

TLE-Industrial Arts
**Electrical Installation and
Maintenance**

First Quarter-Module 2 Part 2
Wireways and Cable Tray



Writers: Jeramil G. Moreno (SST I, PHS)
Rogerson J. Pulido (SST II, MNHS)

Cover Illustrator: Christopher E. Mercado

Mayroong pag-asa dahil sa iyo, dahil sa inyong mga kabataan. Ang iyong mga ngiti, tawa, sigla, at likas na kabutihan ang inspirasyon naming mga magulang at guro upang pagbutihin ang pag-aalaga sa iyo, nang maipagpatuloy mo ang iyong pag-aaral at mga libangan.

Lagi ka sanang maging malusog, masayahin, masipag, at mapagmahal.

Ako ay sabik na maghihintay sa iyong pagbabalik sa paaralan sa hinaharap.

- Mayor Marcy





Paano iniwasan ng ating pamilya ang COVID-19?



Inaalagaan ba natin ang ating kalusugan sa pamamagitan ng **sapat na tulog, ehersisyo, at masustansyang pagkain?**



Lagi ba tayong **naghuhugas ng kamay** gamit ang sabon at tubig o mga alcohol-based na produkto?



Pinapanatili ba natin ang kalinisan sa pamamagitan ng **palagiang pagdi-disinfect ng bahay?**



Binubuksan ba natin ang mga bintana para **makadaloy ang hangin** (natural ventilation)?



Iniiwasan ba natin ang **paglabas ng bahay at pagpapapasok ng bisita** kung hindi naman kailangan? Kung may lalabas man, tayo ba ay nagsusuot ng **face mask at face shield**?



Nagbabasa o nakikinig ba tayo sa mga **balita at bagong impormasyon** tungkol sa COVID-19?



Tinatandaan ba natin ang mga **karaniwang sintomas** ng COVID-19? At alam ba natin kung saan tatawag kung sakaling mayroong may sintomas sa pamilya?



Tinuturuan ba tayo ng ating mga magulang at nagiging mabuti ba silang modelo ng mga nabanggit na health at safety protocols?

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MGA PAALALA UPANG MAIWASAN ANG COVID-19



Laging magsuot ng face mask at face shield.



Practice Social Distancing
(Dumistansya ng 2 metro kapag nakikipag-usap)



Laging maghugas ng kamay at gumamit ng alcohol.



Kumain ng masustansyang pagkain at uminom ng maraming tubig.



Uminom ng bitamina.



Panatilihing malinis ang kapaligiran.



Manatili lamang sa bahay kung walang mahalagang aasikasuhin at panatilihing ligtas ang tahanan sa COVID-19.



Agad sumangguni sa inyong doktor o pinakamalapit na health center kapag nakaramdam ng mga palatandaan ng COVID-19.

Marikina COVID-19 Hotlines:



0926 626 3695
0927 456 6682
0961 470 3326
0961 470 3327

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HINDI PA TAPOS ANG LABAN SA COVID-19: MGA PAALALA LABAN SA FAMILY CLUSTER INFECTION

Iwasan ang hawaan sa pamilya, gawing ligtas ang tahanan. TANDAAN:



**MARIKINA COVID-19
CALL CENTER**

HOTLINE:

0926-626-3695

0927-456-6682

0961-470-3326

0961-470-3327

**SWAB
TEST**



GAWING LIGTAS ANG TAHANAN.



- Huwag balewalain ang sintomas ng COVID-19
- Sundin ang quarantine protocols
- Huwag munang mag-dine in sa mga kainan/café
- Iwasan ang selebrasyon, inuman, at pagtambay
- Iwasan ang pulutong ng mga tao
- Huwag huhubarin ang face mask kapag nakikipagusap at panatilihin ang 2 meters na distansya
- Iwasan magpapasok ng mga bisita na hindi essential sa loob ng bahay
- Palaging maghugas ng kamay

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Hindi kaya ng pamahalaan lamang.
Magkakasama nating talunin ang COVID-19 sa Marikina.
PARA SA LIGTAS NA MARIKINA

