Making Sense of Canadian Railroad Signals

Brian Keay (keay@ucalgary.ca)
(all photos are mine)
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What do these signals mean?
Look at all the colour combinations!

I guess red means stop, green means go and yellow means speed up as it will change to red soon, like traffic lights!
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Part 1: Background Information
1. References
2. Definitions
3. Why are Signals Necessary?
4. Signal Nomenclature
5. 3 Colours → 3 Meanings
6. 3 Speeds → 3 Heads
7. Combining Colours and Heads

Part 2: How to Read Signals
1) Tall Signals
   3-Headed Signals
   2-Headed Signals
   1-Headed Signals

2) Dwarf Signals
   2-Headed Dwarfs
   1-Headed Dwarfs

3) Sequences of Signals
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Topics Include:

a) How to determine what these signals mean?

b) Reading 3 vs. 2 vs. 1 headed signals

c) Plaques

d) Tall vs. dwarf signals

e) Solid vs. Flashing lights

f) Vertical vs. offset heads

Do these paired signals indicate the same thing?

No! They have Different meanings.
Making Sense of Canadian Railroad Signals

How did I get interested learning more about signals and their meaning?

a) Installing signals on my layout.

b) Visited the CP Rail Training Centre at Ogden in June.

References

c) Useful signal websites:
http://broadway.pennsyrr.com/Rail/Signal/learning_the_aspects.html
http://www.sh1.org/eisenbahn/sac.htm
http://www.alkrug.vcn.com/rrfacts/signals/signals.htm

d) How to read Canadian signals videos:
https://www.youtube.com/watch?v=16jXTDfEavA
https://www.youtube.com/watch?v=tJpR93kp44I

e) Canadian Rail Operating Rules (CROR) - Dec 26, 2013

f) Book
This summary sheet of CROR signal rules shows:

- **36 signal rules (#405 - 440);**
- **4 plaques, one direction indicator and 125 aspects!**

The above CROR signals seem to be an arbitrary collection of coloured and blinking lights that make no logical sense that have to be memorized.

I hope to show you that they are not arbitrary and there is a system........
Summary of Rules for Signals

1-Headed Signals (adding imaginary red heads)
If there is only one head on a signal, add 2 'imaginary red' (IR) heads below the existing head.

2-Headed Signals (adding imaginary red heads)
If there are only 2 heads on a signal, then an 'imaginary red' (IR) aspect is added as follows:
   a) If one of the two heads is 'red', add the 'imaginary red' (IR) above (if the 'red' is on top) or below (if the 'red' is on bottom) the existing 'red';
   b) if neither of the two heads is 'red', add the 'imaginary red' to the bottom of the existing 2 aspects.

3-Headed Signals
Rule 1: If the signal is not ALL RED, it is not red at all; (ALL RED = STOP)

Rule 2a: If there is only one coloured light and it’s YELLOW, then the indication is: "______ to stop";

Rule 2b: If you have a SOLID YELLOW on the bottom and no other colours, then the meaning is "Restricting";

Rule 3: If there is only one coloured light and it’s GREEN, then the meaning is: "______ to clear";

Rule 4: If you have two coloured lights and the top light is SOLID YELLOW, then the meaning is "clear to ______";

Rule 5: If there are two coloured lights and they are not on top (i.e. top is RED), then the meaning is "______ to ______".
By the end of this presentation we will fill in this entire table using 5 simple steps!!

Through the 5 steps, we will learn how to determine the meaning of 24 of the 36 CROR rules.

By simple analogy, you should then be able to read and understand the meaning of the remaining 12 CROR rules.
Yes, there is even an App for reading signals
http://www.rcp.ca/mobile/

Rob Chandler's
Mobile Apps

Canadian Rail Operating Rules
Signals & Interpretations

Available for your: Android (Amazon) | Android
iPad / iPhone | BlackBerry PlayBook & BB10 devices

Canadian Railway Signals & Interpretations
Initially written as a web based utility to assist in learning standard CROR railway signals during my Railway Association of Canada Railway Conductor course (it looks like necessity really is the mother of invention). Other students saw it and said "you should make it into a mobile app", so here it is. A basic demo version without the "game" function is shown below in case you'd like to try it out.

