



**GPS-190 WRITING
PERFORMANCE-BASED
GENERATOR SPECIFICATIONS**

LEARNER'S GUIDE

WELCOME

Professional Development Seminar Series

Standby power systems are increasingly in demand. Commercial, industrial, municipal and healthcare facilities are just a few of the markets that require backup power. Writing performance-based genertor specifications is a crucial part of the process when designing a system.

The ever-changing requirements of the power generation industry, coupled with requests for additional training, has prompted Generac Power Systems to develop this training program.

Titled the Generac Power Systems Professional Development Seminar Series, this program consists of individual training modules that provide both theoretical and practical information. Each module is 90 minutes in length and each incorporate proven learning methodology to ensure a positive experience. These modules are designed to broaden the learner's understanding of topics such as:

- Current Technologies
- Sizing
- Codes & Standards
- Switching Technologies
- Reliable Design Characteristics
- Paralleling
- Engines and Alternators
- Controls
- Emissions

THE MODULE IN PERSPECTIVE

PURPOSE:

The purpose of this course is to provide you with a basic overview of the elements to consider when writing specifications for engine generator sets and transfer switches. Presented in a question and answer format, you'll learn what information is needed to put together a comprehensive specification. The seminar begins with defining the scope of the application along with NEC and NFPA considerations. Project conditions are then covered followed by discussions of generator capacity/performance, maintenance, fuels, enclosures, sound attenuation, protection and transfer switches.

TIME:

- 90 minutes of Classroom Instruction
- 30 minutes for Final Assessment

LEARNING OBJECTIVES:

Upon completion of this module, participants will be able to:

- Describe the various NEC and NFPA code compliance considerations
- Determine customer requirements and preferences
- Document the scope of a project (generator(s), distribution, transfer switches, enclosures, locations, maintenance, training, etc)
- List and describe the various submittal documents required
- Determine acceptable suppliers for equipment, installation, warranty and service
- Specify engine capacity and performance requirements
- Determine fuel type and storage requirements
- Identify appropriate location and enclosure requirements
- Determine control and protection requirements
- Describe various load bank options
- Determine appropriate transfer switch requirements

CONTINUING EDUCATION:

Upon successful completion of this seminar, participants will be awarded a certificate of achievement identifying the seminar title, 2.0 PDHs (Professional Development Hours) and 0.2 CEUs (Continuing Education Units).

Successful completion of a PDSS seminar requires that the participant have:

1. Attended the complete seminar
2. A minimum score of 80% on the Final Assessment

TRAINING AT A GLANCE

TIME	LESSON	DESCRIPTION
5 minutes	Introductions	Participants and trainer should become briefly acquainted. The trainer welcomes participants and conducts an opening icebreaker activity.
80 minutes	Lesson 1 Writing Performance-Based Generator Specifications	This seminar provides you with a basic overview of the elements to consider when writing specifications for engine generator sets and transfer switches. Presented in a question and answer format, you'll learn what information is needed when putting together a comprehensive generator specification. The seminar begins with defining the scope of the application along with NEC and NFPA considerations. Project conditions are then covered followed by discussions of generator capacity/performance, maintenance, fuels, enclosures, sound attenuation, protection and transfer switches.
5 minutes	Conclusion	The trainer will review the objectives of the class and discuss how each objective was accomplished. An evaluation will be given out with which participants can provide feedback about the course. An assessment will also be given to each participant to evaluate the skills and knowledge they received from the course.

INTRODUCTION

TIME: 5 minutes

OBJECTIVE:

The introduction is an opportunity for the trainer and participants to become familiar with each other. This period will discuss the topics to be covered, capture initial questions and introduce writing generator specifications.

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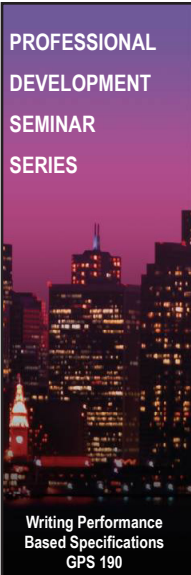
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Writing Performance-Based
Generator Specifications



Writing Performance
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INTRODUCTIONS

Writing Performance
Based Specifications
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INTRODUCTION

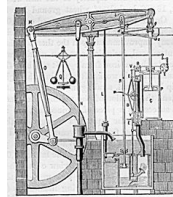
Ice Breaker

Did you know?

The **watt** is named after James Watt for his contributions to the development of the steam engine, and was adopted by the Second Congress of the British Association for the Advancement of Science in 1889.

By the 11th General Conference on Weights and Measures in 1960, the **watt** was adopted as the unit of power incorporated in the International System of Units (or "SI").

Source: wikipedia.org



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What You Will Learn

Upon completion of this seminar, participants will be familiar with the elements involved in writing generator set specifications. Specifically, they will be able to:

- Describe the various NEC and NFPA code-compliance considerations
- Determine customer requirements and preferences
- Document the scope of a project (generator(s), distribution, transfer switches, enclosures, locations, maintenance, training, etc)
- List and describe the various submittal documents required
- Determine acceptable suppliers for equipment, installation, warranty and service
- Specify engine capacity and performance requirements
- Determine fuel type and storage requirements
- Identify appropriate location and enclosure requirements
- Determine control and protection requirements
- Describe various load bank options
- Determine appropriate transfer switch requirements

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INTRODUCTION

What You Will Learn

<u>Topics Covered</u>	<u>Estimated Time</u>
• Introduction	5 min
• Writing Performance-Based Generator Specifications	80 min
• Wrap-up.....	5 min

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WRITING PERFORMANCE-BASED GENERATOR SPECIFICATIONS

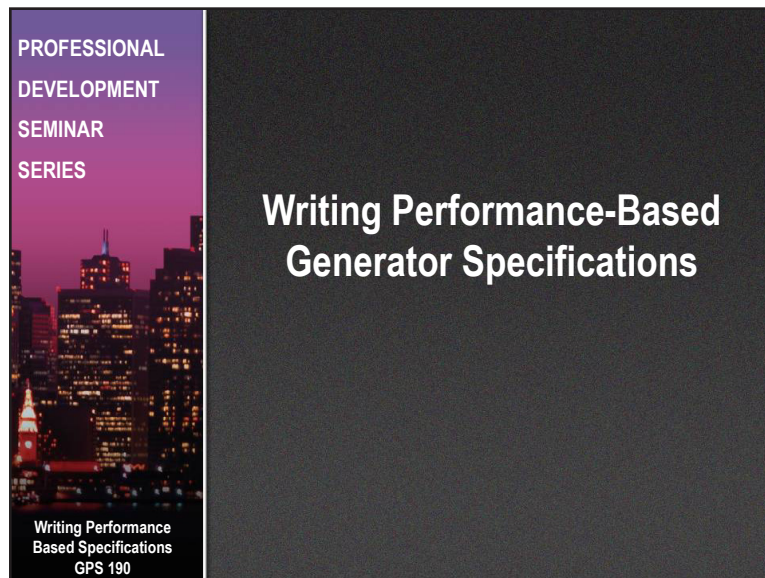
TIME: 80 minutes

OBJECTIVES:

Upon completion of this lesson, participants will be able to:

- Describe the various NEC and NFPA code compliance considerations
 - Determine customer requirements and preferences
 - Document the scope of a project (generator(s), distribution, transfer switches, enclosures, locations, maintenance, training, etc)
 - List and describe the various submittal documents required
 - Determine acceptable suppliers for equipment, installation, warranty and service
 - Specify engine capacity and performance requirements
 - Determine fuel type and storage requirements
 - Identify appropriate location and enclosure requirements
 - Determine control and protection requirements
 - Describe various load bank options
 - Determine appropriate transfer switch requirements
- ## NOTES

NOTES



WRITING PERFORMANCE-BASED GENERATOR SPECIFICATIONS

Probing Questions?

1) What is the application (Code Compliance)?

