

Engineering at Pantex and Y-12

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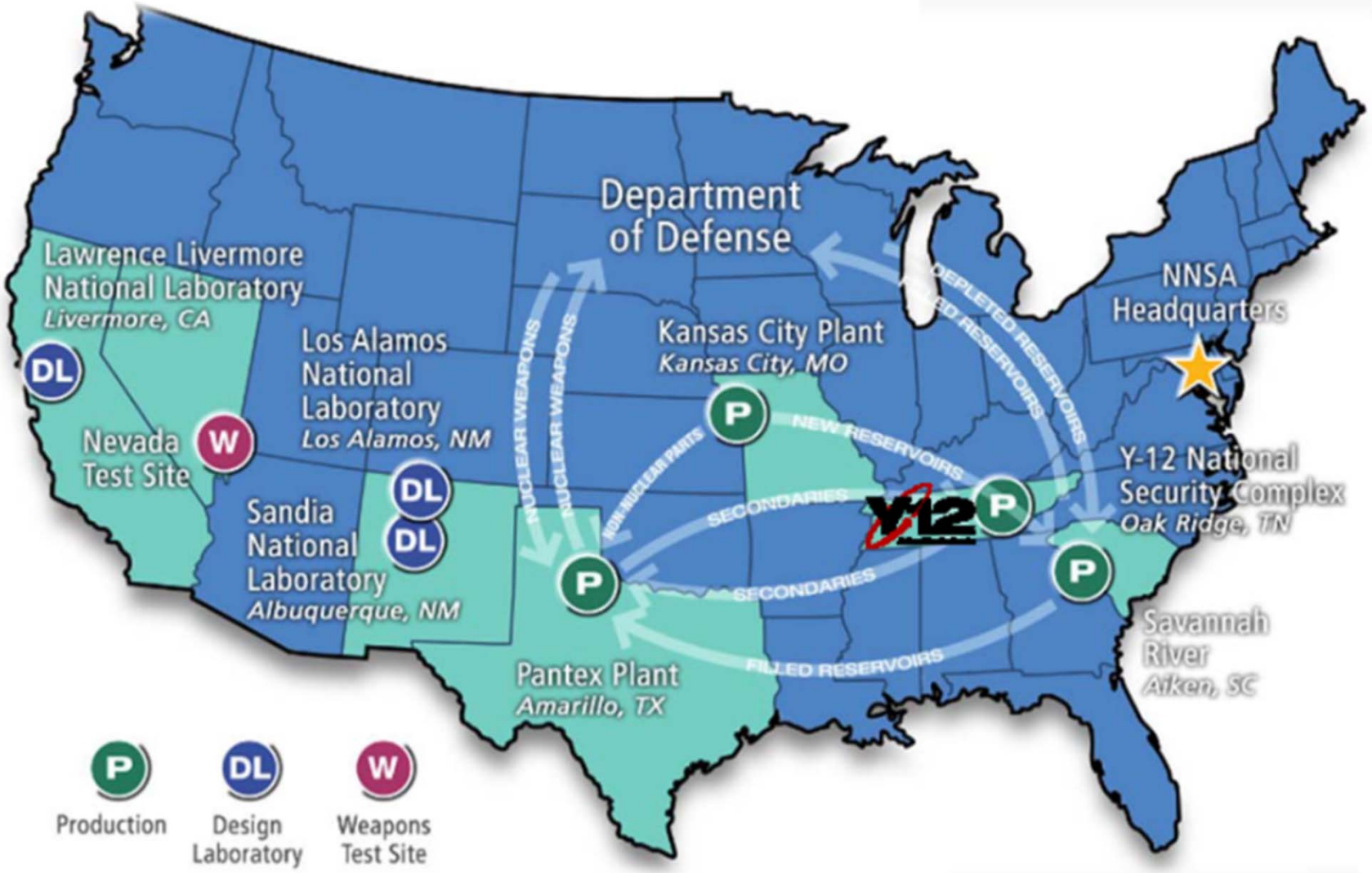
PANTEX PLANT | Y-12 NATIONAL SECURITY COMPLEX

Outline

- Historical background
- Overview of Engineering groups
- Employment opportunities.