Lesson 2

Wireway Installation and Wireway Fittings and Accessories

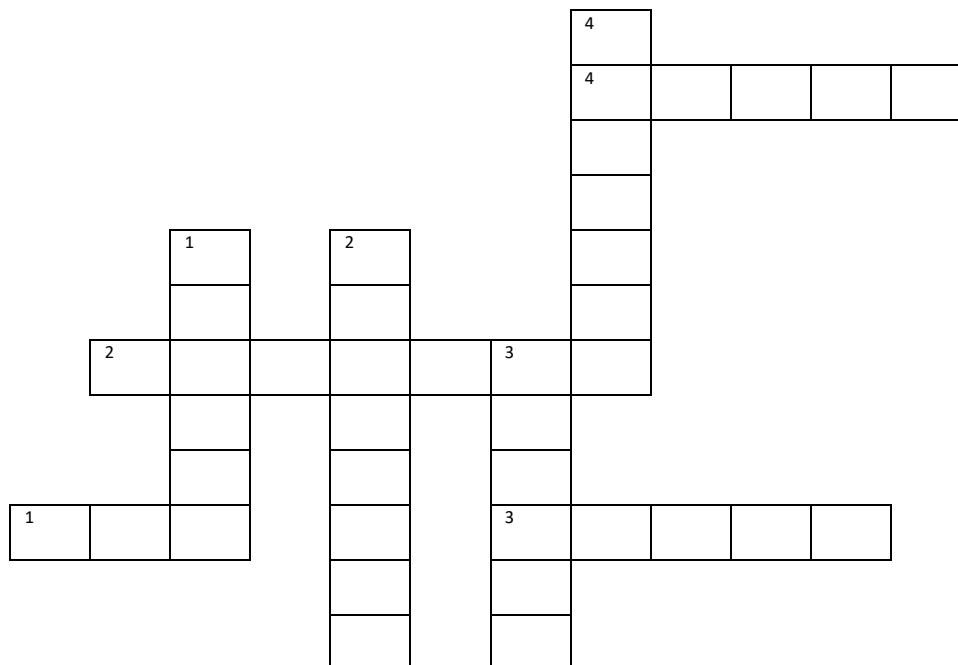
Cable management is the one best practices of being electrician it provides a cleaner workspace or living area, makes easier to add or remove devices and cables, protects the cables from crimping or other damage prevents cable from disconnecting unexpectedly, and limits interference from other cables. In this lesson we are going to understand one of the ideas about cable management.



What I Know

WORD PUZZLE

Fill in the cross word puzzle with the words missing from the sentences below.



ACROSS

1. Wire way fittings with side hinge cover design for applications where a “T” junction is necessary.
2. Wire way fittings used for those installations that require separate wiring compartments.
3. Design for junction cable run in four directions
4. Design for applications where 90° turn is necessary.

DOWN

1. Allows for a secure connection of wireway or fitting to an adjoining enclosure or wall
2. Wireway section lengths from 12.00” (305 mm) to 120.00” (305 mm)
3. It used to terminate the wireway or fitting.
4. Used to reduce or enlarge wireway runs



What's In

Types of Wireway

1. Metal Wireway

A metal trough with hinged or removable covers used for housing, protecting and managing the wires and cable. The following are the PEC 3.76 provision for the use and installation.

- A. Uses permitted of metal wireway:
 - a.1 in exposed work
 - a.2 in hazardous classified location (ex. Presence of combustible dust)
 - a.3 in used extension area with concealed spaces that extending across the wall. Provided the access to the conductor shall be maintained on both sides of the wall.
- B. Metal wireway cannot be use:
 - b.1 in area subject to physical damage.
(wireway should damage free in any chosen location for installation)
 - b.2 in area with severe corrosive environment.
(These particles when combined with oxygen, water, or high humidity environments)



C. Size of conductor

No conductor larger than that for which the wire way is designed shall be installed in any wireway.

D. Securing and Supporting

d.1 Where metal wireway run horizontally at each end and at intervals not to exceed 1 500 mm.

d.2 Where metal wireway run vertically at interval not exceeding 4 500 mm and shall not have more than one joint between support.

E. Splices and Taps

Splices and taps shall be allowed within a wireway provided they are necessary and accessible the conductors including taps and splices shall not fill the wireway to more than 75 percent of its area.

F. Dead Ends

Dead ends of metal wireway must be closed or cover with end cap.

2. Nonmetallic Wire way

Nonmetallic wireway is made of flame-radiant, nonmetallic troughs with removable cover used for housing, protecting and managing cables. The following are the PEC 3.78 provision for the use and installation.

A. Uses permitted of nonmetallic wireway:

a.1 only for exposed work

a.2 in corrosive environment (ex. Presence of combustible dust)

a.3 wet locations (liquid, or moisture)

a.4 in used extension area with concealed spaces that extending across the wall. Provided the access to the conductor shall be maintained on both sides of the wall.