- Healthcare (NEC 517)
- Fire Pumps (NEC 695)
- Emergency Life Safety (NEC 700)
- Legally Required Standby (NEC 701)
- Optional Standby (NEC 702)
- Critical Operation Power Systems (NEC 708)



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Probing Questions?

1a) What is the application (design considerations)?

- What is the load?
 - ◆ Reliability concerns
 - ◆ Sizing concerns



2) Does the customer have strong preferences?

- Fuel choice
- Equipment location
- System reliability
- Run-time
- Systems integration
- Supplier



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Summary - Scope

3) What is being specified?

- Generators
 - Distribution equipment
 - Transfer switches
 - Fuel tanks
 - Enclosures
 - Load banks
 - Electrical installation
 - Mechanical installation
 - Commissioning/performance testing
 - Training
 - Maintenance contract
- 




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Submittals

4) What are the most common submittal elements?

- Spec-Sheets
 - Performance data
 - ◆ Emissions (Sound and Exhaust)
 - ◆ Transient response/motor starting
 - ◆ Decrement and thermal damage curves
 - Electrical drawings (control and power)
 - ◆ Termination type and location
 - ◆ Interconnection requirements
 - Layout/installation/mechanical drawings
 - ◆ Footprints
 - ◆ Stub-ups
 - ◆ Piping connections
 - Warranty
- 



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Quality Assurance (suppliers)

5) Who are acceptable suppliers?

- Approved manufacturers
 - By experience and product offering
 - By name
 - Evaluating supplier capability
 - Presentation by supplier
 - Probing questions and answers
 - Site visit to supplier
- Servicing capabilities (local)
 - Location/response time (2 hours)
 - Factory training and technician experience
 - Services offered
 - Parts on trucks

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Quality Assurance (testing)

6) What testing is required?

- Factory testing
 - Standard load test and test report (most common)
 - Extended testing (multi-hour, .8 pf)
 - NFPA 110 level 1 applications require .8 pf (factory most convenient)
 - Two hour load tests common on large kW or mission critical
- Site testing
 - Operational and Load test with load bank and facility load
 - NFPA 110 testing requirements (typically healthcare)
 - Transient/chart recording (some mission critical)
- Commissioning
 - Servicing dealer with electrical contractor and end-user (most common)
 - Commission agent (some mission critical – based on customer preference)



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Quality Assurance (standards)

7) What are the most commonly referenced codes and standards?

- EPA
- UL 142 Fuel Tanks (UL2085 fire rated tanks in limited markets)
- UL 1008 Transfer Switches
- UL 2200 Generators
- NFPA 20 Installation of Fire Pumps
- NFPA 37 Installation and Use of Stationary Engines
- NFPA 54 National Fuel Gas Code
- NFPA 58 LP Gas Code
- NFPA 70 National Electrical Code
- NFPA 99 Health Care Facilities
- NFPA 110 Standard for Emergency and Standby Power Systems

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Quality Assurance (local codes)

8) What are the local norms (code compliance)?

- AHJ interpretation and local requirements
 - Electrical inspector
 - Fire marshal
 - City ordinances



- Sound
- Diesel fuel containment and location-related issues
- Disconnect at point of building entry
- Enforcement of breaker coordination requirements
- Breaker sizing for fire pumps
- Acceptance of natural gas as a reliable fuel for emergency systems
- Emissions

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Warranty & Maintenance

9) What are the warranty and maintenance requirements?

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Project Conditions

10) What are the site conditions?

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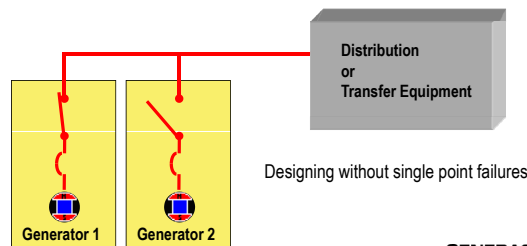
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Specifying the Generator(s)

11) Single or multiple generator configuration?

- Customer's reliability expectation (Is failure an option?)
- Customer's growth needs
- Relative cost between the options
- Integrated paralleling technology makes this a real design question
 - ♦ Paralleled generation reliability at single generator price points



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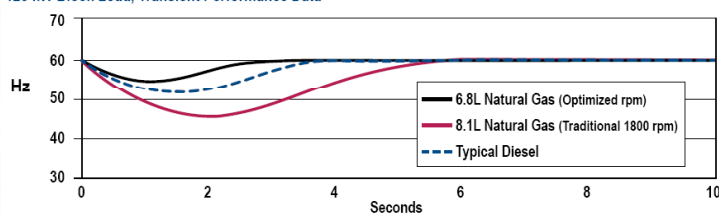
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Specifying the Engine(s)

12) What about engine RPM?

- Engine RPM should be consistent with good engineering practices
- Diesel engines perform quite well at 1800 rpm
- Automotive engines prefer increasing the rpm over turbo-charging
 - ♦ Reduced bearing stress (BMEP)
 - ♦ Improved block loading response

125 kW Block Load, Transient Performance Data



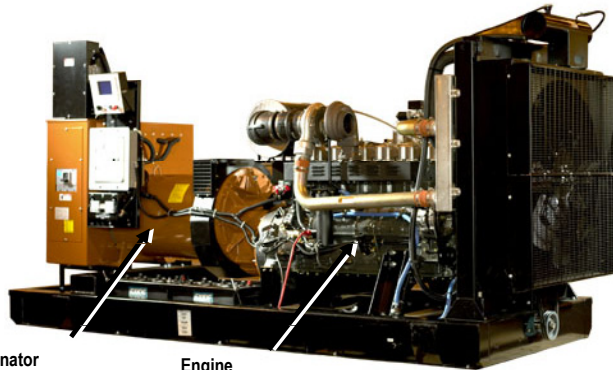
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Generator Capacity and Performance



Alternator
Voltage Dip
Harmonic Distortion

Engine
Available kW
Frequency Dip

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Generator Capacity and Performance

13) What are the generator capacity requirements?

- Power (kW)
 - Present loads (include load diversity – except emergency systems)
 - Future loads
 - Transient loads
 - Motor starting kW = Hp x 2
- Transient capacity
 - Voltage dips (critical element)
 - Specify the starting kVA and maximum allowable voltage dip
 - Frequency dips (typically less critical)
 - Specify the largest kW load step (usually motor starting) and allowable dip
 - Usually an issue with line interactive UPS technology

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Generator Capacity and Performance



Up-sizing the alternator

100 hp x 6.0 skVA/hp = 600 skVA

Vdip	35%	25%	20%	10%
Alternator Model	175	230	275	750

Minimize voltage dip by upsizing alternator

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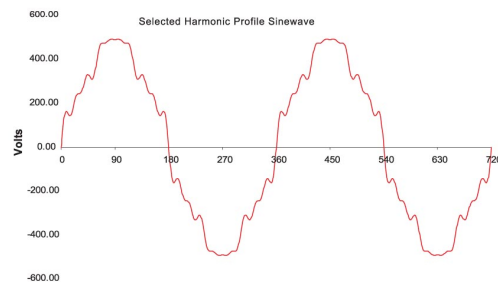
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NOTES

Generator Capacity and Performance

14) How to specify capacity for non-linear loads?

- Provide the kVA of the non-linear load and its estimated THID
- Ask suppliers to size based on alternator X"d to achieve THVD = 10%
- Ask for sizing report with estimated voltage distortion



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WRITING PERFORMANCE-BASED GENERATOR SPECIFICATIONS

Fuel Choices

15) What fuel source to select?

- Diesel
 - ◆ NEC 695, NEC 700 requires "reliable fuel"
 - ◆ Majority of markets define reliable as on-site fuel
 - ◆ NEC 708 requires on-site fuel
 - ◆ Plus 150 kW market (diesel is typically lower capital cost)
- Natural Gas (NG)
 - ◆ Customer has NG infrastructure
 - ◆ NEC 701 and 702 applications or AHJ defines NG "reliable" market
 - ◆ Preference for long run-times and no fuel PM issues
 - ◆ Strong environmental preferences
 - ◆ Minus 150 kW market (NG is lower capital cost)
 - ◆ Plus 150 kW market (cost effective solutions from limited suppliers)

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Fuel Choices

15) What fuel source to select (continued)?

