, PROTECTIVE DEVICES AGAINST SURGES AT THE PV MODULE SHALL BE PROVIDED

- 9. THE GROUNDING SYSTEM SHALL HAVE LOW RESISTANCE AND LOW IMPEDANCE ATTRIBUTE TO PROTECT SOLAR STREET LIGHTS FROM EXTENSIVE LIGHTING DAMAGE. AFTER ESTABLISHING THE STABLE GROUNDING SYSTEM, A SURGE PROTECTION DEVICE (SPD) SYSTEM SHOULD BE INSTALLED.
- 10. AUTOMATIC SELF-CLEANING MECHANISM SHALL HAVE A BRUSH WITH THICK AND SOFT BRISTLES IDEAL FOR CLEANING HEAVY DUST PARTICLES WITH FLAT FITTING ON THE SOLAR PANEL SHALL BE DESIGNED FOR AREAS WHERE SEA SPRAY, DUST AND DIRT THAT MAY COVER THE PANEL PREVENTING THE BATTERY FROM BEING FULLY CHARGED. THE BRUSH SHOULD BE AUTOMATED TO ALLOW THOROUGH CLEANING EVERY FOUR HOURS AND SHALL ROUTINELY RETURN TO ITS INITIAL POSITION TO PREVENT FROM BEING JAMMED WHEN ENCOUNTERING LARGE OBSTACLES THAT MAY CAUSE MOTOR DAMAGE. THE CASING SHALL BE MADE OF ALUMINUM ALLOY FOR INCREASED DURABILITY.
- 11. THE MOTION SENSOR FEATURE SHALL HAVE DIFFERENT POWER CONTROL DEPENDING ON THE PERIOD WITH AN 8-METER RADIUS AND SHALL SET AND LOWER BRIGHTNESS IN A REDUCED PEDESTRIAN AFTER MIDNIGHT TO SAVE ENERGY AND IMPROVE PRACTICALITY

SECTION 2.2 STRUCTURAL SYSTEM

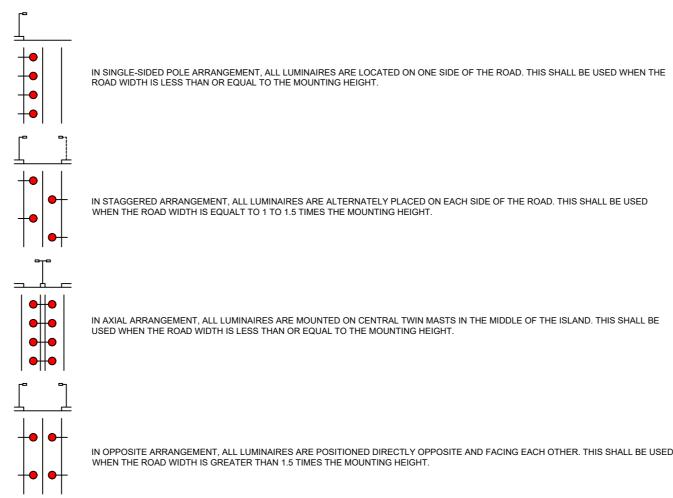
- 1. THE POLE SHALL BE CONSTRUCTED OF ROUND TAPERED HOT-DIP GALVANIZED STEEL GI PIPE OF 3 MM MINIMUM THICKNESS, A MINIMUM LOWER AND UPPER DIAMETER OF 200 MM AND 75 MM DIAMETER AND ITS SURFACE MUST BE PAINTED WITH REFLECTORIZED WHITE ENAMEL COATING. THE POLE SHOULD HAVE THE PROVISIONS TO HOLD THE WEATHERPROOF LAMP HOUSING INDIVIDUALLY PER CASE, THE BATTERY BOX AT AN APPROPRIATE HEIGHT, AND THE SOLAR PHOTOVOLTAIC PANEL, THAT SHALL BE MOUNTED ON TOP OF THE POLE.
- STANDARD LIGHT POLES TO BE UTILIZED WITH SOLAR SHOULD HAVE LARGER BASES AND MORE SUBSTANTIAL FOUNDATIONS DUE TO THE WEIGHT OF THE SOLAR POWER ASSEMBLY AND SHOULD HAVE AN EFFECTIVE PROJECTED AREA (EPA) CAPACITY THAT COULD WITHSTAND SEVERAL WIND VELOCITIES UP TO 340 KPH IN ACCORDANCE WITH AASHTO LTS-6, AS STANDARD POLES ARE TOO WEAK TO HANDLE THE WEIGHT OF THE SYSTEM AND CAN QUICKLY FAIL. POLES SHOULD BE MANUFACTURED EXCLUSIVELY FOR THE PROJECT WITH APPROPRIATE HEIGHT AS IT INFLUENCES THE INTENSITY, UNIFORMITY, AND AREA OF ILLUMINATION
- 2. SOLAR FIXTURE BRACKET SHOULD DIRECT THE PV SOLAR FACING SOUTH (OR TOWARDS THE EQUATOR) AND SHOULD ALLOW THE FIXTURE INSTALLATION TO FACE THE CORRECT DIRECTION IF IT IS ATTACHED TO THE PANEL. SHALL BE DESIGNED TO MEET THE STRENGTH REQUIREMENTS OF THE LATEST EDITION OF THE NATIONAL STRUCTURAL CODE OF THE PHILIPPINES (NSCP) AND SHOULD BE PROVIDED WITH A MOUNTING PLATE AND STIFFENER TO INCREASE ITS LOAD-BEARING CAPACITY
- HARDWARE SUCH AS HINGES, LATCHES, SPRINGS, NUTS, SCREWS, WASHERS, PINS, AMONG OTHERS, SHALL BE MADE OF MATERIALS COMPATIBLE TO THE HOUSING MATERIAL AND SHALL BE INHERENTLY CORROSION PROOF OR HAVE BEEN PROTECTED BY FINISHES APPROVED FOR CORROSION RESISTANCE. HOWEVER, THOSE EXPOSED TO THE ELEMENTS SHALL BE MADE OF HIGH-GRADES STAINLESS STEEL.
- 3. STREET LIGHTING POST CONCRETE FOOTING SHALL BE CLASS A AND SHALL CONFORM WITH SUBSECTION 405.2, MATERIAL REQUIREMENTS OF ITEM

ALL ELECTRICAL LIGHTING POST FOOTINGS WITH DIMENSIONS INDICATED IN THE PLANS SHALL BE REINFORCED CONCRETE AND SHALL CONFORM WITH THE REQUIREMENTS FOR CONCRETE STRUCTURES OF THIS SPECIFICATION. EXCAVATION AND BACK FILL FOR FOUNDATION INCLUDING DISPOSAL OF SURPLUS MATERIALS SHALL BE PROVIDED. EXCAVATED HOLES FOR CONCRETE FOOTINGS SHALL BE NEAT OR PROPERLY FORMED AND FREE FROM LOOSE MATERIALS WHEN THE CONCRETE IS PLACED

CONCRETE FOUNDATION SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL STRUCTURAL CODE OF THE PHILIPPINES (NSCP) TO RESIST WIND VELOCITY AND VIBRATIONS INHERENT IN THE AREA WHERE THE POLES WILL BE CONSTRUCTED AND LOCATED TO PROVIDE ADEQUATE SUPPORT FOR THE LUMINAIRE AND POLE STRUCTURE