The following standard CROR signal combinations are included in the mobile version:
- Mast style with single, double and triple aspects.
- Staggered and non-staggered aspects.
- Single and double aspect dwarf signals.
- Letter plates (except double letter plate signals).

You can either select your own signal pattern and mast style or have some "fun" and let the system pick a pattern for you (Game). "Game" mode is a great way to learn railway signals and is much better than practicing with the standard issue flashcards.

All valid signals are fully explained, including the CROR rule number, correct signal name and the action to be taken.

Notes: Rail transit systems such as Ontario's GO Transit.
Why are Signals Necessary?

Signals Indicate:

1. if the line ahead is clear, occupied, or if there are track problems (e.g. broken rail);
2. if the engineer has permission to proceed or stop;
3. if turnouts are set correctly;
4. which way the turnout(s) are set;
5. the maximum train speed for the signal it is approaching;
6. the maximum speed the train should approach the next signal at; and
7. in some cases, the state of the signal that is 2 or 3 blocks ahead.
**Aspect**: one of a series of allowed options for the visual pattern of a signal mast to convey a speed and/or route indication.

The indication typically dictates the maximum speed a train may pass that signal and at what maximum speed the train is authorized to be travelling when it arrives at the next signal.

The visual pattern of an aspect can contain a combination of lit signal heads (solid or blinking), plaques and/or direction indicators.

**Colours**
- Red
- Yellow
- Green

**And**
- Flashing yellow (FY)
- Flashing green (FG)

**Features**
- Plaques
Signal Nomenclature

Aspect: one of a series of allowed options for the visual pattern of a signal mast to convey a speed and/or route indication.

The indication typically dictates the maximum speed a train may pass that signal and at what maximum speed the train is authorized to be travelling when it arrives at the next signal.

The visual pattern of an aspect can contain a combination of lit signal heads (solid or blinking), plaques and/or direction indicators;

- Every Aspect has a CROR Rule# & Title associated with it;
- Every Rule# & Title has an Indication associate with it;

Indication: the message an Aspect conveys to the crew

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Rule # and Title</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="light" alt="Aspect" /></td>
<td>Rule 422: Medium to Clear</td>
<td>Proceed, MEDIUM speed passing signal and through turnouts; next signal is clear</td>
</tr>
<tr>
<td><img src="light" alt="Aspect" /></td>
<td>Rule 436: Restricting Signal</td>
<td>Proceed at RESTRICTED speed.</td>
</tr>
</tbody>
</table>

Examples:

- Intermediate to Bearspaw East

[Signal mast diagram with visual pattern explanation]
3 Colours.......3 Meanings.

Colours have the same meaning no matter which head they are in.

- GREEN means that at least **TWO** blocks beyond this signal are clear.

- YELLOW means that only **ONE** block beyond this signal is clear and this route is impassable at the next signal.

- RED means that this route is impassable.
3 General Speeds...........3 Heads.

**Highest speed**
(Normal route through switches)

**Intermediate speeds**
(Diverging route through long switches)

**Slowest speeds**
(Diverging route through short switches)

What is meant by ‘long’ and ‘short’ switches?
### Switch Frog Numbers and Track Speeds

Divergence is measured as the number of units of length for a single unit of separation.

<table>
<thead>
<tr>
<th>Frog Number</th>
<th>Max. speed diverging route (miles per hour)</th>
<th>Speed Terminology</th>
<th>Typical Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>10 (16)</td>
<td>Typical</td>
<td>Industry</td>
</tr>
<tr>
<td>8</td>
<td>15 (24)</td>
<td>Slow</td>
<td>Yards</td>
</tr>
<tr>
<td>12</td>
<td>25 (40)</td>
<td>Diverging</td>
<td>Low-speed crossovers</td>
</tr>
<tr>
<td>16</td>
<td>30 (48)</td>
<td>Medium</td>
<td>Passing tracks</td>
</tr>
<tr>
<td>20</td>
<td>45 (72)</td>
<td>Limited</td>
<td>Junctions, end of double track, etc.</td>
</tr>
</tbody>
</table>

Others
- Non-gapped frogs: 26.5, 32.7
- Track speed: 60 (96), 80 (129), 143 (230) in Europe & Japan


LGV East at Chauconin, France

Non-gapped frogs.
3 General Speeds → 5 Track Speeds...3 Heads

The higher the head is on the pole, the higher the permissible speed.