- Bi-fuel
 - ◆ NEC 695, NEC 700, NEC 708
 - ◆ Larger kW market (+600kW commercially-available units)
 - ◆ Preference for long run-times (+30 hrs) and minimal fuel PM issues
 - ◆ Moderate environmental preferences
- Liquid propane (LP) vapor
 - ◆ No NG infrastructure
 - ◆ Minus 150 kW market (limited offering for +150 kW configurations)
 - ◆ On-site back-up to NG (Dual Fuel) – NEC 700 applications
- Liquid propane (LP) liquid
 - ◆ Desire to use LP
 - ◆ Cold environment
 - ◆ Limited LP tank size relative to generator capacity

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Fuel Design Considerations

- **How much fuel is enough... How much fuel is too much?**

- Diesel fuel must be maintained to be reliable
 - Fuel system design shall provide for a supply of clean fuel (NFPA 110 7.9.1.2)
 - Fuel must be consumed within the storage life or replaced (NFPA 110 7.9.1.3)
 - Fuel must be tested annually (NFPA 110 8.3.8)
- Strategies/Considerations
 - Strong fuel-maintenance or fuel-exchange programs
 - Minimize diesel -- Bi-fuel generators
 - Replace diesel -- Natural gas generators

Would a customer that is not actively managing and maintaining the on-site diesel be better served with off-site natural gas?

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Fuel Design Considerations

- **Diesel**
 - Dedicated tank or minimum draw down (NFPA 110, Level 1 apps)
 - Indoor applications typically limited to 660 gallons
 - Engine fuel pumps lift is limited 4' to 6'
 - Fuel level indication should be connected into generator controller
 - Have fuel transfer pumps on generator power
 - Examine fuel transfer schemes from a failure mode analysis perspective
- **Natural Gas**
 - Will the infrastructure support generator (flow and pressure)
- **General comments**
 - Securing or monitoring isolation valves enhances reliability

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Diesel Fuel Tanks

16) What about fuel tanks?

- Secondary containment sub-base tanks (UL 142)
- Normal vents, emergency vents
- Main Storage tanks (30+ hours) with day tank (4 hour run time)
- Special requirement tanks
 - Sub-base day tank (8 hours with transfer pumps)
 - UL2085 fire rated (code-required in select markets)
 - Local code special considerations



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Location

17) Where should the generator be located (inside or outside)?

- Space
- Cost
- Perspective on reliability
 - ◆ Environmental concerns
 - ◆ Supporting system complexity
 - ◆ Human factor
 - ◆ Fire risks



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Enclosures

18) What should be considered when specifying an enclosure?

- Factory standard packaging gives maximum value
- Drop-over enclosures can be a significant cost adder
- Consider aluminum in corrosive environments
- Discharge hoods provide significant value
 - Protect radiator core
 - Prevent circulating hot discharge
 - Superior location for silencers



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Sound – Enclosures

19) What about sound attenuation and silencers?

- Specify sound level requirements (dBA and distance)
- Critical grade mufflers are typical – but total sound level is the goal
- Locate mufflers in hoods or internally with thermal wrapping
- Remember, custom enclosures are expensive and not factory tested
- Can distance, a standard enclosure, and a wall satisfy attenuation requirements?



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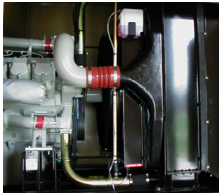
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Cooling System Elements


20) What should be specified relative to the radiator?

- Show a strong preference for attached radiators
- Radiators are typically sized for 50°C environments
- Use closed loop cooling
- Do not restrict radiator discharge
- Have ample-sized air inlet



21) What about block heaters?


- Required on diesels
- Consult supplier data sheets
- Upsize in cold climates
- Optional on small gaseous engines (replace with battery blankets)



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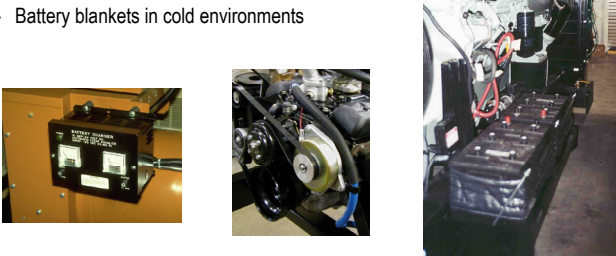
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STARTING SYSTEM

22) What are key elements of a good starting system?

- Lead acid batteries (for cold environments review upsized options at submittal)
- Replace the batteries per schedule
- 10-amp float-equalize battery charger
- 35-amp engine drive charging alternator
- Battery blankets in cold environments



The first image shows a black battery charger with two output terminals and a digital display. The second image shows a close-up of an engine's alternator and belt system. The third image shows a large battery bank with multiple cells and red and black cables connected to them.

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Speed and Voltage Control

23) Important considerations when specifying the governor and regulator

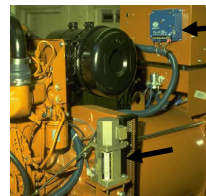
- Governor should be electronic, isochronous with .5% regulation
- Regulator should be .25% regulation, 3 phase RMS sensing
- Preference for integration with genset controller
 - Simplifies diagnostics
 - Supports remote diagnostics
 - Secures dynamic settings



External Regulator



Integrated approach



External Governor

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Speed and Voltage Control

24) How should the genset controller be specified?

- Specifying NFPA 110, Level 1 (takes care of the basics)
- Remote annunciator for healthcare and mission critical
- Some key design elements to consider
 - Integration of control functions
 - Intuitive (alarms not in codes)
 - Sealed connections
 - Surface mount technology
 - Spare and Expandable I/O
 - Custom alarm and logic capabilities
 - Predictive maintenance
 - Remote monitoring and diagnostic capabilities



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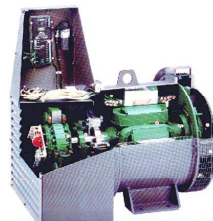
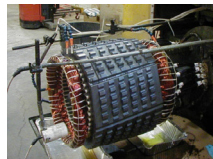
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Alternator

25) What are the standard elements in specifying an alternator?

- Brushless exciter (common 50 kW and above)
- 12 lead (common 400 kW and below)
- 2/3 pitch (no third harmonic)
- Random wound (best performance and value)
- Temperature rise of 120°C (UL2200 standard)



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Alternator

26) What are the optional elements in specifying an alternator?

- PMG
 - ◆ Provides 300% short circuit current
 - ◆ Supports breaker coordination
 - ◆ Required on NEC 700 and 701 applications
- Strip heaters and tropical coating
 - ◆ High humidity environments
 - ◆ Extra winding moisture protection
- Medium voltage elements
 - ◆ Form wound
 - ◆ Vacuum Pressure Impregnation (VPI)
 - ◆ Resistive thermal devices (RTDs)

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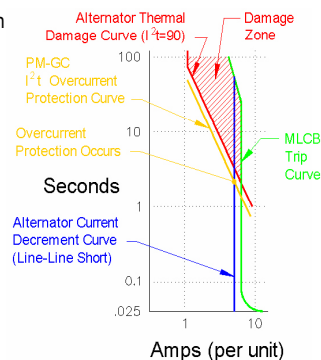
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Alternator Protection

27) What about alternator protection?

- Historically protected by good installation
 - Field circuit breakers (not effective protection)
 - Thermal magnetic breaker (not effective protection)
- Today's options
 - Electronic trip breaker
 - Genset controller protective functions (special algorithm)



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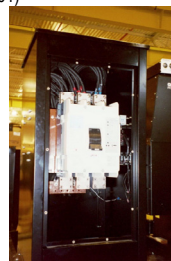
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Alternator Output Breaker

28) What needs to be specified relative to the breaker?