SECTION 3 ROADWAY LIGHTING SECTION AND CONFIGURATION

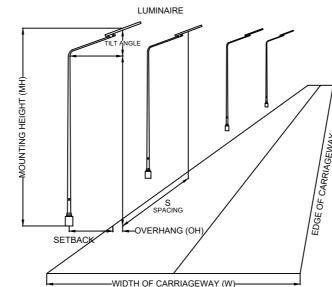
SECTION 3.1 LIGHTING ARRANGEMENT



ARRANGEMENTS SUCH AS OPPOSITE, STAGGERED, AND ONE-SIDED ARE TYPICALLY INSTALLED 30 TO 40 METERS APART WHEN DESIGNING PRIMARY AND SECONDARY ROADS. IF AXIAL AND OPPOSITE ARRANGEMENTS LACK THE REQUIRED ILLUMINATION, THE CAN BE COMBINED WITH SINGLE-SIDED

SECTION 3.2 MOUNTING HEIGHT, SPACING, MAST ARM, AND OVERHANG

THE STREET LIGHTING GEOMETRY IS SHOWN BELOW TO FURTHER ILLUSTRATE THE FOLLOWING DESIGN PARAMETERS:



MOUNTING HEIGHT

THE MOUNTING HEIGHT SHALL BE THE PERPENDICULAR DISTANCE FROM THE CENTER OF THE LAMP TO THE GROUND SURFACE. IN GENERAL, THE MINIMUM MOUNTING HEIGHT SHALL BE GENERALLY 8 METERS AND A LUMINAIRE THAT DOES NOT OVERHANG THE ROADWAY SHALL HAVE A MINIMUM MAST ARM LENGTH OF 1.5 METERS. PROVIDED THAT THE INSTALLED LUMINAIRE USED WOULD NOT RESULT INTO DISABILITY GLARE TO THE MOTORIST AND THE POLE IS INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF PHILIPPINE ELECTRICAL CODE (PEC) 2. TABLE 2. ROADWAY LIGHTING STATIONING AND PARAMETERS SHOULD BE CONSIDERED AS IT SPECIFIES THE SUITABLE MOUNTING HEIGHT FOR THE ENTIRETY OF ROADWAY LIGHTING.

SPACING

SPACING SHALL BE DEFINED AS THE HORIZONTAL DISTANCE BETWEEN SUCCESSIVE LUMINAIRES IN AN INSTALLATION. TO PRESERVE LONGITUDINAL UNIFORMITY, THE SPACE-HEIGHT RATIO SHOULD GENERALLY BE GREATER THAN 3. MINIMUM AND MAXIMUM ALLOWABLE SPACING SHALL BE FOLLOWING THE VALUES ESTABLISHED IN TABLE 2. ROADWAY LIGHTING STATIONING AND PARAMETERS.

POLE SPACING IS ALSO SPECIFIED DEPENDING ON THE ILLUMINATION LEVEL OF THE AREA. INTERSECTIONS AND OTHER MERGING SECTION OF THE ROADWAY SHOULD HAVE A HIGHER LEVEL OF ILLUMINATION.

THE HORIZONTAL DISTANCE BETWEEN THE CENTER OF A LUMINAIRE MOUNTED ON A BRACKET AND THE ADJACENT EDGE OF A CARRIAGEWAY IS DEFINED AS OVERHANG. TO AVOID REDUCED VISIBILITY OF CURBS AND OBSTACLES, THE OVERHANG SHOULD NOT EXCEED ONE-FOURTH OF THE MOUNTING HEIGHT.

THE USE OF AN ARM BRINGS THE LIGHT SOURCE CLOSER TO THE TRAVELED PATH WHILE ALLOWING THE POLE TO BE PLACED FURTHER AWAY FROM THE EDGE OF THE PATH'S EDGE. DEPENDING ON THE APPLICATION, POLEARMS CAN BE SINGLE AND/OR DOUBLE DAVITY OR MAST ARMS AND LOCATED AT THE UPPER MOST PART OF THE POLE.

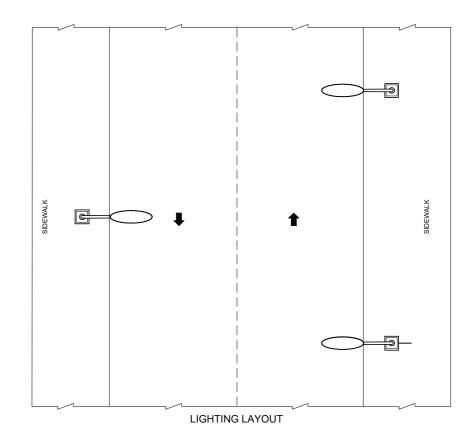
THE POLE ARM'S ANGLE OF TILT SHALL BE KEPT FROM 15° TO 30°, OTHERWISE STRONG LIGHT SHALL AFFECT THE DRIVER'S EYES BY CAUSING DISCOMFORT GLARE. THE TILT GETS LARGER AS THE UNIFORMITY RATIO INCREASE.

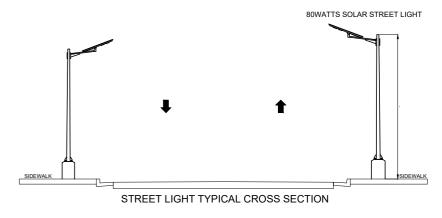
THE SETBACK IS THE HORIZONTAL DISTANCE BETWEEN THE FACE OF A LIGHT POLE AND THE EDGE OF THE TRAVELED WAY. THE MINIMUM ALLOWED VALUE IS SET AT 0.80 TO 1.5 METERS SINCE EXTREMELY SHORT SETBACK GRAZES THE SURFACE AND ENHANCES ITS TEXTURE AND LONG SETBACKS CAUSE SHADOWS AT LOW LEVELS.

THE TABLE BELOW SHALL BE CONSIDERED IN DESIGNING THE LUMINARE SETBACK BASE ON VEHICULAR SPEED ON A PARTICULAR ROADWAY AND EQUIVALENT.

DESIGN SPEED FOR THE ROADWAY (KPH)	POLE SETBACKS (M)
50	0.80
80	1.00
100	1.50
120	1.50

TABLE 1. DESIGNATED ALLOWABLE SETBACK VALUES WITH A ROADWAY DESIGNED SPEED EQUIVALENT





STAGGERED SOLAR STREET LIGHTING ARRANGEMENT



REPUBLIC OF THE PHILIPPINES. **DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS**

DAVAO DEL NORTE

BABAK-SAMAL-KAPUTIAN RD -K1506+054 - K1507+633

PROJECT NAME AND LOCATION:

SOLAR STREET LIGHTS DETAILS AND SCHEDULE

SHEET CONTENTS

HERWIN EVAN J. HABABAG WARREN S. PIÑEZ

BENILDA'S. PACQUIAO DATE:

REVIEWED:

JEZABEL ᡛ∬TULING, MPA CHIEF, PLANNING AND DESIGN SECTION DATE:

GARRY E. KERANO OFFICER-IN CHARGE OFFICE OF THE ASSISTANT DISTRICT ENGINEE DATE:

RECOMMENDED

APPROVED

ARTURO/R)/LONGYAPON DISTRICT ENGINEER

15 36

SET NO.

SHEET NO.

2ND DISTRICT ENGINEERING OFFICE TAGUM CITY

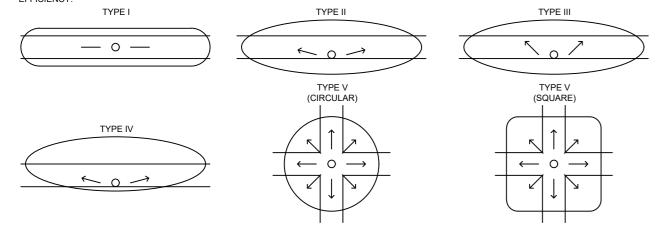
THE OUTREACH OR HORIZONTAL DISTANCE BETWEEN THE LUMINAIRE'S CENTER AND THE COLUMN'S CENTER IS TYPICALLY ESTABLISHED IN ACCORDANCE WITH THE ARCHITECTURAL AESTHETIC CONDITIONS.