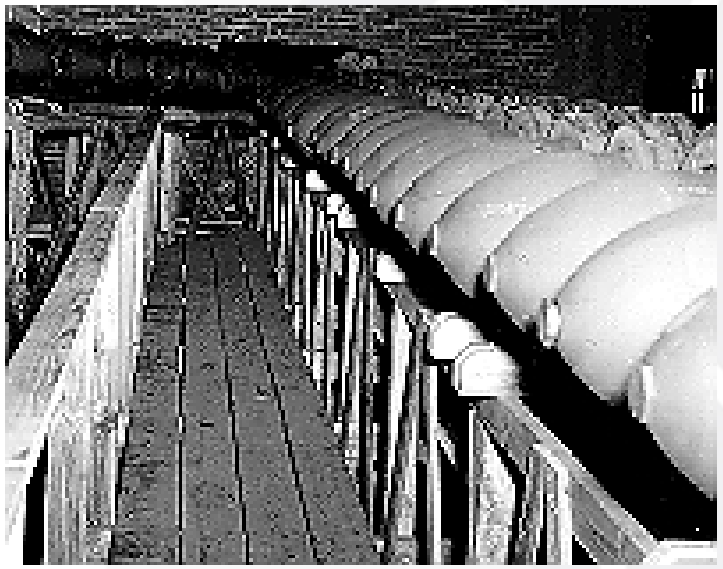
Nuclear Security Enterprise

Six production facilities and three design labs



Pantex History

- **1942-1945:** DoD Ordnance Plant (Closed 1945)
- **1947-1951:** Pantex lands given to Texas Tech University
- **1951:** Atomic Energy Commission reclaimed Pantex as High Explosives fabrication plant
- **1960's-1980's:** Cold War arms race and high explosives development



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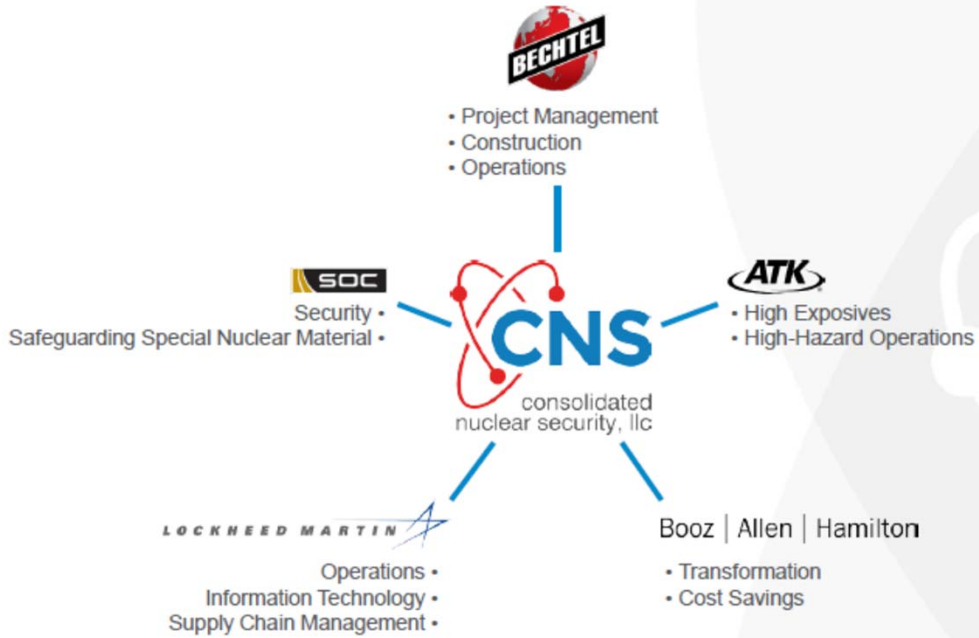
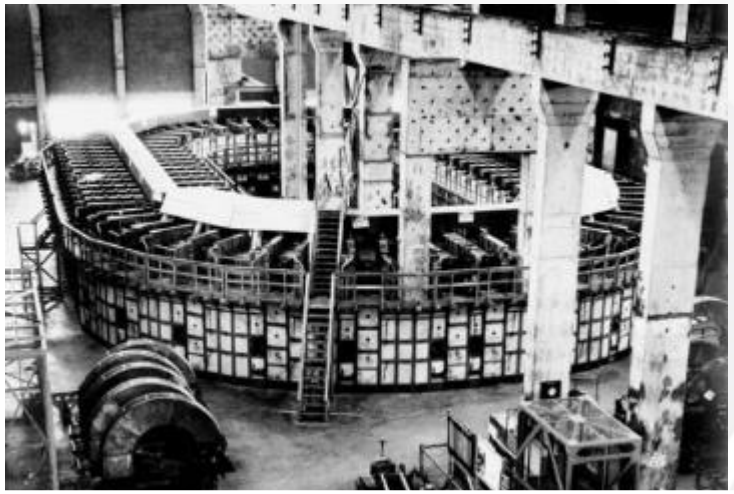
- **1990's:** Mission shifts to disassembly
- **2014:** Combined with Y-12 under Consolidate Nuclear Security (CNS)