- **Highest speed** (straight ahead through switches) → Clear signal: proceed at track speed
  - **Limited Speed**: speed ≤45 mph (72 km/h)
  - **Medium Speed**: speed ≤30 mph (48 km/h)

- **Intermediate speeds** (diverging route through long switches) →
  - **Slow Speed**: speed ≤15 mph (24 km/h)
  - **Restricted Speed**: speed that permits stopping within one-half the range of vision and never exceeding SLOW speed

- **Slowest speeds** (diverging route through short switches)

---

**To Summarize**

- Highest speed
- Intermediate speeds
- Slowest speeds

**Diverging Speed**: speed ≤ 25 mph (40 km/h) - will not be covered
Combining Colours with Head Positions

Colours have the same meaning no matter which head they are in.

- **GREEN** - at least **TWO** blocks clear.
- **YELLOW** - only **ONE** block clear.
- **RED** - route is impassable.

Highest speeds

Intermediate speeds

Slowest speeds

High speed route is impassable.

Intermediate speed route is impassable.

Slowest speed route is impassable.

High speed route is clear for 1 block, prepare to stop at next signal.

Intermediate speed route is impassable.

Slowest speed route is impassable.

High speed route is clear for at least 2 blocks.

Intermediate speed route is impassable.

Slowest speed route is impassable.
Combining Colours with Head Positions

Colours have the same meaning no matter which head they are in.

- **GREEN** - at least TWO blocks clear.
- **YELLOW** - only ONE block clear.
- **RED** - route is impassable.

Highest speeds
- Intermediate speeds
- Slowest speeds

Intermediate speed route is clear for 1 block, prepare to stop at next signal.
Intermediate speed route is clear for at least 2 blocks.
Slowest speed route is clear for 1 block, prepare to stop at next signal.
Slowest speed route is clear for at least 2 blocks.

High speed route is impassable.
High speed route is impassable.
High speed route is impassable.
High speed route is impassable.
3 General Speeds → 5 Track Speeds....3 Heads

The higher the head is on the pole, the higher the permissible speed.

- **Highest speed**
  (normal route through switches)
  - Clear signal: proceed at track speed

- **Intermediate speeds**
  (diverging route through long switches)
  - Limited Speed: speed ≤45 mph (72 km/h)
  - Medium Speed: speed ≤30 mph (48 km/h)

- **Slowest speeds**
  (diverging route through short switches)
  - Slow Speed: speed ≤15 mph (24 km/h)
  - Restricted Speed: speed that permits stopping within one-half the range of vision and never exceeding SLOW speed

Notice that the top Head only needs to indicate one speed, i.e. ‘track speed’, but the middle and bottom Heads need to indicate two speeds.

HOW IS THIS DONE?
Restricted Speed: speed that permits stopping within one-half the range of vision and never exceeding SLOW speed.

Important: This summary slide only tells you the maximum train speed when a 3-headed signal shows a single green or yellow light; not what the aspect is indicating to the train crew!
General Bulletin Orders (GBOs) are Used to Limit Train Speeds on the Main Line

Clear → Track Speed (controlled by speed limit signs or orders)

Rule 405 - Clear Signal - proceed at (or below) allowed track speed.

Rule 415 - Advanced Clear to Stop - proceed, next signal is displaying Clear to Stop, be prepared to stop at second signal.

Rule 411 - Clear to Stop - proceed, preparing to stop at next signal.

IMPORTANT:
Aspects are not used to control speed limits on the main line when a Clear signal is indicated.

Speed limit signs and/or GBOs are used to control speed limits on the main line.

Limited, medium, slow and restricted aspects are used to indicate train speed due to the train taking a diverging route.
Aspect: one of a series of allowed options for the visual pattern of a signal mast to convey a speed and/or route indication.