ROAD CLASSIFICATION	LIGHTING ARRANGEMENT	ROAD WIDTH (meter)	POLE PLACING (meter)	MOUNTING HEIGHT (meter)	LAMP WAT	TAGE (watt)	MAST ARM LENGTH (meter)
					HPS	LED	
		6.70	10 - 25	10	150 - 250	80 - 125	1.50
	SINGLE	13.40	15 - 35	12	150 - 250	80 - 125	3.00
		13.40	20 - 35	10	150 - 250	80 - 125	1.50
	AXIAL	20.10	20 - 40	12	150 - 250	80 - 125	3.00
		26.80	20 - 45	12	300 - 400	200 - 300	3.00
		6.70	20 - 35	10	70 - 120	50 - 80	1.50
PRIMARY	ODDONITE	13.40	20 - 35	12	150 - 250	80 - 125	1.50
	OPPOSITE	20.10	20 - 40	12	300 - 400	200 - 300	1.50
		26.80	20 - 45	12	300 - 400	200 - 300	1.50
	STAGGERED	6.70	10 - 25	8	70 - 120	50 - 80	1.50
		13.40	10 - 25	10	150 - 250	80 - 125	1.50
		20.10	15 - 25	12	300 - 400	200 - 300	3.00
		26.80	15 - 25	12	300 - 400	200 - 30	3.00
	SINGLE	6.70	15 - 35	10	150 - 250	80 - 125	1.50
SECONDARY	OPPOSITE	6.70	20 - 40	8	150 - 250	80 - 125	1.50
	STAGGERED	6.70	15 - 35	8	150 - 250	80 - 125	1.50
		5.00	10 - 25	8	70 - 120	50 - 80	1.50
	SINGLE	6.10	10 - 25	8	70 - 120	50 - 80	1.50
TERTIARY	STAGGERED	5.00	10 - 25	8	70 - 120	50 - 80	1.50
	STAGGERED	6.10	10 - 25	8	70 - 120	50 - 80	1.50

TABLE 2. ROADWAY LIGHTING STATIONING AND PARAMETERS

SECTION 3.3 PHOTOMETRIC REQUIREMENTS AND COMPUTATIONS

ON OF THE MOST IMPORTANT ASPECTS OF OUTDOOR AREA LIGHTING IS THE PROPER DISTRIBUTION OF LIGHT FLUX FROM LUMINAIRES. THE LIGHT EMITTED BY THE LUMINAIRES IS DIRECTED AND PROPORTIONED ACCORDING TO THE REQUIREMENTS FOR SEEING AND VISIBILITY. LIGHT DISTRIBUTION IS TYPICALLY DESIGNED FOR A TYPICAL RANGE OF CONDITIONS SUCH AS LUMINAIRE MOUNTING HEIGHT, TRANSVERSE (OVERHANG) LOCATION OF THE LUMINAIRES, LONGITUDINAL SPACING, WIDTHS OF AREAS TO BE EFFECTIVELY LIGHTED, LUMINAIRE ARRANGEMENT, AND MAINTAINÉD SYSTEM **EFFICIENCY**



LUMINAIRE'S TRANSVERSE (PROJECTION) CAN BE CONSIDERED AS TYPES I, II, III, IV, AND V, AS SHOWN IN THE FIGURE ABOVE. CHARACTERISTICS THAT SHOW THE MAXIMUM INTENSITY OF THE LIGHT IS ABOVE 180° AND 90° TO EVADE GLARE AND SPILL LIGHT, IT IS CLASSIFIED AS FULL CUTOFF, CUTOFF,

ON A TWO-LANE ROADWAY, ADDING LIGHT TO ONE SIDE AND USING A TYPE 2 WILL ALLOW THE LIGHT TO FOCUS ALONG THE ROADWAY. ALLOCATING A TYPE 5 OR TWO (2) TYPE 3 LIGHTS BACK-TO-BACK IS PREFERRED WHEN DESIGNING A FOUR-LANE HIGHWAY WITH A MEDIAN SHALL ENHANCE THE ILLUMINATION OF THE AREA. ADDITIONAL TYPE 2 OR 3 ON THE OUTSIDE EDGES OF THE ROADS COULD ALSO EVENLY ILLUMINATE THE AREA.

GENERAL EQUATION FOR ILLUMINANCE

FOR STREETLIGHT SPACING

A_{WP} = Area of the Work Plane

E_{WP} = Average Maintained Illuminance on the Work Plane Θ_{TOTAL} = Total System Lamp Lumen Output CU = coefficient of utilization

NOTE: ILLUMINATION CALCULATION CAN ALSO BE ATTAINED USING DIGITAL SOFTWARE FOR THE LAMP WATTAGE RATING.

(LL)(MF)(CU)

S = Spacing LL = Lamp Lumen MF = Maintenance Factor CU = Coefficient of Utilization fc = Foot Candle W = Width of Road

EACH LUMINAIRE HAS ITS OWN COEFFICIENT OF UTILIZATION AND CAN BE OBTAINED FROM THE REPUTABLE MANUFACTURER'S DATA, SPECIFIC TO ITS

THE TABLE BELOW ILLUSTRATES HOW THE DESIGN VARIES DEPENDING ON THE STANDARD VALUES LISTED FOR DIFFERENT SURFACE REFLECTANCE CONTINGENT ON THE PAVEMENT TYPE TO BE LIGHTED WHETHER CONCRETE OR ASPHALT.

ILLUMINANCE METHOD - RECOMMENDED VALUES											
	PEDESTRIAN CT AREA	PAVE	MENT CLASSIFIC.	UNIFORMITY RATIO EAVA/EMIN	VEILING LUMINANCE RATIO						
ROAD	PEDESTRIAN CONFLICT AREA	R1 LUX/FC	R2 & R3 LUX/FC	R4 LUX/FC	LAVALIMIN	LMAX/LAVG					
FREEWAY CLASS A		6.0 / 6.0	9.0 / 0.9	8.0 / 0.8	3	0.3					
FREEWAY CLASS B		4.0 / 4.0	6.0 / 0.6	5.0 / 0.5	3	0.3					
	HIGH	10.0 / 1.0	14.0 / 1.4	13.0 / 1.3	3	0.3					
EXPRESSWAY	MEDIUM	8.0 / 0.8	12.0 / 1.2	10.0 / 1.0	3	0.3					
	LOW	6.0 / 0.6	9.0 / 0.9	8.0 / 0.8	3	0.3					
	HIGH	12.0 / 1.2	17.0 / 1.7	15.0 / 1.5	3	0.3					
MAJOR PRIMARY	MEDIUM	9.0 / 0.9	13.0 / 0.3	11.0 / 1.1	3	0.3					
	LOW	6.0 / 0.6	9.0 / 0.9	8.0 / 0.8	3	0.3					
	HIGH	8.0 / 0.8	12.0 / 1.2	10.0 / 0.1	4	0.4					
COLLECTOR SECONDARY	MEDIUM	6.0 / 0.6	9.0 / 0.9	8.0 / 0.8	4	0.4					
	LOW	4.0 / 0.4	12.0 / 1.2	5.0 / 0.5	4	0.4					
	HIGH	6.0 / 0.6	0.9 / 9.0	8.0 / 0.8	6	0.4					
LOCAL TERTIARY	MEDIUM	5.0 / 0.5	7.0 / 0.7	6.0 / 0.6	6	0.4					
	LOW	3.0 / 0.3	4.0 / 0.4	4.0 / 0.4	6	0.4					