Y-12 History

- **1940s: Completion of its World War II mission of separating the U-235 for Little Boy, and the start of its new mission of manufacturing uranium components for nuclear weapons.**



Y-12 History

- **1940s: Completion of its World War II mission of separating the U-235 for Little Boy, and the start of its new mission of manufacturing uranium components for nuclear weapons.**
- **1950s: A decade of tremendous growth: zirconium separation, lithium separation and manufacturing components for thermonuclear weapons testing and deployment.**
- **1960s, 1970s: Expansion and steady improvements in precision machining and measurement.**
- **1980s: Enormously heavy workload and around-the-clock activities at Y-12 to lead the way toward winning the Cold War.**
- **1990s: A decade of radical change from high production to weapons reductions (returns for disassembly), nuclear nonproliferation and manufacturing skills leads to National Prototype Center.**
- **2000s: Revitalization and modernization: production, storage and support buildings. Transition from single-mission site to multiple programs and customers.**

Pantex and Y-12 Today

- Sustain a safe, secure and effective nuclear arsenal
- Supply the U.S. nuclear Navy
- Prevent nuclear proliferation and nuclear terrorism

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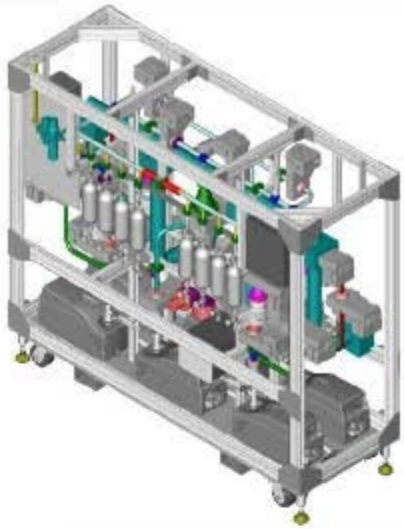
Facility Engineering



System Engineering

- Ensure Systems are Available for Production When Needed
- Configuration Management
- System Health
- Post-Work Tests

Design Engineering

- Prepare design documents
- Provide Technical Support to SEs, Production, and Maintenance
- Nuclear Procurement
  - Ensure requirements (nuclear, safety) are met
  - Prepare/Collect procurement technical documents

Safety Analysis Engineering

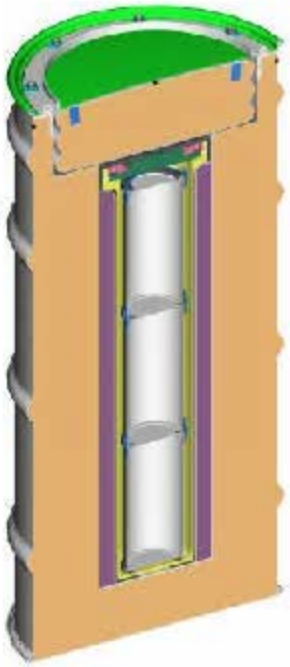
Criticality Safety

- Analyze Nuclear Material activities
- Derive Controls
- Perform Shielding Analyses
- Ensure Compliance
- Respond to Abnormal Conditions

Fire Protection

- Analyze Facility/Systems/Processes for Fire Risk
- Expert on Fire Safety Compliance
- Lead Change on Fire Safety Documentation
- Provide Design Change Recommendations

Safety Basis



- Perform Hazard/Accident Analysis
- Lead Creation/Change Safety Documentation

Packaging

- Design of Nuclear Shipping Packages
- Structural/Thermal Analysis
- Fabrication/Testing Support

Engineering Analysis

- Specialized Modeling/Analysis/Simulation

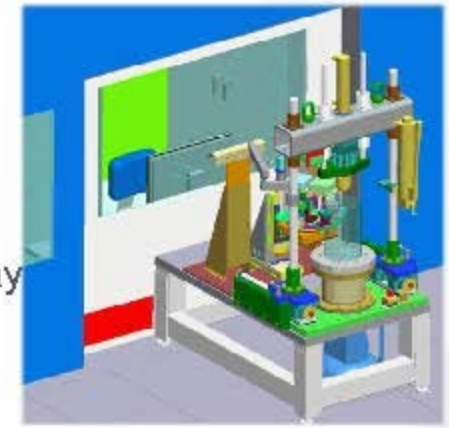
Product and Manufacturing Engineering

Product Engineering

- Provide Technical Guidance for Weapons Program Activities
- Technical Liaison for Interaction w/Design Agency

Process Engineering

- Responsible for Production Manufacturing Processes
- Develop manufacturing processes for New Products
- Analyze Existing Processes
- Quantitative/Qualitative Measurements of Assay
  - How much nuclear material is present?