Signal light

Signal head

Signal mast

**GREEN** - at least TWO blocks clear.

**YELLOW** - only ONE block clear.

**RED** - route is impassable.

**FG**

**FY**

**INTERMINATION TIME**

High speed route is clear for 1 block, prepare to stop at next signal.

Intermediate speed route is impassable.

Slowest speed route is impassable.
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Part 2: How to Read Train Signals

a) Tall Signals
3-Headed Signals
Five simple rules.

2-Headed Signals
Two additional rules.

1-Headed Signals
One additional rule.

b) Dwarf Signals
2-Headed Dwarfs
Four rules.

1-Headed Dwarfs
One rule.

c) Sequences of Signals
Simple Rules to Learn the Meaning of Aspects

Does this signal mean:

- Stop, then go, expecting........
- The next signal to be red?

No: the aspect R/G/R is showing ‘medium to clear’!

WHY? Because are considered as placeholders when one or more of the colours are not red.

Rule 1: If the signal is not ALL RED, it is not red at all; (ALL RED = STOP)

If all heads are ALL red, then..........

- Stop Signal
- Stop and Proceed Signal at restricted speed (intermediate signals)
- Restricting Signal Proceed at restricted speed

If plaque falls off mast, Signal becomes more restrictive

R=Restricting

A=Absolute
<table>
<thead>
<tr>
<th>From:</th>
<th>Clear</th>
<th>Limited</th>
<th>Medium</th>
<th>Slow</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited</td>
<td></td>
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<td></td>
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<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other

- Stop
- Stop and Proceed at restricted speed
- Restricting

To:
Simple Rules to Learn the Meaning of Aspects

Rule 1: If the signal is not **ALL RED**, it is not red at all; (**ALL RED** = **STOP**)

So, none of these signals mean ‘stop and then do something’ or ‘do something and then stop’.

**IMPORTANT:**
Unless ALL the lights in a signal are **red**, the signal is some form of **proceed** signal and it does not require the train to stop at it.
Simple Rules to Learn the Meaning of Aspects

Rule 2a: If there is only one coloured light and it’s YELLOW, then the indication is: "________ to stop"; (Possibilities are: clear, advanced clear, limited, medium, and slow.

Rule 2b: If you have a SOLID YELLOW on the bottom and no other colours, then the meaning is “Restricting”;

- **Clear to Stop** (Proceed preparing to stop at next signal.)
- **Advanced Clear to Stop** (not seen in Calgary) Proceed preparing to stop at 2nd signal
- **Limited to Stop** (not seen in Calgary)
- **Medium to Stop** (Proceed , Medium speed and through turnouts, preparing to stop at next signal)
- **Slow to Stop** (Proceed , Slow speed and through turnouts, preparing to stop at next signal)
- **Restricting** (Proceed at restricting speed.)
<table>
<thead>
<tr>
<th>From:</th>
<th>To:</th>
<th>Clear</th>
<th>Limited</th>
<th>Medium</th>
<th>Slow</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stop</td>
</tr>
<tr>
<td>Limited</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stop</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stop</td>
</tr>
<tr>
<td>Slow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stop</td>
</tr>
</tbody>
</table>

*Other*

- Stop
- Stop and Proceed at restricted speed
- Advanced clear to Stop
- Restricting
Simple Rules to Learn the Meaning of Aspects

Rule 3: If there is only one coloured light and it’s GREEN, then the meaning is: "________ to clear"; Possibilities are: clear, limited, medium, slow

Clear to Clear or simply “clear signal at ______”

Limited to Clear (not seen in Calgary)

Medium to Clear (Proceed, Medium speed passing signal and through turnouts)