TABLE 3. IESNA RECOMMENDED MAINTAINED AVERAGE HORIZONTAL ILLUMINANCE LEVELS (LUX) FOR DIFFERENT TYPES OF ROADS, PAVEMENTS, AND PEDESTRIAN CONDITIONS. (EXCERPT FROM IESNA 2000)

*ACCORDING TO NATIONAL ROAD CLASSIFICATIONS

SECTION 4 DESIGN CONSIDERATIONS

SURFACE LUMINANCE AND SOURCE LUMINANCE ARE THE TWO MOST IMPORTANT FACTORS TO BE CONSIDERED IN DESIGNING ROADWAY LIGHTING SYSTEMS. SURFACE LUMINANCE ADDS INTEREST AND DEPTH TO AN OUTDOOR SCENE AND CAN BE NECESSARY FOR GOOD VISIBILITY, ESPECIALLY FOR THE SAFETY OF

FACTORS IN DESIGNING ROADWAY LIGHTING SYSTEM

- THE EXPERTISE REQUIRED FOR LIGHTING DESIGNS INCLUDES:
- LAMP TYPES AND CHARACTERISTICS, INCLUDING DEPRECIATION FACTORS
- BALLAST AND DRIVER TYPES AND CHARACTERISTICS FIXTURE MECHANICAL CHARACTERISTICS
- PHOTOMETRIC PERFORMANCE OF LUMINAIRES AND FACTORS IMPACTING SUCH PERFORMANCE FIXTURE MOUNTING TYPES
- POLE MECHANICAL AND ELECTRICAL CHARACTERISTICS
- BREAKAWAY DEVICE OPTIONS AND WHEN APPROPRIATE TO USE CLEAR ZONE CRITERIA
- POLE TYPES, MOUNTING OPTIONS, AND LOADING CONSIDERATIONS
 FOUNDATION AND SUPPORT DETAILS
- PAVEMENT REFLECTION FACTORS
- MOUNTING HEIGHT AND SPACING OPTIONS
 LIGHT TRESPASS AND SKY GLOW ISSUES INCLUDING LAWS AND ORDINANCES LIGHTING QUALITY REQUIREMENTS, SUCH AS ILLUMINANCE, VEILING, VISIBILITY
- ENERGY AND LIFE-CYCLE COSTS

MASTER LIGHTING PLAN

A MASTER LIGHTING PLAN IS A FORMAL ARRANGEMENT BETWEEN RELEVANT GOVERNMENT AGENCIES AND OTHER ENTITIES WITHIN A REGIONAL AREA TO COORDINATE AND STANDARDIZE THE DESIGN, OPERATION, MAINTENANCE OF PUBLIC LIGHTING. BASIC BENEFITS OF LIGHTING INCLUDE SAFETY, BEAUTIFICATION, AND SECURITY FOR PEOPLE AND PROPERTY.

ILLUMINANCE CONSIDERATIONS

ILLUMINANCE ON ROADWAY LIGHTING IS A MEASURE OF THE LIGHT INCIDENT ON THE PAVEMENT SURFACE MEASURED IN FOOT-CANDLES (LUX). THE ILLUMINANCE AT ANY CERTAIN POINT WILL BE THE SUM OF ILLUMINANCE FROM ONE OR SEVERAL CONTRIBUTING SOURCES.

LUMINANCE IN ROADWAY LIGHTING IS A MEASURE OF THE REFLECTED LIGHT INCIDENT ON THE PAVEMENT SURFACE THAT IS VISIBLE TO THE MOTORIST'S EYE. DIFFERENT ROAD SURFACE MATERIAL, SUCH AS PORTLAND CEMENT CONCRETE OR ASPHALT HAVE DIFFERENT LUMINANCE COEFFICIENT. FOR A SECTION OF ROADWAY, LUMINANCE UNIFORMITY IS CALCULATED BOTH AS THE RATIO OF AVERAGE LEVEL TO MINIMUM POINT. THE EVALUATION OF GLARE FROM THE FIXED LIGHTING SYSTEM IS ALSO RELEVANT AND INCLUDED WITH THE LUMINANCE CRITERIA.

DESIGN CRITERIA

- DPWH DESIGN GUIDELINES, CRITERIA AND STANDARDS (DGCS) 2015 EDITION
- NATIONAL STRUCTURAL CODE OF THE PHILIPPINES PHILIPPINE ELECTRICAL CODE, PART 2, 2017
- ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA) LIGHTING HANDBOOK, 9TH EDITION, 2000

PEDESTRIAN	VEHICULAR TRAFFIC CLASSIFICATION					
PEDESTRIAN	VERY LIGHT	LIGHT	MEDIUM	HEAVY TO HEAVIEST		
TRAFFIC	UNDER 150	150 - 500	500 - 1200	1200 AND UP		
HEAVY	9.68	12.91	16.14	21.52		
MEDIUM	6.46	8.61	10.26	12.91		
LIGHT	2.15	4.30	6.46	9.68		

TABLE 4. RECOMMENDED AVERAGE HORIZONTAL ILLUMINATION LEVEL LUX (ELECTRICAL LAYOUT AND ESTIMATE, 2000)

POLE HEIGHT (M)							
ROAD CLASSIFICATION	PEDESTRIAN CONFLICT	1 LANE ONE SIDE	2 LANES ONE SIDE	3 LANES ONE SIDE	4 LANES OPPOSITE	5 LANES OPPOSIT	
FREEWAY CLASS A		12 (40')	12 (40')	12 (40')	15 (49')	15 (49')	
FREEWAY	CLASS B	12 (40')	12 (40')	12 (40')	15 (49')	15 (49')	
	HIGH		12 (40')	12 (40')	12 (40')	12 (40')	
EXPRESSWAY	MEDIUM	1	12 (40')	12 (40')	12 (40')	12 (40')	
	LOW	1	12 (40')	12 (40')	12 (40')	12 (40')	
	HIGH	1	12 (40')	12 (40')	12 (40')	12 (40')	
MAJOR PRIMARY	MEDIUM	7	12 (40')	12 (40')	12 (40')	12 (40')	
	LOW	1	12 (40')	12 (40')	12 (40')	12 (40')	
	HIGH	1	10 (33')	10 (33')	10 (33')	12 (40')	
COLLECTOR SECONDARY	MEDIUM		10 (33')	10 (33')	10 (33')	12 (40')	
	LOW	1	10 (33')	10 (33')	10 (33')	12 (40')	
	HIGH	7 (23')	7 (23')	10 (33')		•	
LOCAL TERTIARY	MEDIUM	7 (23')	7 (23')	10 (33')			
	LOW	7 (23')	7 (23')	10 (33')			

TABLE 5. POLE HEIGHT BY ROADWAY CONFIGURATION (IESNA RP-8-05)

MASTER LIGHTING PLAN

LIGHTING BENEFITS MOTORISTS BY IMPROVING THEIR ABILITY TO SEE ROADWAY GEOMETRY AND OTHER VEHICLES AT EXTENDED DISTANCE AHEA THIS RESULTS IN GREATER DRIVER CONFIDENCE AND IMPROVED SAFETY, WHICH IN TURN IMPROVES HIGHWAY CAPACITY, PEDESTRIAN SAFETY, PUBLIC SAFETY, SECURITY AND CONVENIENCE.