Specialty Mechanical Engineering

- Tooling
- Fixtures
- Special Production Systems (Gloveboxes, Ovens, etc.)
- NC Program Creation/Support
  - Programs used to machine and inspect parts and tooling fabricated on numerically controlled machines

Research & Development

Metallurgical Engineering and Processing

- Melting (Microwave, Induction Melt Casting, etc.)
- Alloy Development/Analysis
- Joining (Welding, Brazing, Soldering, etc.)
- Coatings

Materials Processing

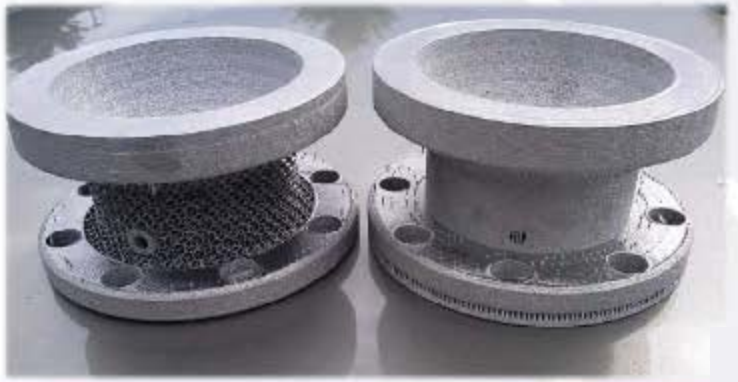
- Chemistry/Process Engineering for Uranium
- Special Material Design/Processing
- Materials Science
- Ceramics

Compatibility and Surveillance

- Microanalysis (X-ray, SEM, Microscopy)
- Radiation Measurement
- Mechanical Properties
- Non-Destructive Evaluation

Mechanical, Control, and Sensor Systems

- Machining Process Development, Additive Manufacturing
- Wireless Technologies, Sensors
- Hardware/Software Design
- Simulation/Modeling