Slow to Clear (Proceed, Slow speed passing signal and through turnouts)
<table>
<thead>
<tr>
<th>From:</th>
<th>Clear</th>
<th>Limited</th>
<th>Medium</th>
<th>Slow</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td><img src="image1.png" alt="Light" /></td>
<td><img src="image2.png" alt="Light" /></td>
<td><img src="image3.png" alt="Light" /></td>
<td><img src="image4.png" alt="Light" /></td>
<td><img src="image5.png" alt="Light" /></td>
</tr>
<tr>
<td>Limited</td>
<td><img src="image1.png" alt="Light" /></td>
<td><img src="image2.png" alt="Light" /></td>
<td><img src="image3.png" alt="Light" /></td>
<td><img src="image4.png" alt="Light" /></td>
<td><img src="image5.png" alt="Light" /></td>
</tr>
<tr>
<td>Medium</td>
<td><img src="image1.png" alt="Light" /></td>
<td><img src="image2.png" alt="Light" /></td>
<td><img src="image3.png" alt="Light" /></td>
<td><img src="image4.png" alt="Light" /></td>
<td><img src="image5.png" alt="Light" /></td>
</tr>
<tr>
<td>Slow</td>
<td><img src="image1.png" alt="Light" /></td>
<td><img src="image2.png" alt="Light" /></td>
<td><img src="image3.png" alt="Light" /></td>
<td><img src="image4.png" alt="Light" /></td>
<td><img src="image5.png" alt="Light" /></td>
</tr>
</tbody>
</table>

Other:  
- ![Light](image6.png) | **Stop**  
- ![Light](image7.png) | **Stop and Proceed at restricted speed**  
- ![Light](image8.png) | **Advanced clear to Stop**  
- ![Light](image9.png) | **Restricting**
Simple Rules to Learn the Meaning of Aspects

Rule 4: If you have **TWO** coloured lights and the top light is **SOLID YELLOW**, then the meaning is "clear to ______"; Possibilities are: limited, medium, slow

********Warning of a speed restriction at the next signal!**********
<table>
<thead>
<tr>
<th>From:</th>
<th>Clear</th>
<th>Limited</th>
<th>Medium</th>
<th>Slow</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Clear</td>
<td>Limited</td>
<td>Medium</td>
<td>Slow</td>
<td>Stop</td>
</tr>
<tr>
<td>Limited</td>
<td>Limited</td>
<td>Clear</td>
<td>Limited</td>
<td>Slow</td>
<td>Stop</td>
</tr>
<tr>
<td>Medium</td>
<td>Limited</td>
<td>Limited</td>
<td>Medium</td>
<td>Slow</td>
<td>Stop</td>
</tr>
<tr>
<td>Slow</td>
<td>Limited</td>
<td>Limited</td>
<td>Medium</td>
<td>Slow</td>
<td>Stop</td>
</tr>
</tbody>
</table>
Simple Rules to Learn the Meaning of Aspects

Rule 5: If there are **TWO** coloured lights and they are not on top (i.e. top is **RED**), then the meaning is "______ to _______."
Possibilities are: “limited, medium or slow to limited, medium or slow”

Can an aspect indicate a diverging route at the current signal and a diverging route at the next signal?

A) These aspects indicate the train will take the diverging route at this signal and then have a clear or stop signal.

B) But what if the train has to take a diverging route at the next signal?

Represented by:
Simple Rules to Learn the Meaning of Aspects

Rule 5: If there are **TWO** coloured lights and they are not on top (i.e. top is **RED**), then the meaning is "______ to ______".
Possibilities are: “limited, medium or slow to limited, medium or slow”
Meaning: Proceed, _____ speed passing signal and through turnouts, approach next signal at ______ speed)