WARRANTS FOR CONTINUOUS EXPRESSWAY LIGHTING, COMPLETE INTERCHANGE LIGHTING, AND PARTIAL INTERCHANGE LIGHTING ARE PROVIDED TABLE 4. COMPLETE INTERCHANGE LIGHTING IS DEFINED AS A LIGHTING SYSTEM THAT PROVIDES RELATIVELY UNIFORM LIGHTING WITHIN THE LIMIT OF THE INTERCHANGE, LANES, RAMP TERMINALS, CROSSROAD INTERSECTIONS

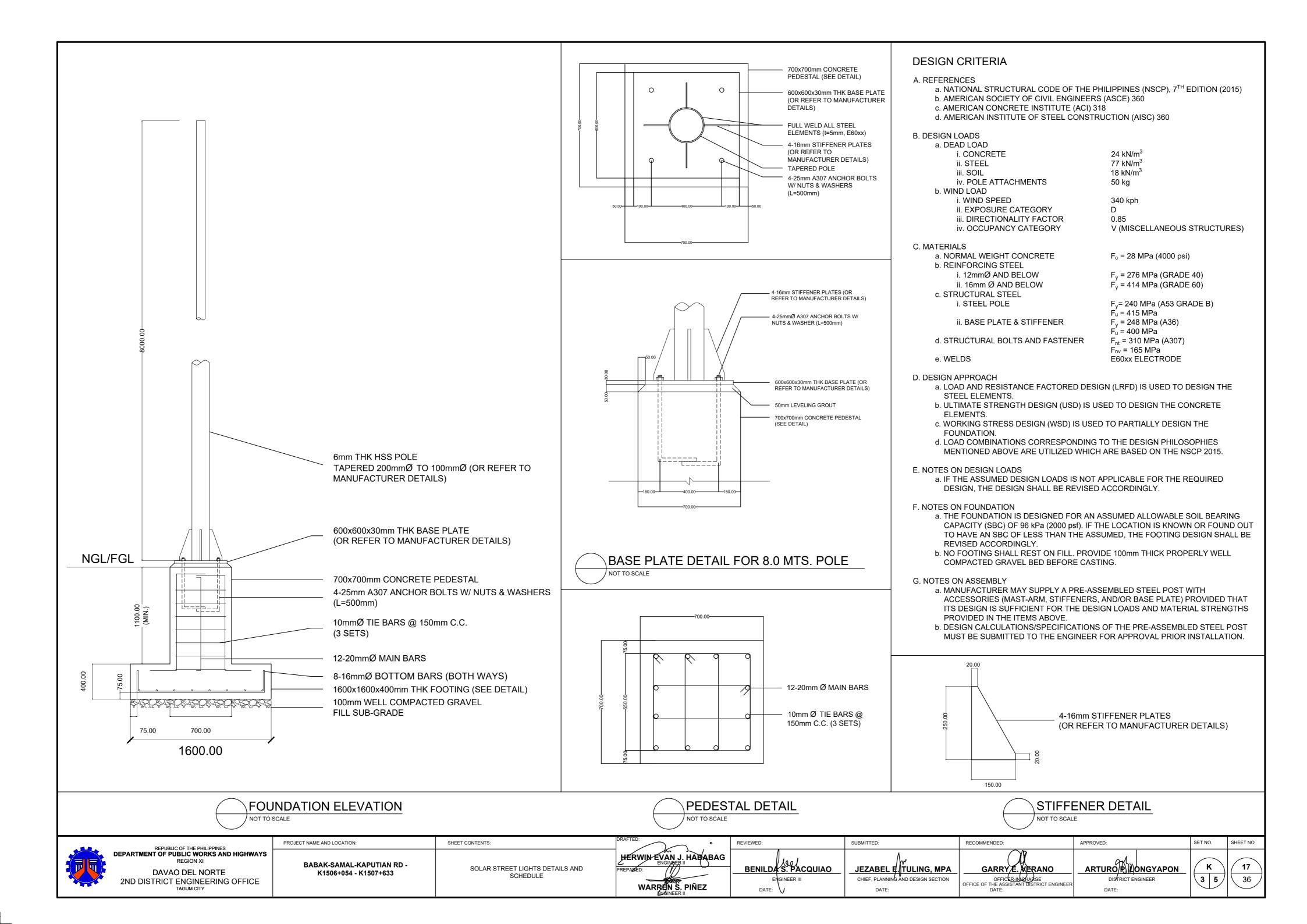
, K	AMP TERMINALS, C	RUSSRUAD INTERSECTIONS.			
	CASE	WARRANTING CONDITIONS			
	CEL-1	SECTIONS IN AND NEAR CITIES WHERE THE CURRENT AVERAGE DAILY TRAFFIC (ADT) IS 30,000 OR GREATER			
	CEL-2	SECTIONS WHERE THREE OR MORE SUCCESSIVE INTERCHANGES ARE LOCATED WITH AN AVERAGE SPACING OF 2.3KM OR LESS, AND ADJACENT AREAS OUTSIDE THE RIGHT-OF-WAY ARE SUBSTANTIALLY URBAN IN CHARACTER.			
	CEL-3	SECTIONS OF 3 KM OR MORE PASSING THROUGH SUBSTANTIALLY DEVELOPED URBAN OR SUBURBAN AREAS IN WHICH ONE OR MORE OF THE FOLLOWING CONDITIONS EXIST: LOCAL TRAFFIC OPERATES ON A COMPLETE STREET GRID HAVING SOME FORM OF STREET LIGHTING, PARTS OF WHICH ARE VISIBLE FROM THE EXPRESSWAY, THE EXPRESSWAY PASSES THROUGH A SERIES OF DEVELOPMENTS - SUCH AS RESIDENTIAL, COMMERCIAL, INDUSTRIAL, AND CIVIC AREAS, COLLEGES, PARKS, TERMINALS, ETC., THAT INCLUDE LIGHTED ROADS, STREETS, PARKING AREAS, YARDS, ETC., THAT ARE LIGHTED AS PART OF THE LOCAL STREET SYSTEM THE EXPRESSWAY CROSS SECTION ELEMENTS, SUCH AS MEDIAN AND BORDERS, ARE SUBSTANTIALLY REDUCED IN WIDTH BELOW DESIRABLE SECTIONS USED IN RELATIVELY OPEN COUNTRY.			
	CEL-4	SECTIONS WHERE THE RATION OF NIGHT TO DAY CRASH RATES IS AT LEAST 2.0 TIMES THE REGION AVERAGE FOR ALL UNLIGHTED SIMILAR SECTION, AND A STUDY INDICATES THAT LIGHTING MAY BE EXPECTED TO RESULT IN A SIGNIFICANT REDUCTION IN THE NIGHT CRASH RATE. WHERE CRASH RATE DATA IS NOT AVAILABLE, RATE COMPARISON MAY BE USED AS A GENERAL GUIDELINES FOR CRASH SEVERITY.			