B. Nonmetallic wireway cannot be use:

b.1 in areas subject to physical damage

(wireway should damage free in any chosen location for installation)

b.2 in hazardous classified location (ex. Presence of combustible dust)

b.3 in areas which exposed to sunlight it might be affect to the material of the wireway.

b.4 in areas which with ambient temperature or any environment where equipment is stored.

b.5 with conductors having limitation in its insulation temperature

C. Size of conductor

No conductor larger than that for which the wireway is designed shall be installed in any wireway.

D. Securing and Supporting

d.1 Where nonmetallic wireway run horizontally at each end and at intervals not to exceed 900 mm.

d.2 Where nonmetallic wireway run vertically at interval not exceeding 1 200 mm and shall not have more than one joint between support.

E. Splices and Taps

Spices and taps shall be allowed within a wireway provided they are necessary and accessible the conductors including taps and splices shall not fill the wireway to more than 75 percent of its area.

F. Dead Ends

Dead ends of nonmetallic wireway must be closed or cover with end cap.

G. Grounding

Grounding is needed for those equipment required ground. A separate grounding conductor must be installed in nonmetallic wireway.



What's New

Wireways are basically raceway systems that are constructed in a boxy rectangular design. Wireways are typically a modular design with fittings permitting change of directions, “T” fittings and “X” fittings, and these generally require a coupler.

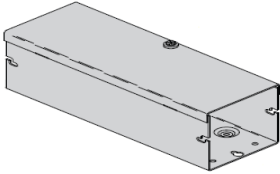
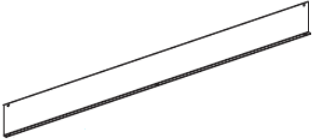
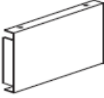

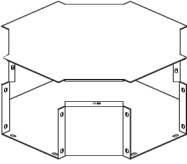
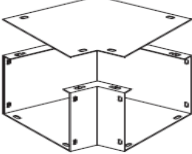


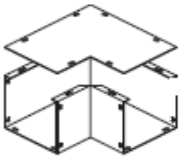
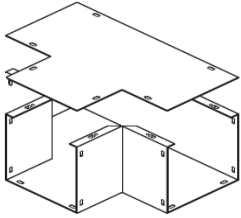
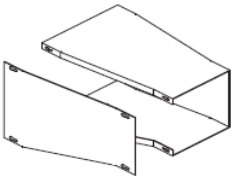
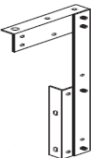
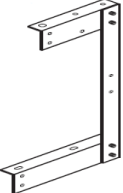


What Is It

Wireway fittings and accessories

The following are some fittings and accessories used in wireway.

	<p>Wireway straight Section</p> <p>A straight path section where the cables are in place.</p>
	<p>Wireway barrier (Bolt-On)</p> <p>Used for those installations that require separate wiring compartments.</p>
	<p>Wireway end cap</p> <p>It used to terminate the wireway or fitting.</p>
	<p>Wireway end flange</p> <p>Allows for a secure connection of wireway or fitting to an adjoining enclosure or wall.</p>
	<p>Wireway cross</p> <p>Design for junction cable run in four directions</p>
	<p>Wireway 90° elbow</p> <p>Side opening hinge cover design for applications where 90° turn is necessary.</p>

	<p>Wireway 45 ° elbow</p> <p>Similar to the 90° side opening design except for a 45° turn</p>
	<p>Wireway Tee</p> <p>Side hinge cover design for applications where a “T” junction is necessary.</p>
	<p>Wireway reducer</p> <p>Used to reduce or enlarge wireway runs. Removable cover is secured with screws.</p>
	<p>Wireway hanger (Side cover assembly)</p> <p>Used for those installations where the wireway cover must be removed from the side.</p>
	<p>Wireway hanger (Top cover assembly)</p> <p>Used for those installations where the wireway cover must be removed from the top.</p>