- Thermal magnetic, 80% rated, 100-125% of rated output (industry norm)
- Multiple breakers (multiple ATS application, separation of circuits)
- Separation of circuits with generator connection box (AHJ interpretation)
- Electronic trip breakers (coordination support, NEC 700 and 701)
- Auxiliary contact breaker open alarm (good idea)
- Shunt trip (limited use, closed transition switch apps)
- Fire pump breaker (125% to 250% per NEC 695)
- Ground fault indication (NEC 700, 480V, 1000 amps)
- Ground fault protection (not common, reference local norms)



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Auxiliary Power Circuits

29) What about auxiliary power circuits?

- Auxiliary power normally has dedicated terminations
- Common elements are block heater, battery charger and alternator strip heater
- Optional elements
 - Load center (convenient on larger gensets)
 - Convenience outlet
 - Lighting (not code required for generators in enclosures)
 - Enclosure heater (NFPA 110, level 1 application)
 - Motorized louvers



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Load Bank Provisions

30) Should load bank provisions be provided?

- Periodic load banking is recommended
- Load banking is more important in lightly loaded applications
- Include load bank connect provisions
- Mission critical applications may incorporate a load bank onsite
- Limit unit-mounted load banks with sound attenuated enclosures
 - ◆ Discharge hood limitations



The left image shows a wall-mounted load bank unit with its door open, revealing internal wiring and terminals. The right image shows a portable, sound-attenuated load bank unit on wheels, labeled 'Averline INDUSTRIAL LOAD BANK'.

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Automatic Transfer Switches (ATS)

31) What are some key specification elements for ATS's?

- Open transition switches are the most common
- Specify in-phase re-transfers for standard applications
- Specify delay-in-neutral re-transfers for motor loads or devices with filtering
- Specify digital switches only if you plan on utilizing the communications
- Retrofit, whole building applications consider service entrance rated ATS
- Healthcare and data applications consider bi-pass isolation ATS
- Consider closed transition transfer switch (CTTS)
 - Storm mitigation
 - Weekly facility load tests
 - Interruptible/curtailable utility rates



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Automatic Transfer Switches (ATS)

32) What about fault ratings and separately derived?

- Evaluate the available fault capability of the application (spec accordingly)
- Small switches usually have lower fault ratings
- **A 4-pole switch must be used when...**
(separately derived system, switched neutral)
 - Multiple ATS application and GFP is on the utility feeders
 - Multiple services or multiple buildings on one generator system
 - If sensitive GFI on the generator is desired

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Fire Pumps

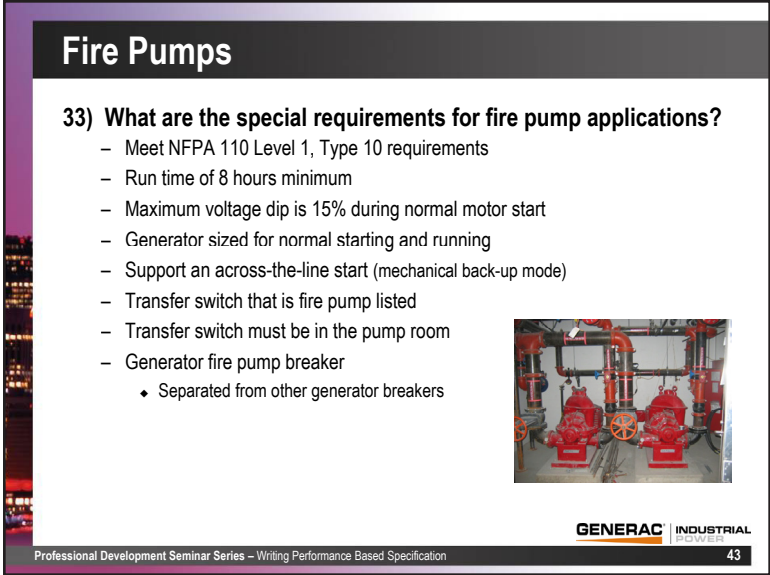
33) What are the special requirements for fire pump applications?

- Meet NFPA 110 Level 1, Type 10 requirements
- Run time of 8 hours minimum
- Maximum voltage dip is 15% during normal motor start
- Generator sized for normal starting and running
- Support an across-the-line start (mechanical back-up mode)
- Transfer switch that is fire pump listed
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- Generator fire pump breaker
 - Separated from other generator breakers



Professional Development Seminar Series – Writing Performance Based Specification



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Fire Pumps

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Professional Development Seminar Series – Writing Performance Based Specification

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Professional Development Seminar Series – Writing Performance Based Specification

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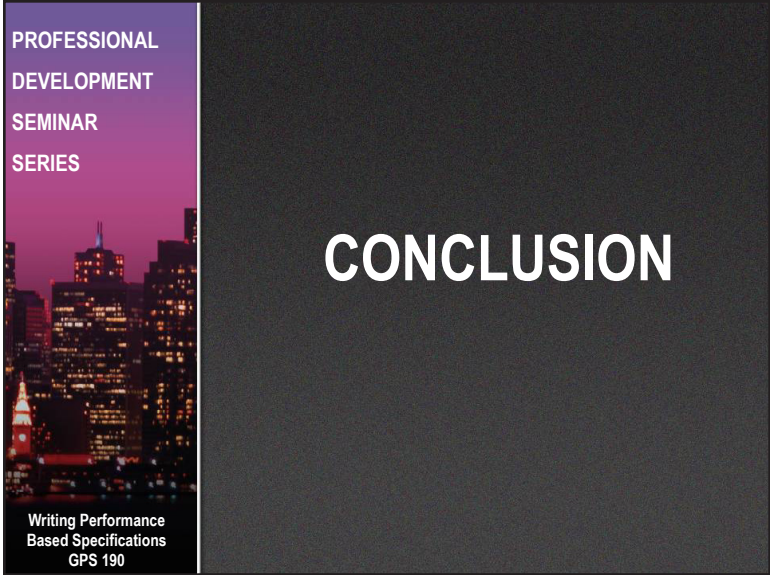


Professional Development Seminar Series – Writing Performance Based Specification

43

[illegible]

CONCLUSION



NOTES

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NOTES

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ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

Online Final Assessment

Final assessments are available for each PDSS session. These assessments are Web-based and can be accessed using Generac's online learning system "*The Learning Center*" ([http:// learning.generac.com](http://learning.generac.com)). PDSS participants are required to obtain a score of at least 80% to pass an assessment. Each online assessment also contains a training survey. The survey provides each participant an opportunity to rate various components of the learning experience along with information relative to business development. Instructions for how to register and log in to this system, take the final assessment and print a certificate, are described in the Registering in "*The Learning Center*" section below.

Continuing Education

Upon successful completion of a seminar, participants will be awarded 2.0 PDHs (Professional Development Hours) and 0.2 CEUs (Continuing Education Units). Successful completion of a seminar requires that the participant have:

- Attended the complete seminar
- Received a minimum score of 80% on the Final Assessment

Certificate of Accomplishment

Participants who successfully complete the seminar and receive a passing score on the online final assessment are entitled to a "Certificate of Accomplishment." Certificates are available for printing directly from the participant's account screen on Generac's online training system "*The Learning Center*". Instructions for how to register and log in to this system, take the final assessment and print a certificate, are described beginning in the following section.

Registering in "*The Learning Center*"

To gain access to "*The Learning Center*", you are required to register and set up a user account. During your account setup you will create a *Username* and *Password*. Your username and password can then be used to log in on subsequent visits.

The following pages will aid you in the registration process along with the Final Assessment, Survey and Certificate procedures.

