**Task 1:** Complete Reading #3. Once you have completed this reading prepare answers to the questions listed below:

* What is the difference between a movement and a phase

A phase is the timing unit which controls each movement. There can be multiple movements within a single phase. A movement is a specific direction and type of traffic such as NBLT, EB pedestrian, etc…

* What is the purpose of the Ring Barrier Diagram?

The purpose of the ring barrier diagram is to separate movements which are able to safely time simultaneously (ensures that movements do not conflict).

* Why are phases 1, 2, 3, and 4 typically served sequentially?

Phases 1, 2, 3, and 4 are typically served sequentially because they are unable to be served concurrently with any of the other listed movements. However, phases 1 and 2 can be served at the same time as phases 5 and 6 and phases 3 and 4 can be served at the same time as phases 7 and 8.

**Task 2:** Complete Link to Practice #3. Based on your reading, prepare answers to the following questions.

* What is the logic for the sequence of phases that are included in a ring?

Phases are ordered so that no movement on the same ring is able to be served concurrently.

* What is a movement?

A movement describes the user type and action taken at an intersection.

* What is a phase?

A controller timing unit associated with the control of one or more movements.

* What is a ring?

A grouping of phases that operate in sequence

* What is a barrier?

A separation of intersecting movements in separate rings to prevent operating conflicting phases at the same time.

* What is a ring diagram?

A graphical representation of phases within a set of rings, and phases within a set of barriers.

* What is a concurrent phase?

A concurrent phase is two phases which are able to safely operate at the same time (such as EBTH and WBTH).

* What is a conflicting phase?

A conflicting phase is two phases which are unable to safely operate at the same time (such as EBTH and NBTH).

* What is an overlap?

A phase that has a green indication concurrently with another phase

* What is the NEMA numbering convention for phases?

The through movements on the major street are numbered 2 and 6 with their corresponding left turns numbered 5 and 1. On the major street, through and left turn movements should add to 7. For example, if the major street is oriented east west, the eastbound through and eastbound left movements should be numbered 2 and 5 respectively. On the minor street, the through movements should be numbered 4 and 8 with their corresponding left turns numbered 7 and 3. Just as the through and left turn movements should add to 7 for the major street, the through and left turn movements should add to 11 on the minor street.

**Task 3:** Sketch a four leg intersection, showing an exclusive left turn lane and one through lane on each approach. Number each movement with a phase number corresponding to the standard NEMA numbering scheme.

Major Street

Minor Street

1

6

2

5

3

8

4

7

2

1

**Task 4:** Prepare a sketch of a ring-barrier diagram that represents a dual ring, eight phase operation.



**Task 5:** Prepare a brief description of the timing process for this eight phase operation. In other words, describe the order and manner in which each phase is served.

 The major street is served first, with the northbound and southbound left turn are served first, then the northbound and southbound through movements. After the major street has been served, the minor street is served in a similar fashion, with the eastbound and westbound left turns being served before the eastbound and westbound through movements.

**Task 6:** Suppose the east-west movements at a signalized intersection require the following times to be served. Draw a partial Ring Barrier Diagram showing the sequence and the timing of the phases controlling these movements.

|  |  |  |
| --- | --- | --- |
| **Movement** | **Phase controlling movement** | **Required time (sec)** |
| EBLTEBTHWBLTWBTH | 5216 | 5251015 |

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