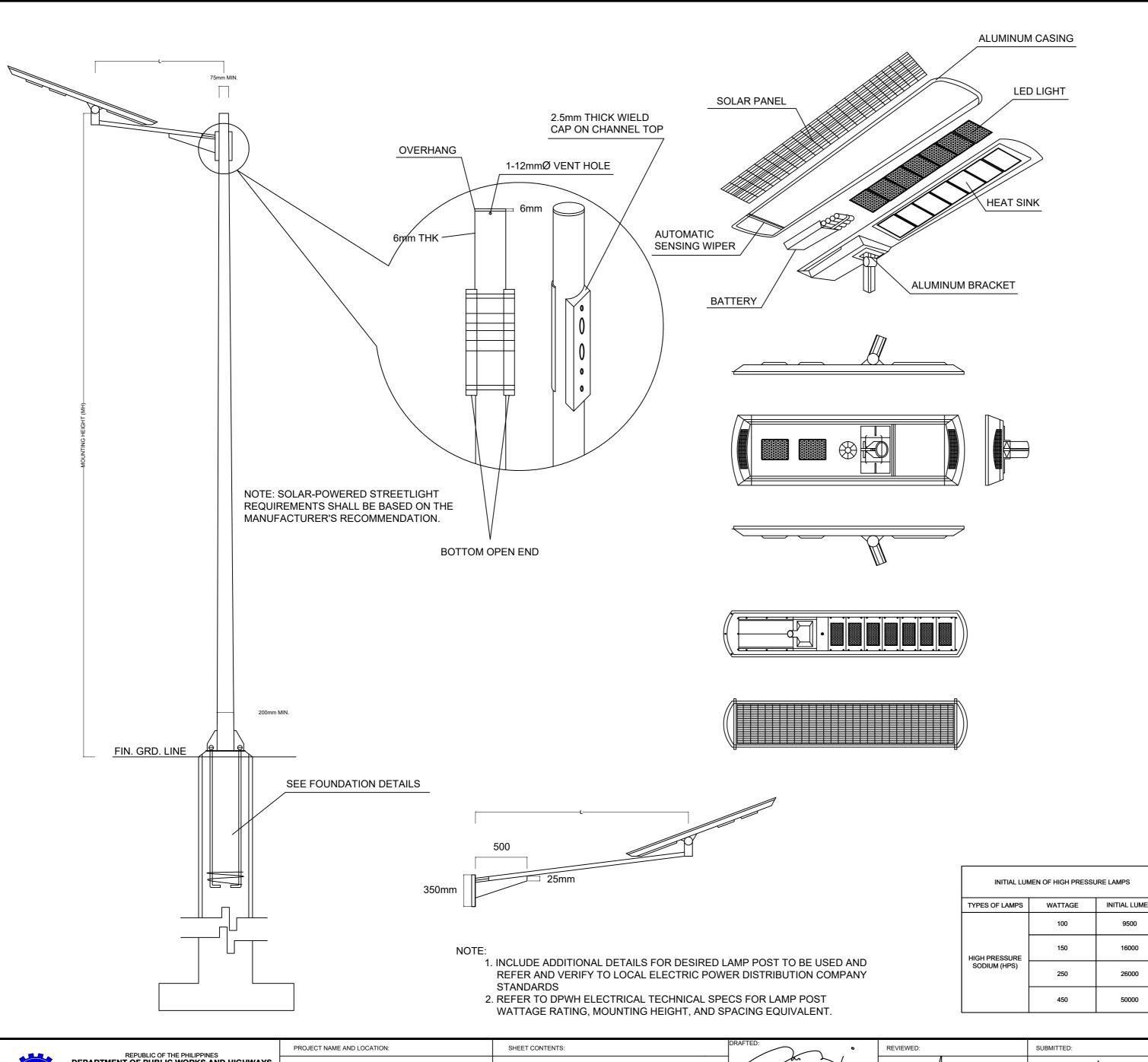
TABLE 6. WARRANTING CONDITIONS FOR CONTINUOUS EXPRESSWAY LIGHTING (AASHTO 2005, ROADWAY LIGHTING DESIGN GUIDE)

CASE	WARRANTING CONDITIONS
CIL-1	WHERE THE TOTAL CURRENT ADT RAMP TRAFFIC ENTERING AND LEAVING EXPRESSWAY WITHIN THE INTERCHANGE AREAS EXCEEDS 10,000 FOR URBAN CONDITIONS, 8,000 FOR SUBURBAN CONDITIONS, OR 5,000 FOR RURAL CONDITIONS.
CIL-2	WHERE THE CURRENT ADT ON THE CROSSROAD EXCEEDS 10,000 FOR URBAN CONDITIONS, 8,000 FOR SUBURBAN CONDITIONS, OR 5,000 FOR RURAL CONDITIONS.
CIL-3	WHERE EXISTING SUBSTANTIAL COMMERCIAL OR INDUSTRIAL DEVELOPMENT THAT IT LIGHTED DURING HOURS OF DARKNESS IS LOCATED IN THE IMMEDIATE VICINITY OF THE INTERCHANGE, OR WHERE THE CROSS ROAD APPROACH LEGS ARE LIGHTED FOR 0.75 KM OR MORE EACH SIDE OF THE INTERCHANGE.
CIL-4	WHERE THE RATIO OF NIGHT TO DA CRASH RATE WITHIN THE INTERCHANGE AREA IS AT LEAST 1.5 TIMES THE REGION AVERAGE FOR ALL UNLIGHTED SIMILAR SECTIONS, AND A STUDY INDICATES THAT LIGHTING MAY BE EXPECTED TO RESULT IN A SIGNIFICANT REDUCTION IN THE NIGHT CRASH RATE. WHERE CRASH DATA IS NOT AVAILABLE, RATE COMPARISON MAY BE USED AS A GENERAL GUIDELINE FOR CRASH SEVERITY.

TABLE 7. WARRANTING CONDITIONS FOR COMPLETE INTERCHANGE LIGHTING (AASHTO 2005, ROADWAY LIGHTING DESIGN GUIDE)

RECOMMENDED: APPROVED: SET NO. SHEET NO. PROJECT NAME AND LOCATION: SHEET CONTENTS: REVIEWED: REPUBLIC OF THE PHILIPPINES **DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS** HERWIN EVAN J. HABABAG BABAK-SAMAL-KAPUTIAN RD -BENILDA'S. PACQUIAO 16 SOLAR STREET LIGHTS DETAILS AND GARRY E. MERANO ARTURO R LONGYAPON <u>JEZABEL ᡛ∬TULING, MPA</u> DAVAO DEL NORTE K1506+054 - K1507+633 SCHEDULE OFFICER-INV HARGE OFFICE OF THE ASSISTANT DISTRICT ENGINEE 2 5 36 ENGINEER III CHIEF, PLANNING AND DESIGN SECTION DISTRICT ENGINEER 2ND DISTRICT ENGINEERING OFFICE WARREN S. PIÑEZ DATE: DATE:





SOLAR STREET LIGHTS DETAILS AND SCHEDULE

		12V - 36V		
	OPERATING VOLTAGE AND POWER	60 - 310 W		
) Onex	(SHOULD BE GREATER THAN 90% AFTER 10 YEARS AND LE THAN 80% AFTER 25 YEARS		
SOLAR PHOTOVOLTAIC PANEL	LIFETIME	>25 YEARS		
	MATERIAL	MONOCRYSTALLINE/POLYCRY ALLINE SILICON		
	WEIGHT	<25KG		
	ALLOWABLE AMBIENT TEMPERATURE RANGE	-40° TO +60°C		
	INPUT VOLTAGE	12.8V		
	TYPE	LITHIUM-ION OR LEAD-ACID TYF ELECTROLYTE PLATE LEAD AC WITH LOW ANTIMONY LEAD ALLOY PLATES AND CERAMIC VENT PLUGS		
BATTERY	LIFETIME	6 - 8 YEARS		
	CHARGING AND DISCHARGING CYCLES	2000		
	CHARGING TIME	7 HOURS		
	WORKING TIME UNDER RAINY DAYS	10 DAYS		
CHARGE CONTROLLER	INTELLIGENT CONTROL FOR CIRCUIT PROTECTION			
CHARGE CONTROLLER	FEATURE	TIMING, DIMMING, AND SENSO		
	LIGHT OUTPUT	50W TO 300W		
	SYSTEM FLUX	6000 - 30,000 LM		
	COLOR TEMPERATURE	2,500K - 3,500K (WARM WHITE 3,000K - 4,500K (COOL WHITE 5,500K - 6,500K (DAYLIGHT)		
	OPTICAL COVER/LENS TYPE	UV STABILIZED		
HOUT FAULTING BIODE (LED)	0.1.0.20012.122.10	POLYCARBONATE COVER		
LIGHT-EMITTING DIODE (LED) LAMP	DRIVER	DIMMABLE AND DESIGNED TO OPERATE MAINTENANCE FRE FOR 50,000 HOURS WITH A COMPATIBILITY TO WIRELES LIGHTING CONTROL PROTOCO		
	LIFETIME	>50,000 HOURS		
	PHOTO CONTROLLER	INDIVIDUAL OR GROUP		
	HOUSING	HIGH PRESSURE DIE-CAST ALUMINUM WITH HEAT MANAGEMENT SYSTEM AND RUST RESISTANT		
	RANGE	-40°C TO +60°C		
ALLOWABLE AMBIENT TEMPERATURE	RANGE FOR CHARGING	0°C TO +45°C		
	RANGE FOR DISCHARGING -20°C TO +35°0			
CHARGE TIME	7 HOURS UNDER DIRECT	AND STRONG SUNLIGHT		
IP RATING	IP	65		
WARRANTY PERIOD	6 YEARS MINIMUM			