Remember

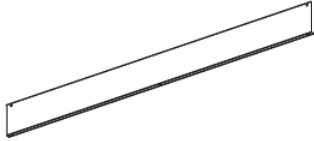

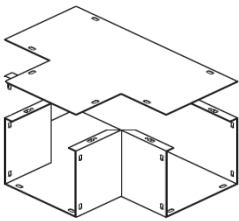
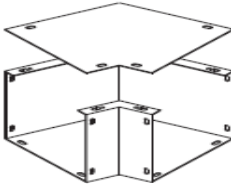
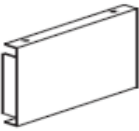
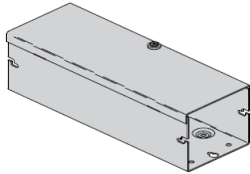
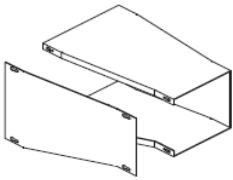
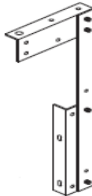
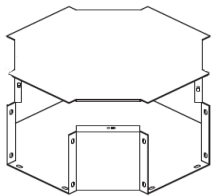
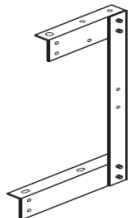
It depends on the product type of wireway, it can be mounted to walls or ceilings, secured under flooring, or laid out in a hybrid design in unique cable management systems.





What's More

Identify of fittings based on the illustration given. Write the answer on the space provided.

	1.		6.
	2.		7.
	3.		8.
	4.		9.
	5.		10.



What I Have Learned

Answer the following question below.

1. Why is it important to have cable management in certain establishment or building?

2. What do you think the advantage of using wireway?

RUBRICS FOR ESSAY TYPE

CRITERIA	SCORING GUIDE				Student's Rating
	(8-10)	(5-7)	(2-4)	(0-1)	
Organization	The introduction is relevant and presented in logical order. The conclusion is included and clear	The introduction is presented relevant to the topic. The conclusion is included, but does not strengthen the answer	The introduction is presented and few relevant to the topic. The conclusion is included, but not especially relevant	No clear introduction and conclusion	
Details	Main ideas are clear and well supported by detailed and accurate info.	Main ideas are clear but are not supported by detailed info.	Main ideas are not especially clear	Main ideas are not clear	
Sentence, Grammar and Spelling	All sentence are well-constructed, there are very few errors in grammar or spelling	Most sentence are well-constructed, there are very few errors in grammar or spelling	Most sentence are well constructed but, there several errors in grammar or spelling.	Words in sentence are repetitive, there are numerous errors in grammar or spelling.	
Total Score 30 points					



What I Can Do

OFFLINE ACTIVITY

Complete the paragraphs. Fill in the blanks with the correct answers.

A (1.) _____ is typically produced as a metallic or non-metallic trough with hinged or removable covers, so that the cables contained are well-protected but still (2.) _____. Nonmetallic wireway is made of (3.) _____, can be used only for exposed work, corrosive environments, wet locations and in extension area with concealed spaces that extending across the wall is unbroken. Provided the access to the conductor shall be maintained on both sides of the wall.

(4.) _____ shall be allowed within a wireway, provided they are necessary and accessible. The conductors including taps and splices shall not fill the wireway to more than (5.) _____ of its area.

Dead ends of nonmetallic wireway must be closed or cover with (6.) _____. Grounding is needed for those equipment required ground. A separate grounding conductor must be installed in nonmetallic wireway.

ONLINE ACTIVITY

Using PowerPoint presentation application create infographics about the lesson wireway fittings you can use the information provided in this module. Send your soft copy to the link/email given by your teacher.



RUBRICS FOR THE ACTIVITY

	5	4	3	2	1
Design	Layout is organized and uses consistent style Color scheme has visual appeal and works with content Fonts are legible and consistent	Generally good layout Has minor inconsistency or one distracting element Color scheme clashes	Layout could use improvement Two or more inconsistent elements Hard to read fonts Layout distracts from content	Layout is disorganized, no obvious organization Layout distracts from content Color scheme is confusing	No layout or scheme just random elements, colors, and fonts
Content	Appropriate terms, vocab, jargon defined and used More than enough data to make claims Data clearly demonstrate trend, claim, etc.	One or two terms or jargon used incorrectly or without explanation Adequate amount of data Data demonstrate trend, claim, etc.	Not enough terms, vocab, jargon Data is sparse Data might not demonstrate the trend or claim	Lacking in appropriate terminology Not enough facts or data	No real data or facts are present
Clarity	Claim, main idea is obvious and easy to understand No unnecessary graphics or visuals Infographic makes a good initial impression	Claim, main idea is understandable No unnecessary graphics or visuals	Claim, main idea is made Some graphics or visuals are unneeded	Infographic makes a poor initial impression Confusing	Claim, main idea is missing
Representation	Design elements are clearly informed by content Visuals show connection to content and create a visual flow Visualizations fit the data and the claim	Design elements are clearly informed by content Visualizations fit the data and the claim	Visualizations fit the data and the claim	Design and visuals are at odds with the content or claims being made	Design elements and visuals convey a meaning contrary to the intent





Assessment

Write **T** if the statement is True. If it is false **change the underline** word or group of words that makes it wrong and then write the correct one on the spaces provided.