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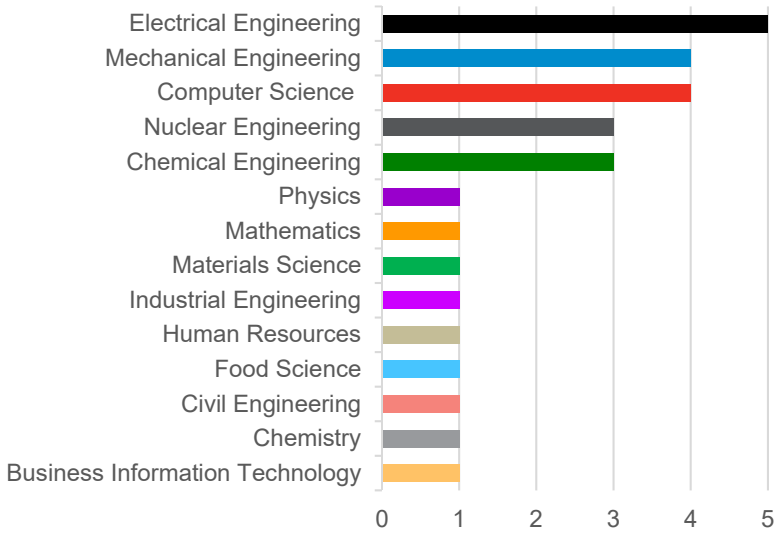
Electrical Engineering
Mechanical Engineering
Computer Science
Nuclear Engineering
Chemical Engineering
Physics
Mathematics
Materials Science
Industrial Engineering
Human Resources
Food Science
Civil Engineering
Chemistry
Business Information Technology
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1
2
3
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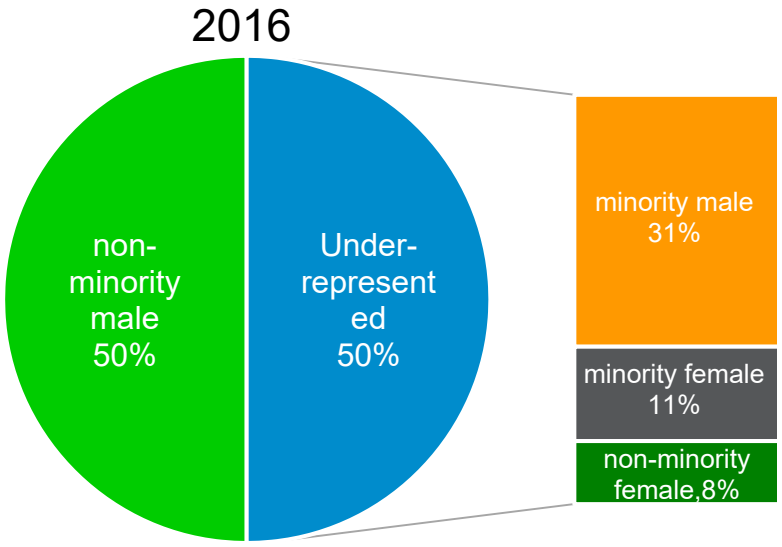
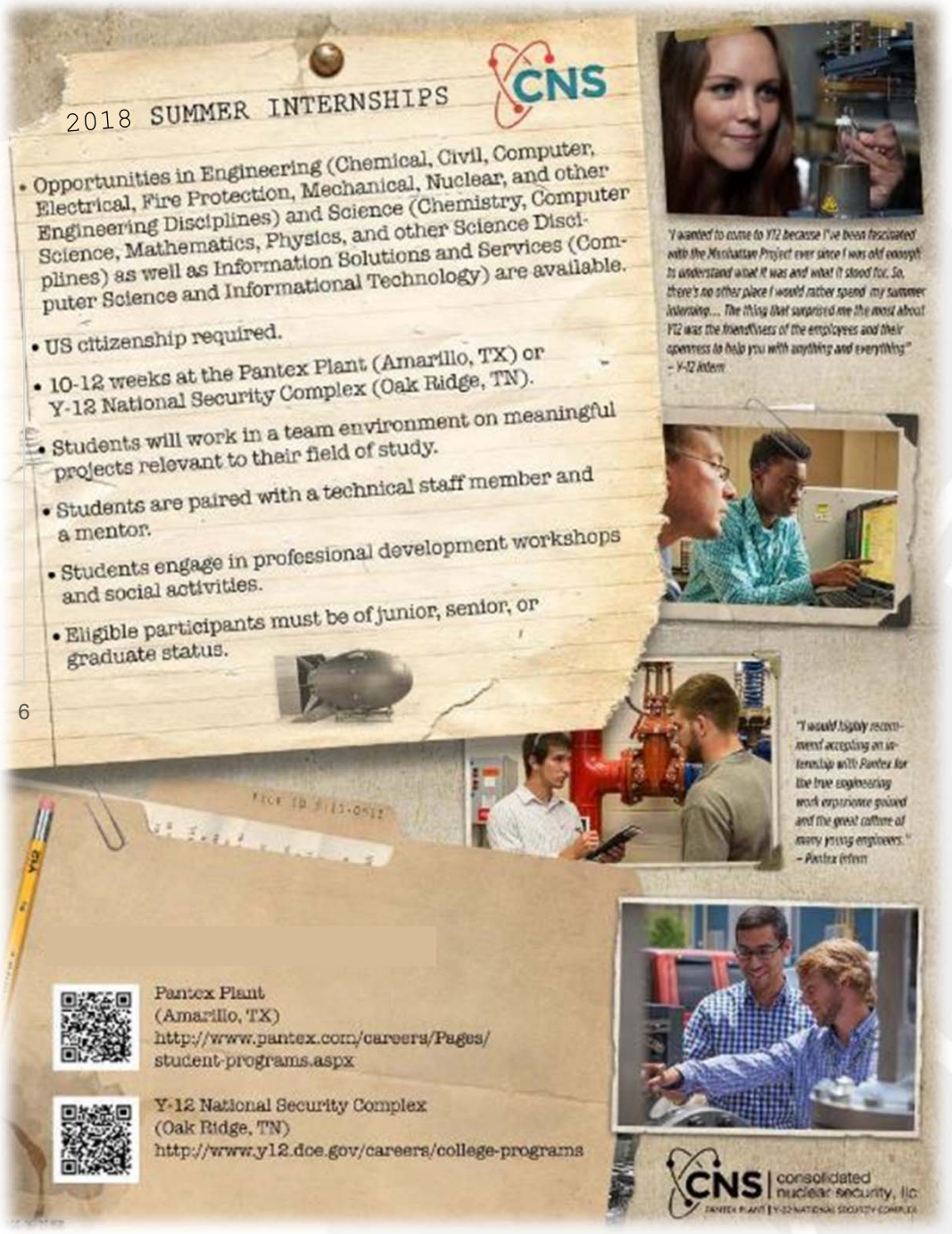
5
6