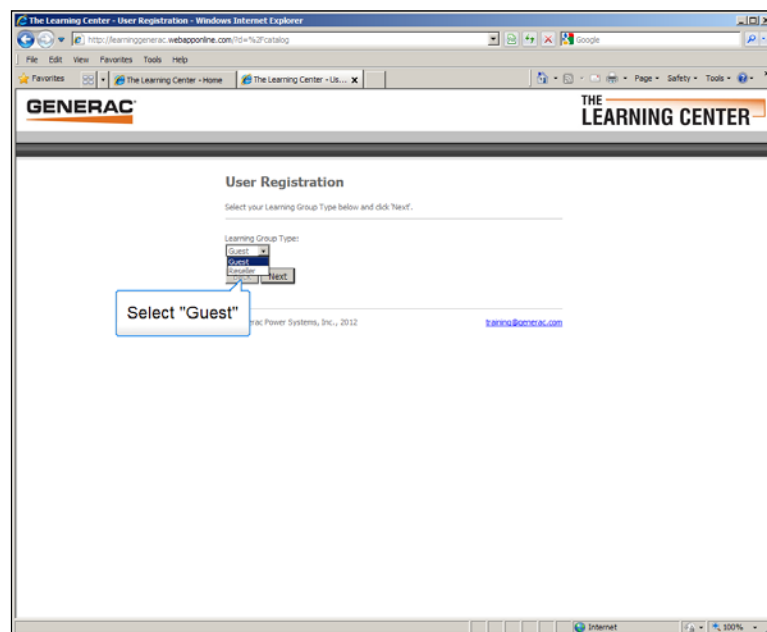
To begin the registration process, open your computer's browser and enter [http:// learning.generac.com](http://learning.generac.com). This should take you to "*The Learning Center*" home page. This page is displayed at the top of the next page. From this point you can follow illustrated steps.

ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

Begin by entering <http://learning.generac.com> in your computer's browser. The screen below will be displayed. Click on the "register here" link to begin the registration process.

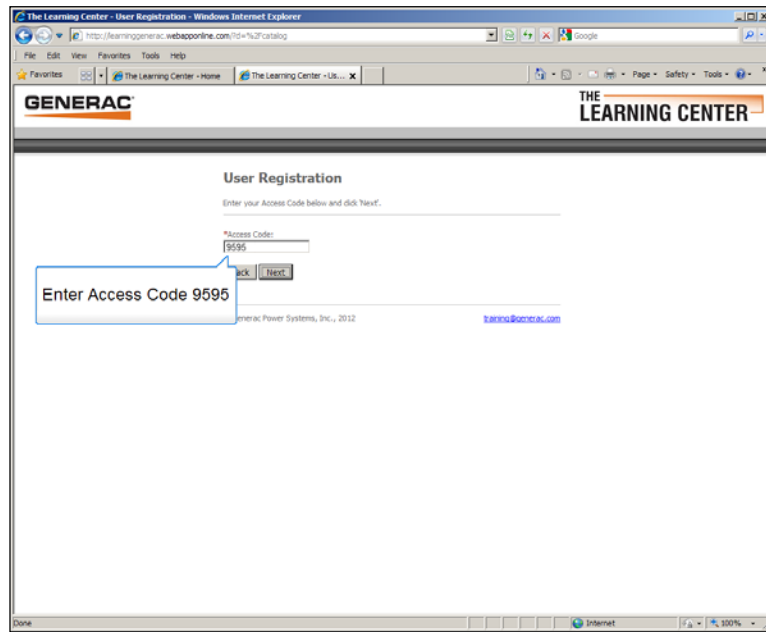


On this screen you will select "Guest" from the drop down box and click the "Next" button.



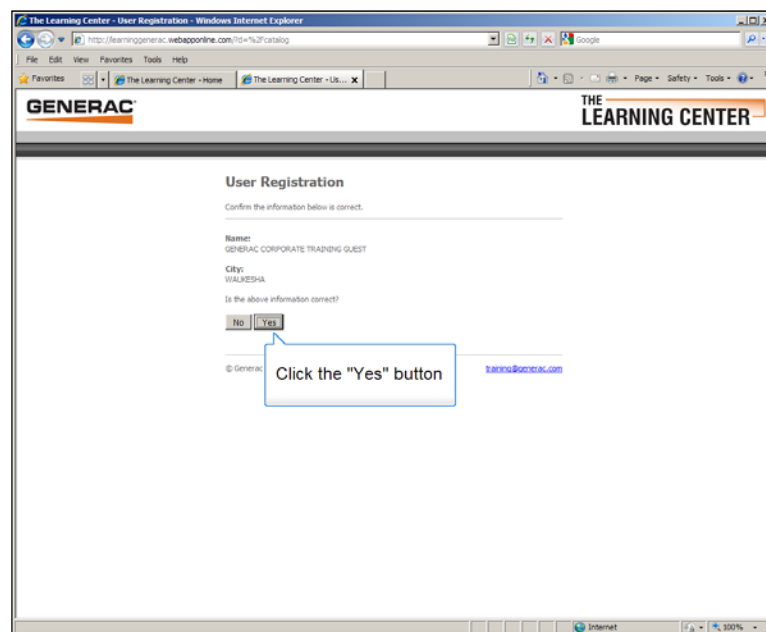
ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

In this next screen enter **Access Code 9595** and click the “Next” button. Please keep this code private.



The screenshot shows a web browser window titled "The Learning Center - User Registration - Windows Internet Explorer". The address bar shows the URL "http://learninggenerac.webapponline.com/ld=162/catalog". The page header includes the "GENERAC" logo and "THE LEARNING CENTER". The main heading is "User Registration" with the instruction "Enter your Access Code below and click Next!". There is a text input field labeled "Access Code" containing the value "9595". Below the field are "Back" and "Next" buttons. A blue callout box points to the "Next" button with the text "Enter Access Code 9595". At the bottom, it says "© Generac Power Systems, Inc., 2012" and provides an email address "training@generac.com".

This screen confirms the correct access code entry. Click the “Yes” button to proceed.



The screenshot shows the same web browser window, but the page content has changed. The heading is still "User Registration", but the instruction is now "Confirm the information below is correct:". Below this, the "Name:" field is populated with "GENERAC CORPORATE TRAINING GUEST" and the "City:" field is populated with "WALKER, GA". Below these fields is the question "Is the above information correct?" followed by "No" and "Yes" buttons. A blue callout box points to the "Yes" button with the text "Click the 'Yes' button". At the bottom, it says "© Generac" and provides an email address "training@generac.com".

ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

The next screen contains the “User Registration” form. Fill in the required boxes, and then click the “Register” button.

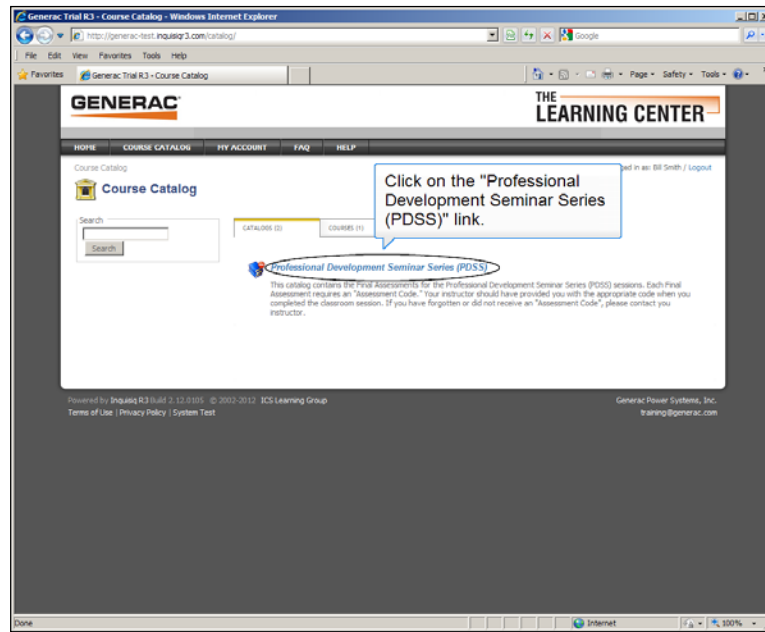
The screenshot shows a web browser window titled "The Learning Center - User Registration - Windows Internet Explorer". The address bar shows the URL "http://learninggenerac.webapponline.com/10+%2Fcatalog". The page title is "User Registration". Below the title, there is a brief instruction: "Complete the form below to register. Once registered, you can log in to the system. Required items are marked with an asterisk (*)." The form contains several fields: "First Name", "Middle Name", "Last Name", "Email Address", "Username", "Password (case-sensitive)", "Confirm Password (case-sensitive)", "Company Name", "Title", "Company Address", "City", "State/Province", "Postal Code", and "Country" (with a dropdown menu set to "UNITED STATES"). A "Register" button is at the bottom. Two callout boxes provide additional instructions: one points to the form fields saying "Fill in the required boxes on the 'User Registration' form." and another points to the "Username" and "Password" fields saying "Create a 'Username' and 'Password' that you can remember --- You will need them when you log in at any point in the future."

