

Designing the I/M Test to Match the Technology and Meet the Goals



Test Types

- Idle or 2-speed idle
- Transient Loaded
 - × IM240
 - × VMass
- Steady State Loaded
 - × ASM
- Remote Sensing

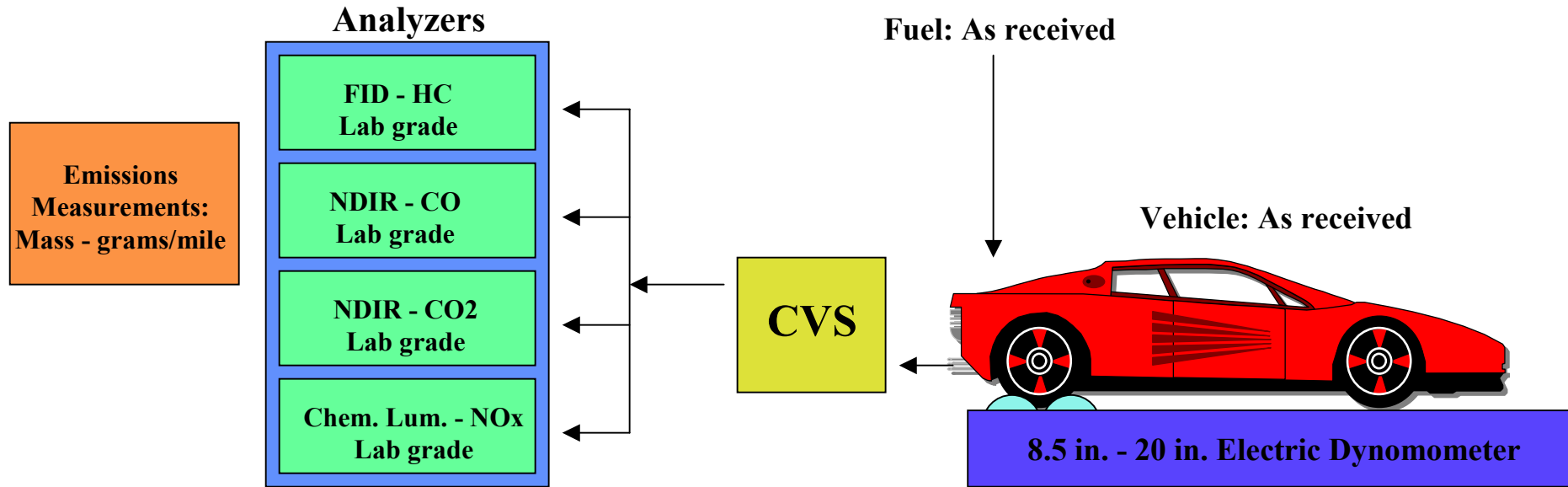


Unloaded Tests

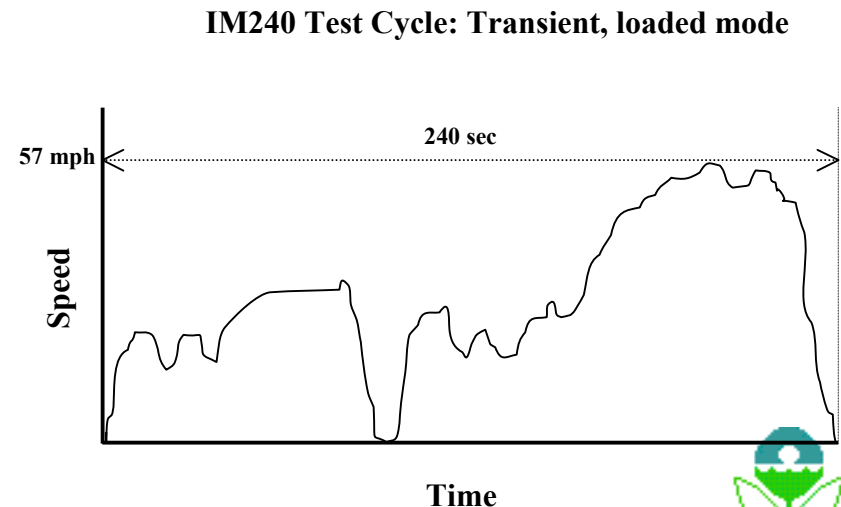
- ✈ Idle or Two-Speed (Idle + 2500 rpm)
 - ✗ Tests for HC and CO
 - ✗ Use NDIRs
 - ✗ Least expensive equipment
 - ✗ Doesn't require dynamometer
 - ✗ Test lasts 30-90 seconds
 - ✗ Inaccurate
 - ✗ High false failure rates at low cutpoints
 - ✗ Not suitable for testing Nox