INTEGRATED SOLAR STREETLIGHT TECHNICAL PARAMETERS



REPUBLIC OF THE PHILIPPINES

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

REGION XI

DAVAO DEL NORTE
2ND DISTRICT ENGINEERING OFFICE

BABAK-SAM

BABAK-SAMAL-KAPUTIAN RD -K1506+054 - K1507+633 PREPARED:

WARREN S. PIÑEZ

ENGINEER II

BENILDA S. PACQUIAO
ENGINEER III
DATE:

JEZABEL E TULING, MPA
CHIEF, PLANNING AND DESIGN SECTION
DATE:

GARRY E. MERANO

OFFICER-INCHARGE

OFFICE OF THE ASSISTANT DISTRICT ENGINEER

DATE:

RECOMMENDED:

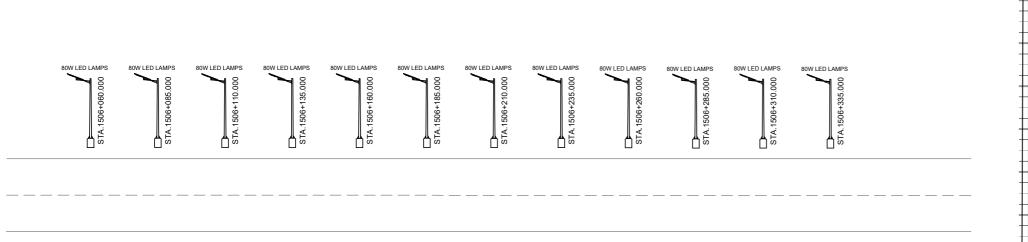
ARTURO PLONGYAPON
DISTRICT ENGINEER
DATE:

SET NO.

K
4

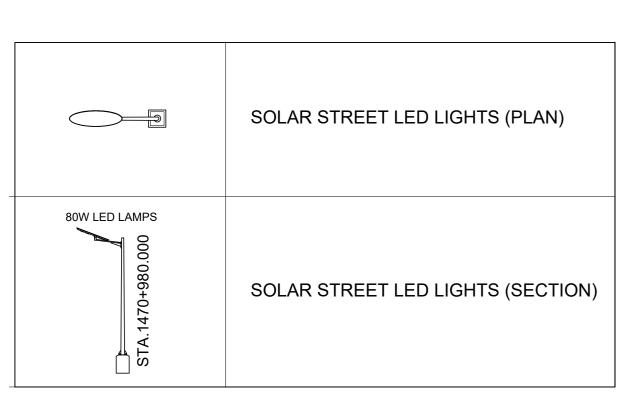
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SHEET NO.