- Limited
  - FG
  - FG
- Medium
  - FG
  - FG
- Slow
  - FY
  - FY

Looking north across Bow River: Medium to Medium

Mewatta

8th St SE & 9th Ave SE
<table>
<thead>
<tr>
<th>From:</th>
<th>Clear</th>
<th>Limited</th>
<th>Medium</th>
<th>Slow</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td><img src="image1" alt="Signal 1" /></td>
<td><img src="image2" alt="Signal 2" /></td>
<td><img src="image3" alt="Signal 3" /></td>
<td><img src="image4" alt="Signal 4" /></td>
<td><img src="image5" alt="Signal 5" /></td>
</tr>
<tr>
<td>Limited</td>
<td><img src="image6" alt="Signal 6" /></td>
<td><img src="image7" alt="Signal 7" /></td>
<td><img src="image8" alt="Signal 8" /></td>
<td><img src="image9" alt="Signal 9" /></td>
<td><img src="image10" alt="Signal 10" /></td>
</tr>
<tr>
<td>Medium</td>
<td><img src="image11" alt="Signal 11" /></td>
<td><img src="image12" alt="Signal 12" /></td>
<td><img src="image13" alt="Signal 13" /></td>
<td><img src="image14" alt="Signal 14" /></td>
<td><img src="image15" alt="Signal 15" /></td>
</tr>
<tr>
<td>Slow</td>
<td><img src="image16" alt="Signal 16" /></td>
<td><img src="image17" alt="Signal 17" /></td>
<td><img src="image18" alt="Signal 18" /></td>
<td><img src="image19" alt="Signal 19" /></td>
<td><img src="image20" alt="Signal 20" /></td>
</tr>
<tr>
<td>Other</td>
<td><img src="image21" alt="Signal 21" /></td>
<td><img src="image22" alt="Signal 22" /></td>
<td><img src="image23" alt="Signal 23" /></td>
<td><img src="image24" alt="Signal 24" /></td>
<td><img src="image25" alt="Signal 25" /></td>
</tr>
</tbody>
</table>

- **Stop**: Stop and Proceed at restricted speed
- **Advanced clear to Stop**: If the signal is set to this, proceed at restricted speed.
- **Restricting**: Stop

Notes:
- FY: Forward Yellow
- FG: Forward Green
Summary of Rules for Tall Signals

3-Headed Signals
Rule 1: If the signal is not **ALL RED**, it is not red at all; (**ALL RED** = **STOP**)

Rule 2a: If there is only one coloured light and it’s **YELLOW**, then the indication is: "________ to stop";

Rule 2b: If you have a **SOLID YELLOW** on the bottom and no other colours, then the meaning is “Restricting”;

Rule 3: If there is only one coloured light and it’s **GREEN**, then the meaning is: "________ to clear";

Rule 4: If you have two coloured lights and the top light is **SOLID YELLOW**, then the meaning is "clear to ______";

Rule 5: If there are two coloured lights and they are not on top (i.e. top is **RED**), then the meaning is "_______ to ________".
3-Headed Signals are the Foundation for Interpreting all signals!!

Standard sized signals

1- and 2- headed signals and dwarfs must be viewed as 3-headed signals in order to interpret the meaning of the aspect displayed.

Dwarfs

Is converted to a 3-headed signal by adding an imaginary red head.

examples

Is converted to a 3-headed signal by adding 2 imaginary red heads.

imaginary reds
Summary of Rules to Learn the Meaning of Aspects

Rule 6: If there are only 2 heads on a signal, then an 'imaginary red' (IR) head is added as follows:

a) If one of the two heads is 'red', add the 'imaginary red' (IR) above (if the 'red' is on top) or below (if the 'red' is on bottom) the existing 'red'.

Adding Imaginary Red Heads

- Add an imaginary red so this signal then becomes a 3-headed signal
  - Clear
  - Slow to clear
Summary of Rules to Learn the Meaning of Aspects

Rule: If there are only 2 heads on a signal, then an 'imaginary red' (IR) head is added as follows:

a) If one of the two heads is 'red', add the 'imaginary red' (IR) above (if the 'red' is on top) or below (if the 'red' is on bottom) the existing 'red'.

Adding Imaginary Red Heads

Add an imaginary red so this signal then becomes a 3-headed signal

Add an imaginary red so this signal then becomes a 3-headed signal

Adding Imaginary Red

Slow to stop
Rule: If there are only 2 heads on a signal, then an 'imaginary red' (IR) head is added as follows:

a) If one of the two heads is 'red', add the 'imaginary red' (IR) above (if the 'red' is on top) or below (if the 'red' is on bottom) the existing 'red'.

b) If neither of the two heads is 'red', add the 'imaginary red' to the bottom of the existing 2 heads.
Summary of Rules for Signals