Test Type: IM240



- Total time = up to 240 seconds (x2)
- Capital cost = \$75,000 to \$125,000



IM240 Features

→ IM240 Test

- × Transient
- × Loaded
- × Max length 240 seconds
- × Based on FTP

→ Measurement

- × Mass emission capture
- × Uses FID for VOCs
- × Chemi-luminescence for NO_x
- × NDIR for CO
- × Fuel economy
- × Grams/kilometer

→ Pros

- × Best correlation with FTP
- × Tests all major pollutants
- × Accurate and repeatable
- × Emission factors and fleet characterization

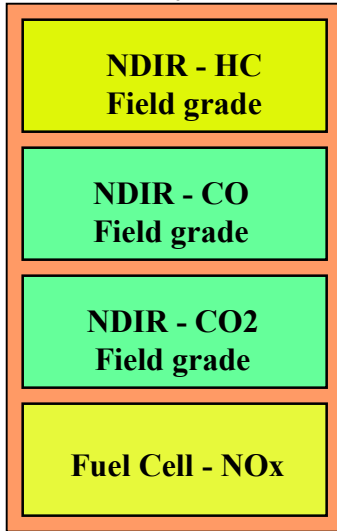
→ Cons

- × Most expensive
- × Most complex to maintain
- × Driving trace is harder than steady state



Test Type: ASM 2

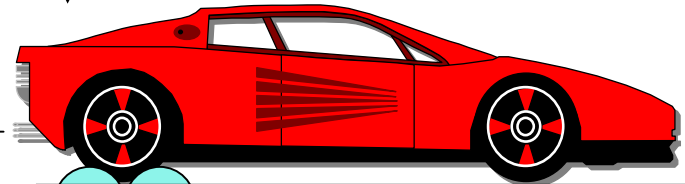
Analyzers



**Emissions Measurements:
ppm and %**

Fuel: As received

Vehicle: As received



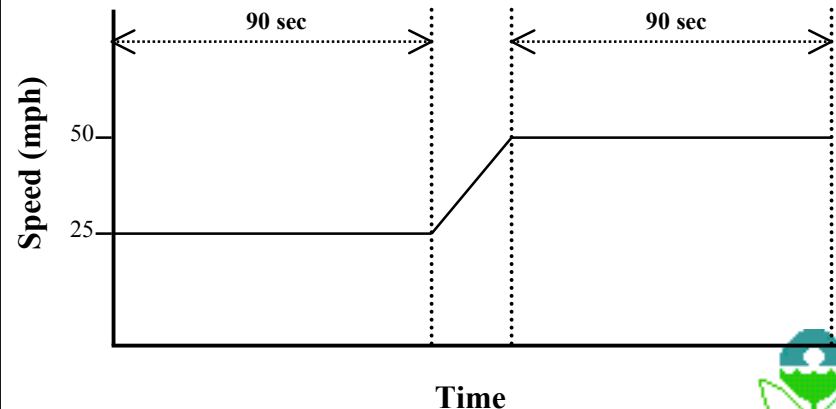
8.5 in. - 20 in. Electric Dynamometer

•We recommend a speed wiggle between the 1st and 2nd modes if the vehicle is failing after the 1st mode to prevent false failure.

•Total time = 180 seconds

•Capital cost =\$40,000

ASM 2 Test Cycle: Steady-state, loaded mode



Acceleration Simulation Mode

→ ASM Test

- × Loaded steady-state test
- × 15 mph or 25 mph
- × Extra heavy load

→ Measurement

- × Concentration-based
- × PPM and %
- × NDIR for HC and CO
- × Electrochemical for NOx