The next screen confirms your registration. Click the “Continue” button to proceed.

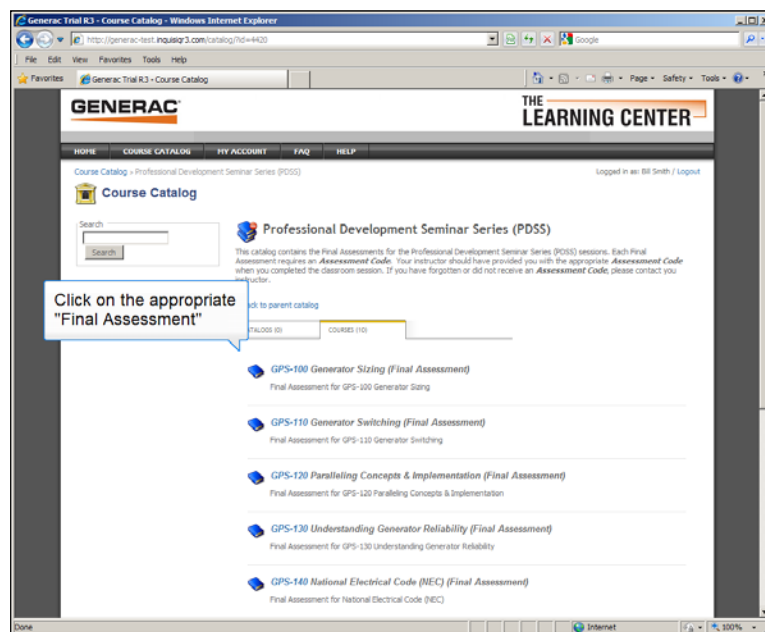
The screenshot shows the same web browser window, but the page content has changed. The header now includes the "GENERAC" logo on the left and "THE LEARNING CENTER" on the right. The main heading is "User Registration". Below it, a message states: "You have successfully been registered. Please click the 'Continue' button to log in." A "Continue" button is prominently displayed. A callout box points to this button with the text "Click the 'Continue' button". At the bottom of the page, there is small text: "© 2012 Generac Power Systems, Inc." and a link to "training@generac.com".

ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

The next screen displays the “Course Catalog.” Click on the “Professional Development Seminar Series” link.

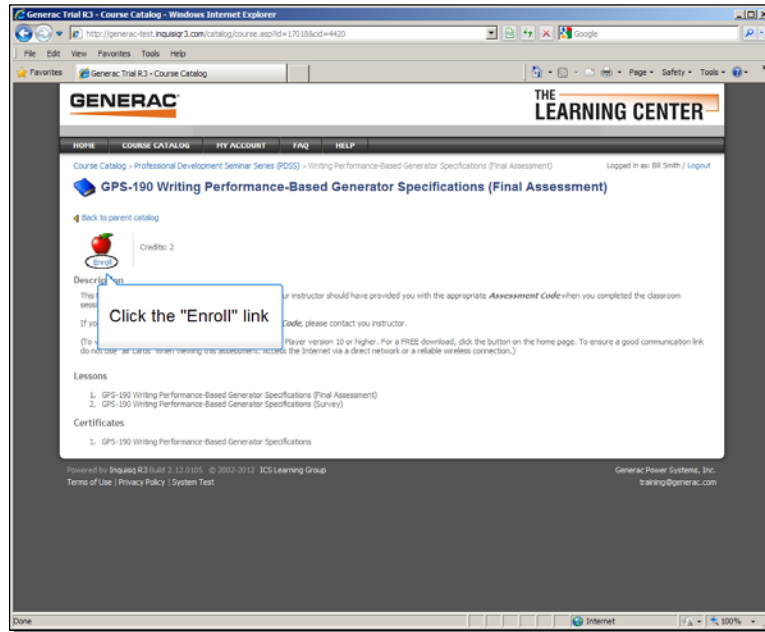


This next screen lists all currently available Final Assessments. Click on the Final Assessment that is tied to the course name and number you completed.

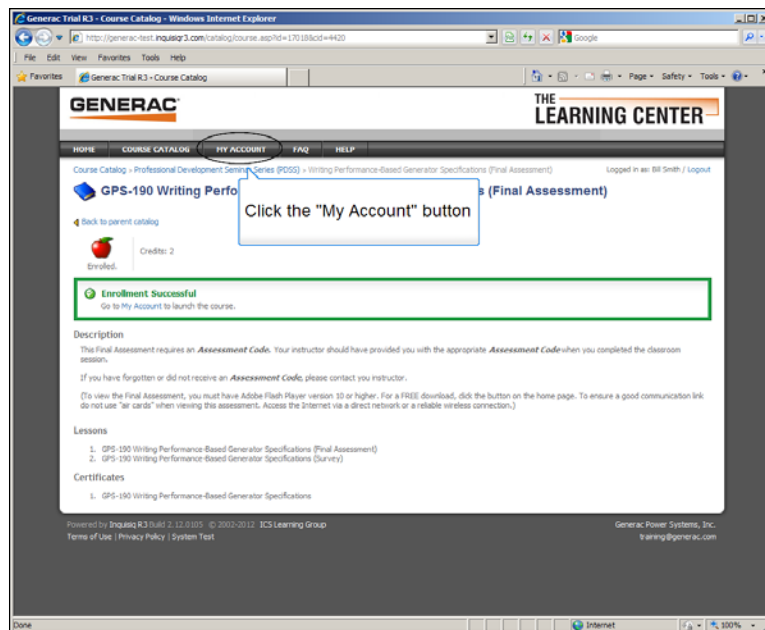


ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

The next screen is the “Enrollment” screen for the Final Assessment that you selected. Click the “Enroll” link to proceed.

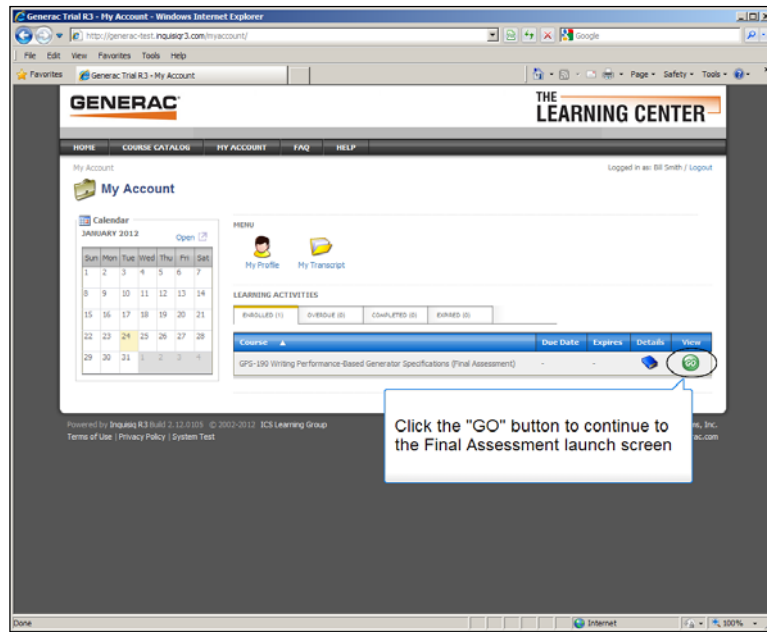


This screen confirms your enrollment. Click the “My Account” button to proceed.