_____ 1. Metal Wireway cannot be used in area subject to physical damage

_____ 2. Each end at intervals not to exceed 900 mm for securing and supporting metal wireway which run horizontally.

_____ 3. Dead ends of nonmetallic wireway must be installed or cover with end cap.

_____ 4. A separate grounding conductor should be installed in nonmetallic wireway.

_____ 5. Securing and supporting of metallic wireway run vertically at interval not exceeding 10000 mm and shall not have more than one joint between support.

_____ 6. Wireway cross is used to terminate the wireway or fittings.

_____ 7. Wireway end flange is used to secure connection of wireway or fitting to an adjoining enclosure or wall.

_____ 8. Nonmetallic wireway can be used in exposed work.

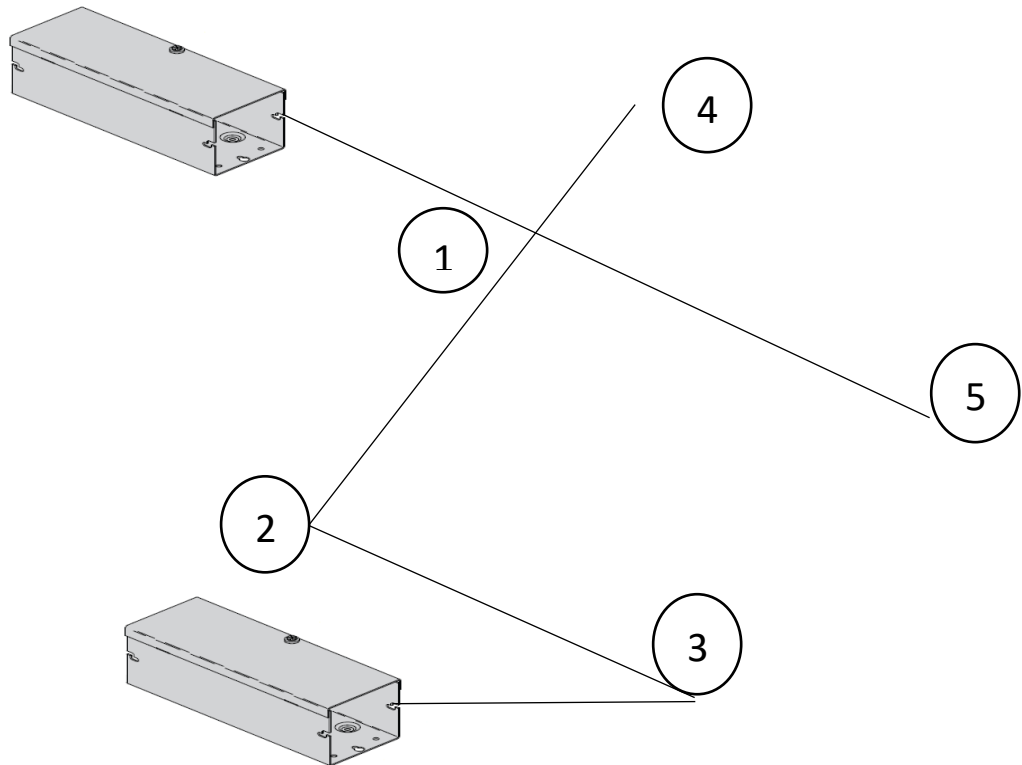
_____ 9. No conductor larger than for which the wireway is designed shall be installed in any wireway.

_____ 10. Splices and taps shall be allowed within a wireway provided they are necessary and accessible the conductors including taps and splices shall not fill the wireway to more than 75 percent of its area.



Additional Activities

Prepare a list of wireway fittings necessary to complete the wireway system below.





References

Books

Mogado, Jomar P. (2015). *Technology and Livelihood Education (TLE) 10 Electrical Installation & Maintenance (Specialization)*. Philippines: Trinitas Publishing Inc.