→ Pros

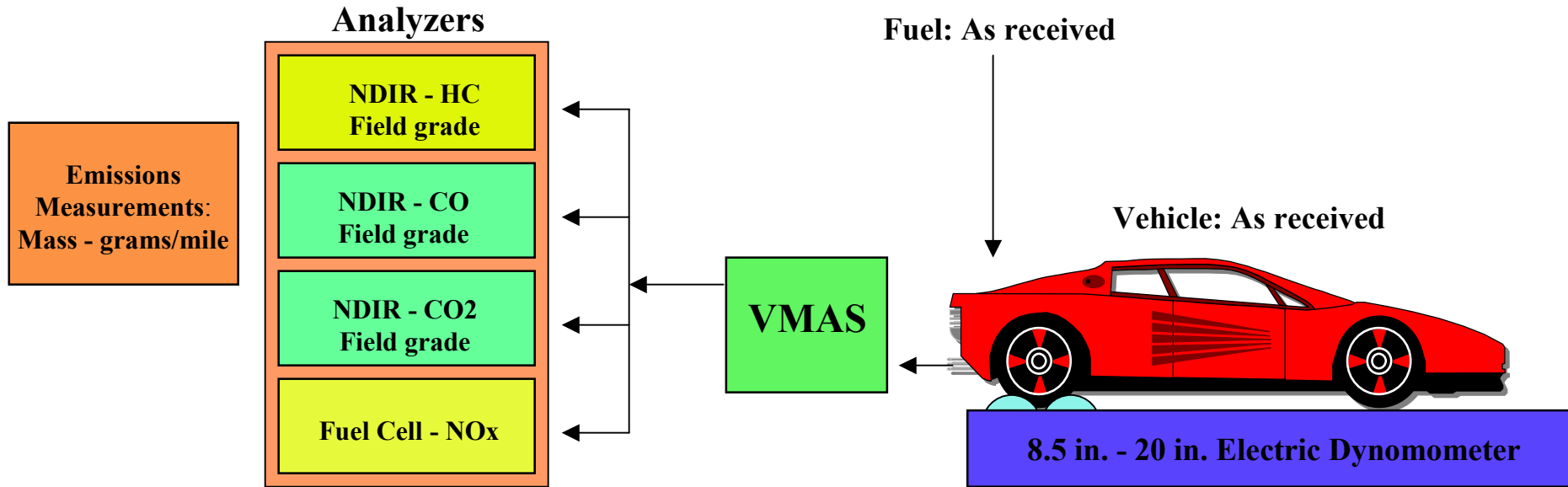
- × Cheaper than IM240
- × Easier to run test
- × Easier to maintain
- × Cheaper to duplicate test in repair shop

→ Cons

- × Poor correlation to FTP
- × High false failure rates
- × Lower identification rate
- × Can't use for fleet characterization



Test Type: Mass 31

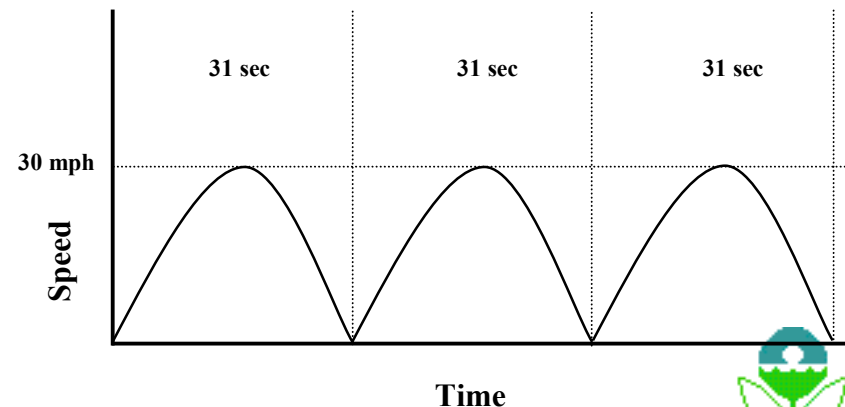


- Like Oregon's BAR 31 but with VMAS instead of a CVS and BAR97 equipment.

- Total time = 31 to 93 seconds

- Capital cost = \$40,000 + (\$3,000 to \$4,000 for VMAS)