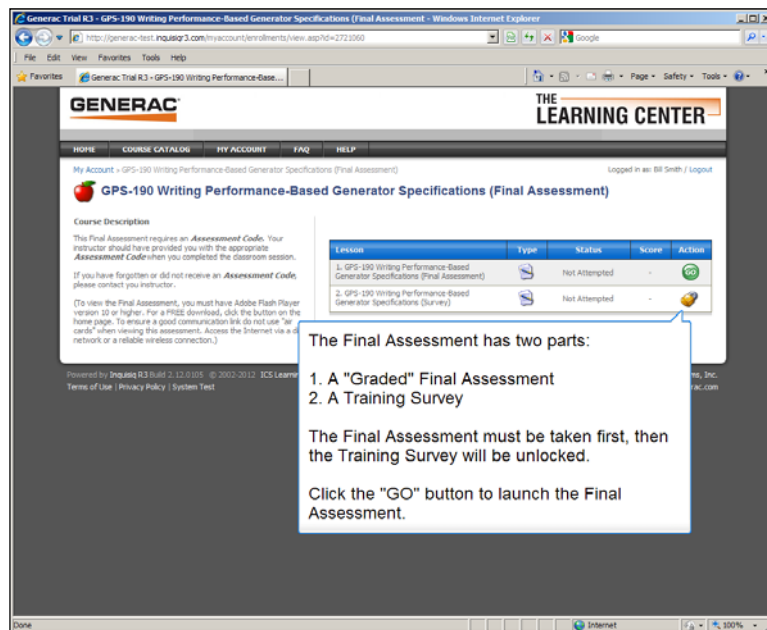


ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

This is your “My Account” screen. Note that the Final Assessment you selected is displayed under the “Enrollment” tab. Click the “GO” button to proceed.

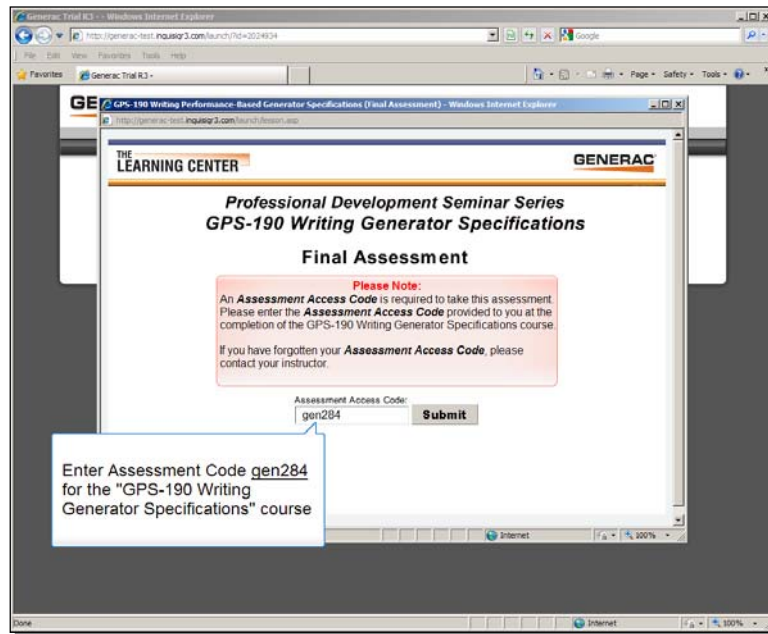


This screen lists the two parts to the Final Assessment. You must take the “Graded” Assessment first, then the Training Survey.

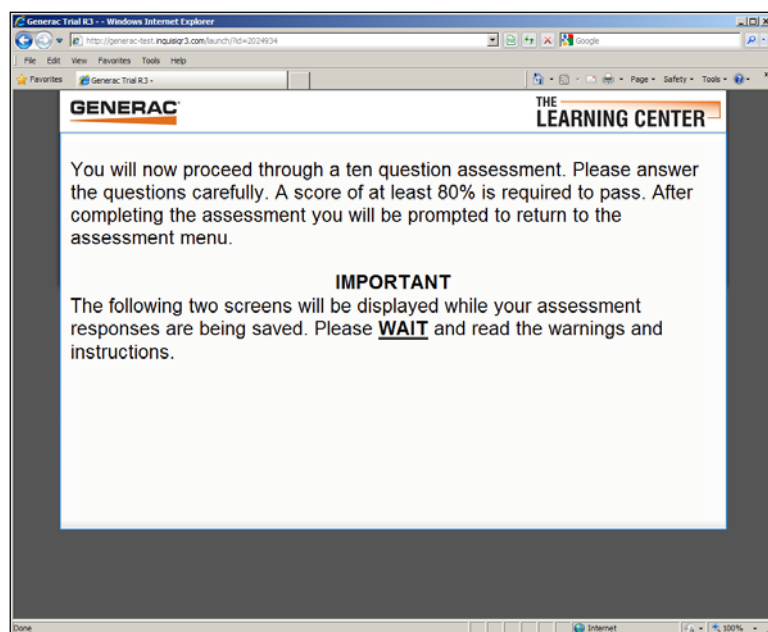


ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

In the next screen an “Assessment Code” is required before you can continue. The code for GPS-190 Writing Generator Specifications is **gen284**. Enter the code in the box and click the “Submit” button to continue.

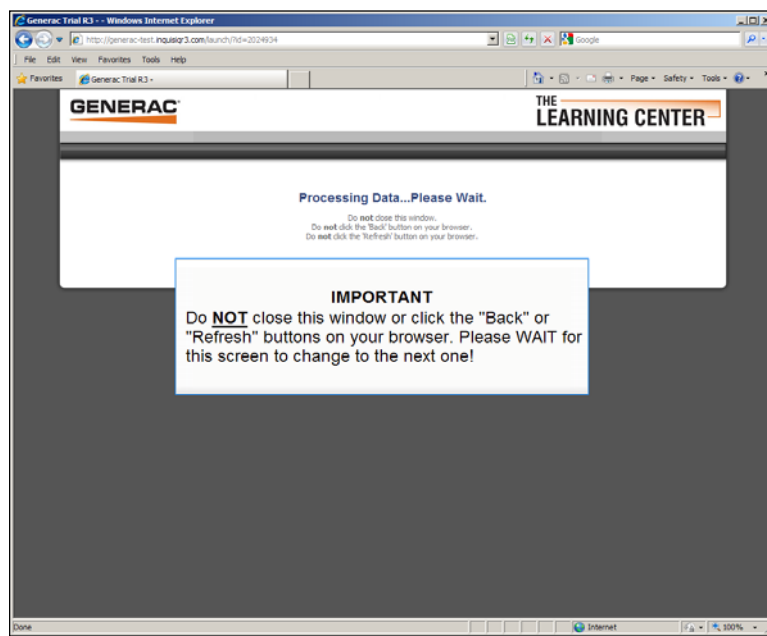


You will now proceed through a ten question assessment. Please read the warnings below.

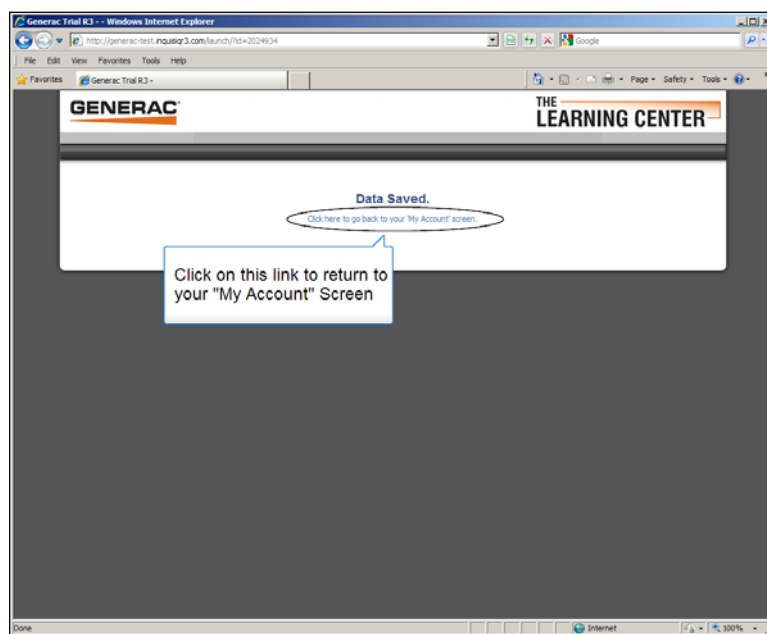


ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

Please follow the instructions on this screen. You must wait for your assessment data to be saved. Do not close this window or click the 'Back' or 'Refresh' buttons on your browser.