3-Headed Signals
Rule 1: If the signal is not **ALL RED**, it is not red at all; **(ALL RED = STOP)**

Rule 2a: If there is only one coloured light and it’s **YELLOW**, then the indication is: "________ to stop";

Rule 2b: If you have a **SOLID YELLOW** on the bottom and no other colours, then the meaning is “Restricting”;

Rule 3: If there is only one coloured light and it’s **GREEN**, then the meaning is: "________ to clear";

Rule 4: If you have two coloured lights and the top light is **SOLID YELLOW**, then the meaning is "clear to ______";

Rule 5: If there are two coloured lights and they are not on top (i.e. top is **RED**), then the meaning is "______ to ______".

2-Headed Signals (adding imaginary red heads)
If there are only 2 heads on a signal, then an 'imaginary red' (IR) aspect is added as follows:

a) If one of the two heads is 'red', add the 'imaginary red' (IR) above (if the 'red' is on top) or below (if the 'red' is on bottom) the existing 'red';

b) if neither of the two heads is 'red', add the 'imaginary red' to the bottom of the existing 2 aspects
Summary of Rules to Learn the Meaning of Aspects

Rule: If there is only one head on a signal, add two 'imaginary red' (IR) heads below the existing head.

Add an imaginary red so this signal then becomes a 3-headed signal.

Clear to stop

Imaginary Red
Summary of Rules for Signals

3-Headed Signals
Rule 1: If the signal is not ALL RED, it is not red at all; (ALL RED = STOP)

Rule 2a: If there is only one coloured light and it’s YELLOW, then the indication is: "_______ to stop";

Rule 2b: If you have a SOLID YELLOW on the bottom and no other colours, then the meaning is “Restricting”;

Rule 3: If there is only one coloured light and it’s GREEN, then the meaning is: "_______ to clear";

Rule 4: If you have two coloured lights and the top light is SOLID YELLOW, then the meaning is "clear to ______";

Rule 5: If there are two coloured lights and they are not on top (i.e. top is RED), then the meaning is "______ to _______".

2-Headed Signals (adding imaginary red heads)
If there are only 2 heads on a signal, then an 'imaginary red' (IR) aspect is added as follows:
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b) if neither of the two heads is 'red', add the 'imaginary red' to the bottom of the existing 2 aspects

1-Headed Signals (adding imaginary red heads)
If there is only one head on a signal, add 2 'imaginary red' (IR) heads below the existing head
<table>
<thead>
<tr>
<th>From:</th>
<th>Clear</th>
<th>Limited</th>
<th>Medium</th>
<th>Slow</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td><img src="image1" alt="Light1" /></td>
<td><img src="image2" alt="Light2" /></td>
<td><img src="image3" alt="Light3" /></td>
<td><img src="image4" alt="Light4" /></td>
<td><img src="image5" alt="Light5" /></td>
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<tr>
<td>Limited</td>
<td><img src="image6" alt="Light6" /></td>
<td><img src="image7" alt="Light7" /></td>
<td><img src="image8" alt="Light8" /></td>
<td><img src="image9" alt="Light9" /></td>
<td><img src="image10" alt="Light10" /></td>
</tr>
<tr>
<td>Medium</td>
<td><img src="image11" alt="Light11" /></td>
<td><img src="image12" alt="Light12" /></td>
<td><img src="image13" alt="Light13" /></td>
<td><img src="image14" alt="Light14" /></td>
<td><img src="image15" alt="Light15" /></td>
</tr>
<tr>
<td>Slow</td>
<td><img src="image16" alt="Light16" /></td>
<td><img src="image17" alt="Light17" /></td>
<td><img src="image18" alt="Light18" /></td>
<td><img src="image19" alt="Light19" /></td>
<td><img src="image20" alt="Light20" /></td>
</tr>
</tbody>
</table>

So now the summary sheet looks like this........
As far as I know Limited and Advanced Clear to Stop signals are not seen in Calgary......
Let’s Try Some Examples

1-Headed Signals (adding imaginary red heads)
If there is only one head on a signal, add 2 'imaginary red' (IR) heads below the existing head.