MASS 31 Test Cycle: Transient, loaded mode



V-Mass

→ Test Procedure

- × Uses IM240 test procedure or other transient cycle

→ Measurement

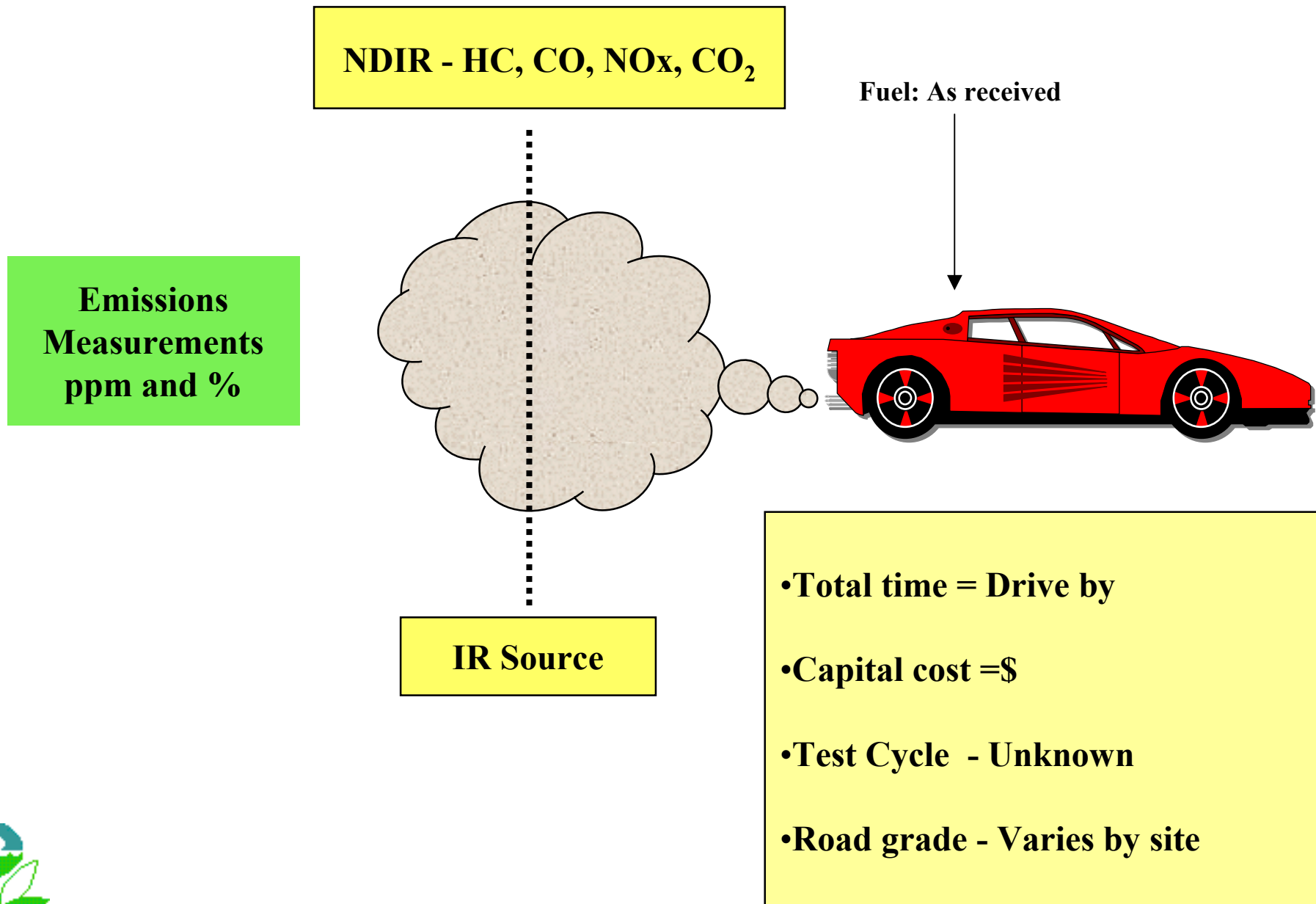
- × Uses ASM-type equipment
- × Plus mass flow measurement device
- × Yields same measures as IM240

→ Pros/Cons

- × Costs about the same as ASM
- × Good correlation with IM240
- × Appears to be nearly as effective as IM240



Test Type: Remote Sensing (RSD)



Remote Sensing

→ Definition

- × Measure emissions while vehicle drives on road

→ Features

- × Measures HC, CO, NOx
- × May measure speed or acceleration. etc.
- × Uses lasers or NDIR
- × Tests many cars per hour
- × Set up on roadways
- × Takes picture of license plate

→ Pros

- × Very cheap tests
- × Suitable for failing old technology cars
- × Prevent readjustment

→ Cons

- × Not suitable for failing new technology cars
- × Hard to cover entire fleet
- × Limited use conditions
- × Half-second snap shot