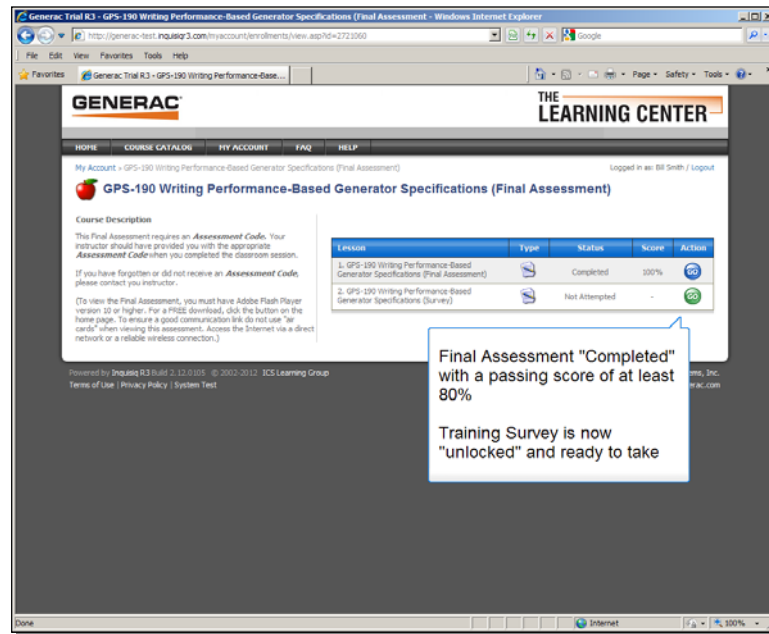


This screen confirms that your data was saved. Click on the link shown here to proceed.

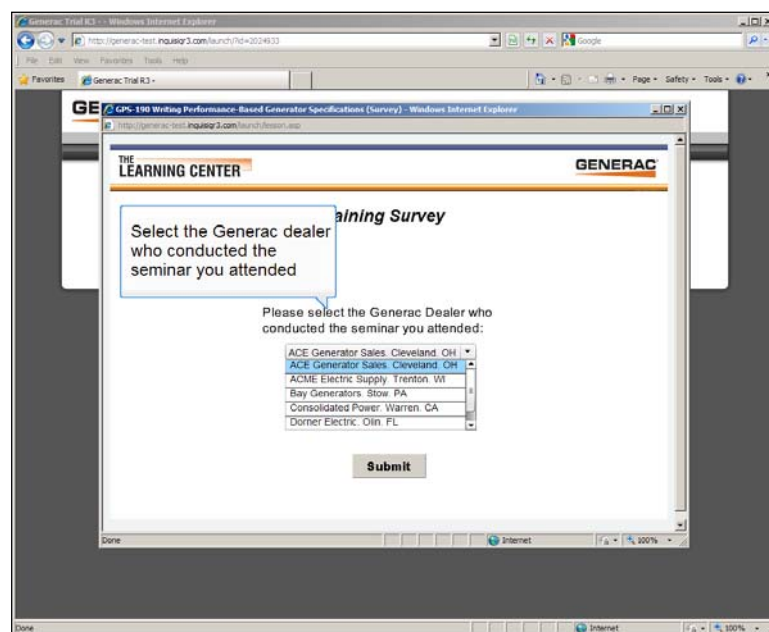


ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

This screen will be displayed after your assessment data is saved. Note that in this example the assessment was passed with a score of 100% and the Survey is unlocked and ready to launch.

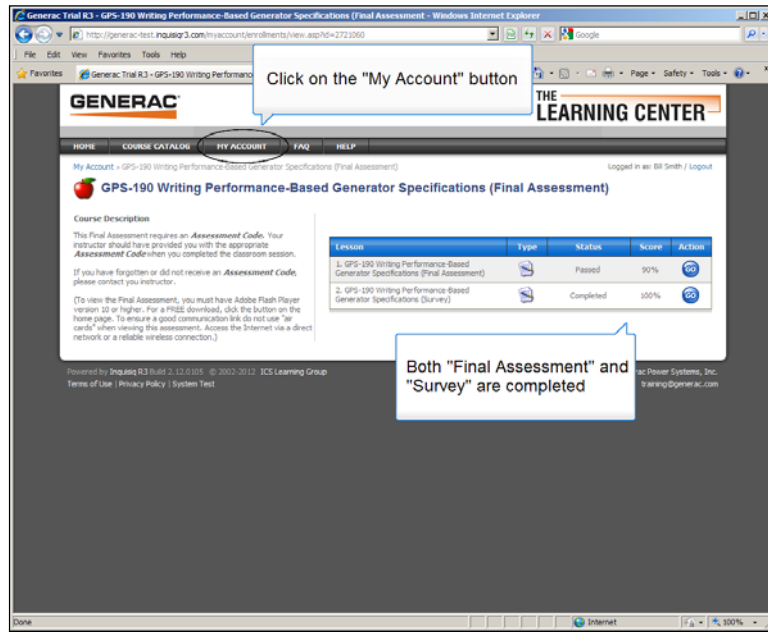


Upon launching the Survey, this screen will be displayed. Select the Generac dealer who conducted the seminar you attended.

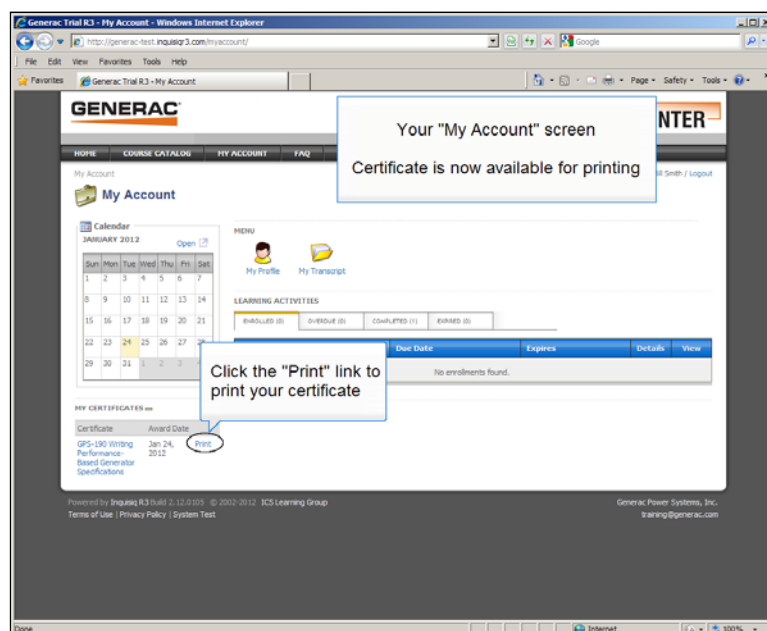


ONLINE FINAL ASSESSMENT AND CERTIFICATE REGISTRATION AND LOGIN PROCEDURE

After completing the survey you will be prompted to return to the assessment menu. Your response data will be saved as before, and you will see the screen below. Click the “My Account” button to continue.



Your “My Account” screen will look similar to the one shown here. Click the “Print” link to print your certificate.



NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

NOTES

[illegible]

NOTES

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings on the paper.