2-Headed Signals (adding imaginary red heads)
If there are only 2 heads on a signal, then an 'imaginary red' (IR) aspect is added as follows:
   a) If one of the two heads is 'red', add the 'imaginary red' (IR) above (if the 'red' is on top) or below (if the 'red' is on bottom) the existing 'red';
   b) if neither of the two heads is 'red', add the 'imaginary red' to the bottom of the existing 2 aspects

3-Headed Signals
Rule 1: If the signal is not ALL RED, it is not red at all; (ALL RED = STOP)

Rule 2a: If there is only one coloured light and it’s YELLOW, then the indication is: "________ to stop";

Rule 2b: If you have a SOLID YELLOW on the bottom and no other colours, then the meaning is “Restricting”;

Rule 3: If there is only one coloured light and it’s GREEN, then the meaning is: "________ to clear";

Rule 4: If you have two coloured lights and the top light is SOLID YELLOW, then the meaning is "clear to _______";

Rule 5: If there are two coloured lights and they are not on top (i.e. top is RED), then the meaning is "_______ to _______".
Practice makes perfect.

What is the meaning of the following signals?
Summary of Rules for Dwarf Signals

a) Two Headed Dwarf Signal

i) G/G - clear

ii) Y/G - add imaginary red head to bottom: Clear to Medium

iii) Y/Y - add imaginary red head to bottom: Clear to Slow

iv) all other combinations, add imaginary red head to the top of the dwarf signal, Examples:

G/R  Medium to Clear

R/G  Slow to Clear

R/FY  Slow to Stop

b) Single Head Dwarf Signal

i) always place 2 imaginary red heads on top of the existing head,

G  Slow to Clear

FY  Slow to Stop
<table>
<thead>
<tr>
<th>From:</th>
<th>To:</th>
<th>Clear</th>
<th>Medium</th>
<th>Slow</th>
<th>Stop</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Clear</td>
<td>🟢</td>
<td>🟠</td>
<td>🟡</td>
<td>🟥</td>
<td>🟥</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
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<td>🟠→🟠</td>
<td>🟡→🟠</td>
<td>🟥→🟠</td>
<td>🟥→🟠</td>
</tr>
<tr>
<td>Slow</td>
<td>Slow</td>
<td>🟢→🟠</td>
<td>🟠→🟠</td>
<td>🟡→🟠</td>
<td>🟥→🟠</td>
<td>🟥→🟠</td>
</tr>
</tbody>
</table>

Summary of Dwarf Signals with Imaginary Reds

- Restricting
- Stop

Images of railway signals showing different color combinations and directions of movement.
Examples
(all signals are not shown)

MEDIUM Speed: speed < 30 mph

RESTRICTED Speed: speed that permits stopping within one-half the range of vision and never exceeding SLOW speed

SLOW Speed: speed < 15 mph

Advance

clear to stop

Medium to clear

Clear to medium

train and direction

Medium to clear

Restricting signal - entering dark territory

Medium to medium

Medium to stop

Clear to medium

clear to stop

clear to medium

clear to stop
Signals on Laggan Sub from Bearspaw to 8th St SE

- Bearspaw (7376')
- Intermediate signals
- Keith (8945')
- Dark territory – track doesn’t show on RTC board.
- Twin bridges Over the Bow River

- Brickburn (6888')
- Intermediate signals
- Sunalta
- Mewatta

- 8th St SE
- Elbow River
Signals on Laggan Sub from Bearspaw to 8th St SE

Dark territory – track doesn’t show on RTC board.
Questions?

NOW I KNOW WHAT THESE SIGNALS MEAN?

IT’S NOT THAT DIFFICULT!

YAHOO!

Intermediate to Bearspaw East

Sunalta

Keith East

Bengal

Sunalta

Keith East

8th St. SE & 9th Ave. SE

Mewatta
Practice makes perfect.

What is the meaning of the following signals?

- **Clear**: Stop and proceed at restricted speed
- **Clear to Limited**: Medium to Medium
- **Stop and proceed**: Slow to Stop
- **Clear to stop**: Medium to Stop
- **Restricting**: Slow to Slow
- **Stop**: Stop