Philippine Electrical Code Part 1 (2017 edition)

Institute of Integrated Electrical Engineers of the Philippines, Inc. (IIEE)
IIE Bldg., #41 monte de Piedad St., Cubao, Quezon City

Online Sources

Madsen, David A. (2004). *Print Reading for Engineering and Manufacturing Tech.* Delmar Learning Blueprint Reading Series (2nd, Illustrated ed.). Cengage Learning. ISBN 1401851630. Retrieved 2013 0204
https://en.wikipedia.org/wiki/Abrasive_saw

Wikipedia contributors. (2020, March 24). Drill. In *Wikipedia, The Free Encyclopedia*. Retrieved 07:27, June 27, 2020, from
<https://en.wikipedia.org/w/index.php?title=Drill&oldid=947165860>

Wikipedia contributors. (2020, April 13). File (tool). In *Wikipedia, The Free Encyclopedia*. Retrieved 07:38, June 27, 2020, from
[https://en.wikipedia.org/w/index.php?title=File_\(tool\)&oldid=950802073](https://en.wikipedia.org/w/index.php?title=File_(tool)&oldid=950802073)



Wikipedia contributors. (2020, June 9). Wrench. In *Wikipedia, The Free Encyclopedia*. Retrieved 07:40, June 27, 2020,
from <https://en.wikipedia.org/w/index.php?title=Wrench&oldid=961547966>

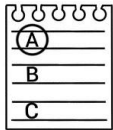
Wikipedia contributors. (2020, May 28). Hacksaw. In *Wikipedia, The Free Encyclopedia*. Retrieved 07:43, June 27, 2020,
from <https://en.wikipedia.org/w/index.php?title=Hacksaw&oldid=959319389>

Wikipedia contributors. (2020, April 25). Spirit level. In *Wikipedia, The Free Encyclopedia*. Retrieved 07:45, June 27, 2020,
from https://en.wikipedia.org/w/index.php?title=Spirit_level&oldid=953125090

HowStuffWorks.com Contributors "Does a torque wrench stop when it reaches its torque?" 18 May 2011. HowStuffWorks.com.
<<https://home.howstuffworks.com/torque-wrench-stop-when-reaches-torque.htm>> 27 June 2020



Electrical Installation and Maintenance NCII – Grade 9
Alternative Delivery Mode
Quarter 1 – Module 2 Part 2: Wireways and Cable Tray
Lesson 2: Wireway Installation and Wireway Fittings and Accessories
First Edition, 2020



Answer Key

Lesson 2

WHAT I KNOW (WORD PUZZLE)

ACROSS	1. TEE 2. BARRIER 3. CROSS 4. ELBOW DOWN
DOWN	1. FLANGE 2. STRAIGHT 3. ENDCAP 4. REDUCER

WHAT'S MORE ACTIVITY 1

1. Wireway barrier	6. Wireway flange
2. Tee	7. 90° Elbow
3. End Cap	8. Straight Section Wireway
4. Reducer	9. Wireway hanger (Side cover assembly)
5. Cross	10. Wireway hanger (Top cover Assembly)

ACTIVITY 2 COMPLETION

1. Wireway
2. Accessible
3. Flame-radiant
4. Splices and taps
5. 75 percent

ASSESSMENT (Modified True or False)

1. T
2. 1500 mm
3. T
4. T
5. 4500 mm
6. End Cap
7. T
8. T
9. T
10. T

ADDITIONAL ACTIVITIES

1. Wireway cross
2. Wireway 90° elbow
3. Wireway 45° elbow
4. Wireway end cap
5. Wireway end cap

Development Team of the Module

Writers: JERAMIL G. MORENO (SST-I, PHS)
ROGERSON J. PULIDO (SST-II, MNHS)

Editors: Jose Ferdinand B. Nisperos (SST-II, MHS)
Joffre N. Albiento (Head Teacher-III, MNHS)
Lauro Z. De Guzman (PRINCIPAL-IV, MHS)

Internal Reviewer: Joseph T. Santos (EPS – EPP/TLE/TVL)

Cover Illustrator: Christopher E. Mercado

Management Team: **Sheryll T. Gayola**
Assistant Schools Division Superintendent
OIC, Office of the Schools Division Superintendent

Elisa O. Cerveza
Chief, Curriculum Implementation Division
OIC, Office of the Assistant Schools Division Superintendent

Joseph T. Santos
Education Program Supervisor – EPP/TLE/TVL

Ivy Coney A. Gamatero
EPS – Learning Resource Management and Development System

For inquiries or feedback, please write or call:

Schools Division Office – Marikina City
Email Address: sdo.marikina@deped.gov.ph
191 Shoe Ave., Sta. Elena, Marikina City, 1800, Philippines
Telefax: (02) 682-2472 / 682-3989