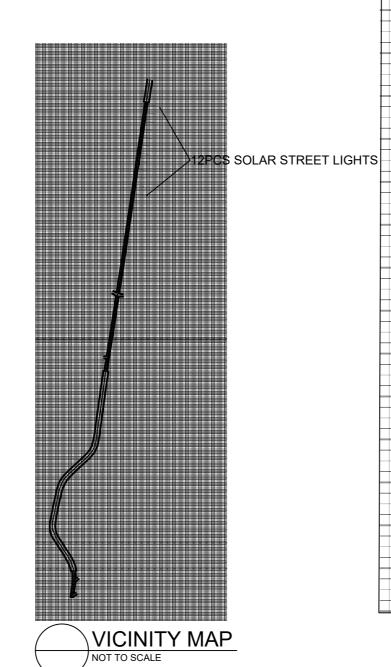


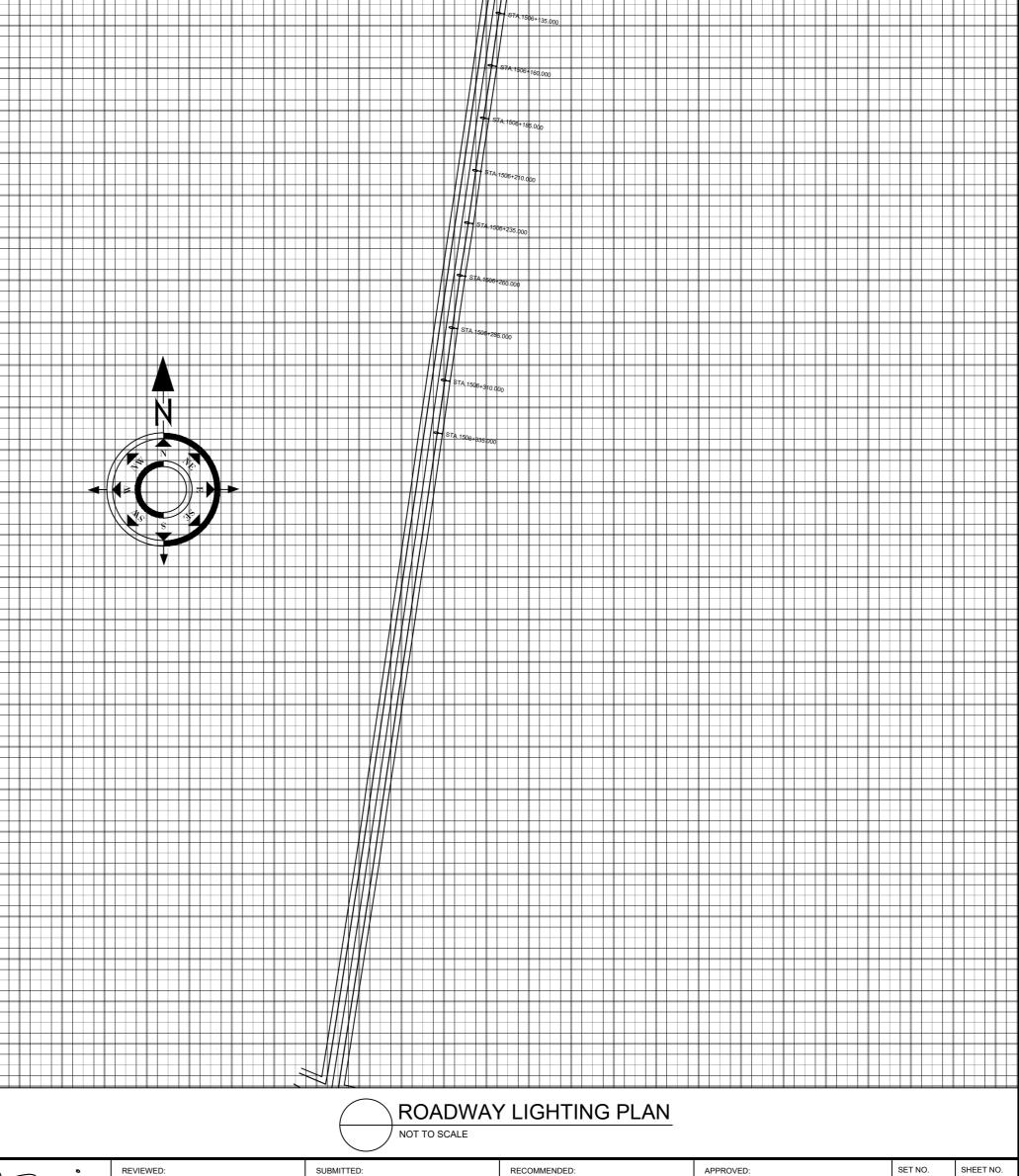


SCHEDULE OF SOLAR STREET LIGHTS							
80-125W SOLAR LED STREET LIGHT							
STATION	QTY	SPACING(m)	REMARKS	STATION	QTY	SPACING(m)	REMARKS
K1506+060.00	1.00	25.00	LS	K1506+210.00	1.00	25.00	LS
K1506+085.00	1.00	25.00	LS	K1506+235.00	1.00	25.00	LS
K1506+110.00	1.00	25.00	LS	K1506+260.00	1.00	25.00	LS
K1506+135.00	1.00	25.00	LS	K1506+285.00	1.00	25.00	LS
K1506+160.00	1.00	25.00	LS	K1506+310.00	1.00	25.00	LS
K1506+185.00	1.00	25.00	LS	K1506+335.00	1.00	25.00	LS











REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS REGION XI

DAVAO DEL NORTE 2ND DISTRICT ENGINEERING OFFICE BABAK-SAMAL-KAPUTIAN RD -K1506+054 - K1507+633

PROJECT NAME AND LOCATION:

SOLAR STREET LIGHTS DETAILS AND SCHEDULE

SHEET CONTENTS:

HERWIN EVAN J. HABABAG WARREN S. PIÑEZ

BENILDA'S. PACQUIAO ENGINEER III DATE:

JEZABEL F. TULING, MPA CHIEF, PLANNING AND DESIGN SECTION DATE:

GARRY E. MERANO

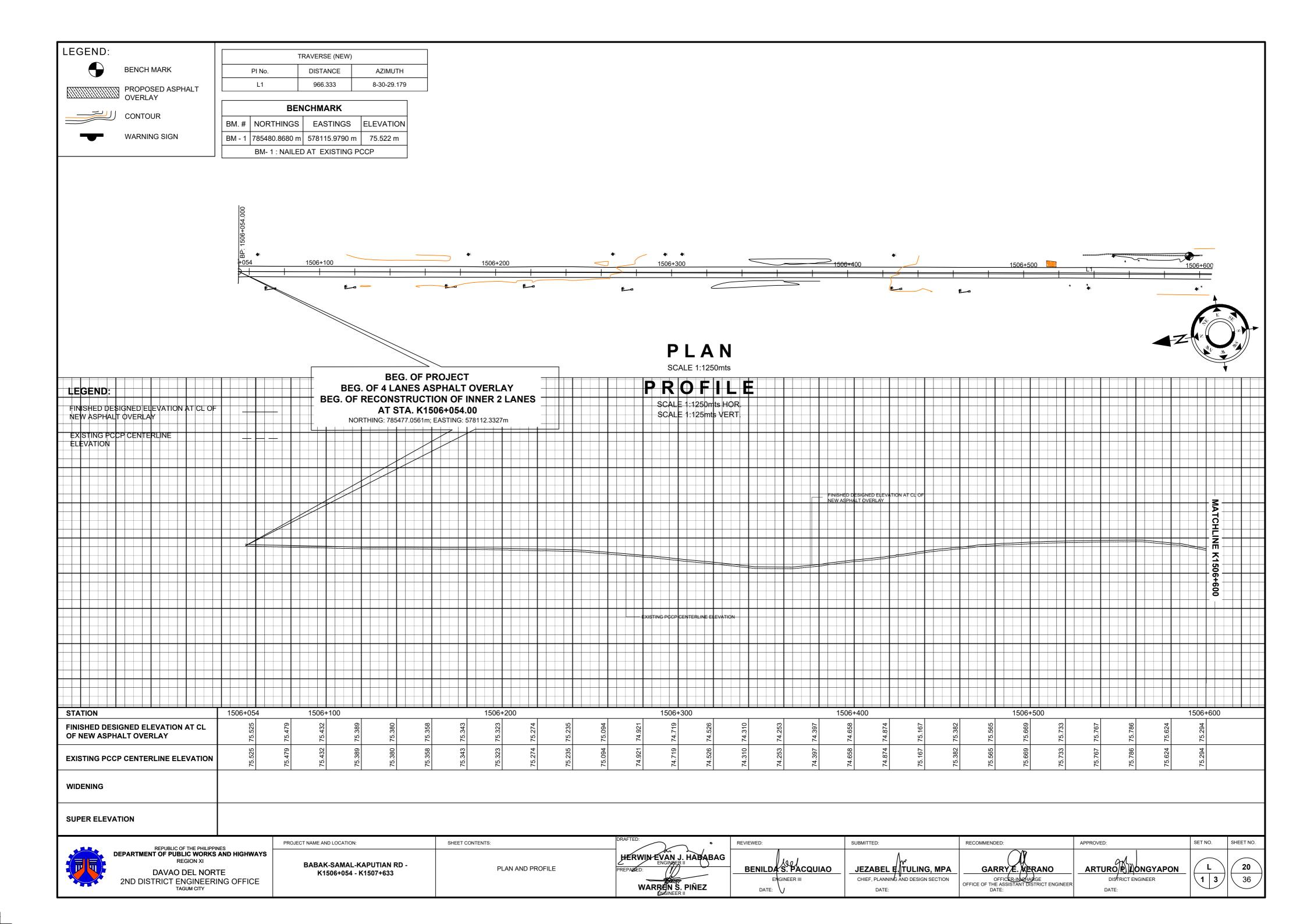
OFFICE OF THE ASSISTANT DISTRICT ENGINEER

DATE:

ARTURO R LONGYAPON
DISTRICT ENGINEER

K 5 5

19



LEGEND: TRAVERSE (NEW) BENCH MARK DISTANCE PI No. AZIMUTH L2 88.559 7-59-56.337 PROPOSED ASPHALT OVERLAY WARNING SIGN PLAN SCALE 1:1250mts LEGEND: SCALE 1 1250mts HOR. EXISTING PCCP CENTERLINE ELEVATION FINISHED DESIGNED ELEVATION AT CL OF STATION 1506+054 1506+054 1506+700 1506+000 1506+900 1507+000 FINISHED DESIGNED ELEVATION AT CL OF NEW ASPHALT OVERLAY **EXISTING PCCP CENTERLINE ELEVATION** WIDENING **SUPER ELEVATION** RECOMMENDED: PROJECT NAME AND LOCATION: SHEET CONTENTS: REVIEWED: SUBMITTED: APPROVED: REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS HERWIN EVAN J. HABABAG ARTURO R LONGYAPON
DISTRICT ENGINEER REGION XI BENILDA S. PACQUIAO BABAK-SAMAL-KAPUTIAN RD -GARRY E. XERANO

OFFICE OF THE ASSISTANT DISTRICT ENGINEER DATE: PLAN AND PROFILE JEZABEL É. TULING, MPA DAVAO DEL NORTE K1506+054 - K1507+633 CHIEF, PLANNING AND DESIGN SECTION ENGINEER III 2ND DISTRICT ENGINEERING OFFICE WARREN S. PIÑEZ DATE: \ DATE:

1507+100

SET NO.

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SHEET NO.

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