2016
non-minority male 50%
Under-represented 50%
minority male 31%
minority female 11%
non-minority female,8%


2018 SUMMER INTERNSHIPS
CNS
• Opportunities in Engineering (Chemical, Civil, Computer, Electrical, Fire Protection, Mechanical, Nuclear, and other Engineering Disciplines) and Science (Chemistry, Computer Science, Mathematics, Physics, and other Science Disciplines) as well as Information Solutions and Services (Computer Science and Informational Technology) are available.
• US citizenship required.
• 10-12 weeks at the Pantex Plant (Amarillo, TX) or Y-12 National Security Complex (Oak Ridge, TN).
• Students will work in a team environment on meaningful projects relevant to their field of study.
• Students are paired with a technical staff member and a mentor.
• Students engage in professional development workshops and social activities.
• Eligible participants must be of junior, senior, or graduate status.
Pantex Plant
(Amarillo, TX)
http://www.pantex.com/careers/Pages/student-programs.aspx
Y-12 National Security Complex
(Oak Ridge, TN)
http://www.y12.doe.gov/careers/college-programs
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Pantex (TX) Internship examples

	Department	Project	Major
1	Research and Development	Assist Data Analysis and Automation PDRD project. This will require knowledge in data analysis and computer coding in the MATLAB environment. Experience with creating MATLAB GUI is a plus. Coding and data analysis experience is more important than degree type.	Physics, Computer sci/eng, Data science
2	Fire Protection Engineering	Engineers will be reaponsible for gaining a basic level of understanding of how Fire Protection Engineering interfaces with plant fire protection systems, to include wet pipe, deluge, alarms, fire barriers, and pump/tank. Engineers will also be responsible for contributing to facility assessments, drawing reviews, procedure validations, engineering evaluations, and system calculations.	Fire Protection Engineering Mechanical Engineering
3	Project Engineering	The first 4 working design projects and or supporting system engineers in the plant. At this point, it is difficult knowing exactly what projects. However, with clearances, there will be plenty of work for them.	Mechanical Engineering
4	System Engineering	The intern works within the production process equipment section. He will support our Mass Properties machines, Nondestructive evaluation equipment and our High Vacuum Systems. The intern may also be utilized within our Plant Engineering Group to support our HVAC systems.	Mechanical Engineering
5	Process Engineering	the student will work with a senior PE to conduct project engineering.	Electrical Engineering

Full-time and part-time opportunities

Up to 3 semesters

- Separate departmental rotations or single group

Student works on detailed technical project

Hire co-ops for specific project need

Co-ops obtain security clearance

CAREER ONE

ONE = Opportunities for New Engineers

- Building a resource pool of talented professionals
- Creating broad exposure to various aspects of engineering
- Providing opportunities to learn engineering tools, work processes, and typical discipline deliverables
- Establishing a network of technical and business contacts
- Providing multiple levels of career mentoring
- Offering small group seminars, workshops and other learning opportunities

Full-time position

Three 4 month department rotations

- Permanent placement in group of individuals choosing

Hiring in four Engineering areas

- Chemical
- Electrical
- Mechanical
- Nuclear

Opportunities Also Available at Pantex!

Summer Internship Case Study

- Brenden Wiggins (Fisk University)
  - Intern (2011-2012)
  - Y-12 funded graduate student (2013-2016)
  - Student mentor
- Internship project led to internal funding which led to external funding
- Students produce!
  - 17 publications
  - 42 presentations
  - 4 patent applications
  - 6 invention disclosures
  - 2013 R&D 100
  - 2015 R&D 100 finalist

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Mission Engineering

Talent Development Lifecycle

Career Phase	1 Early Career 0-7 years	2 Mid Career 8-20 years	3 Late Career >20 years
Development Needs	▪ Onboarding ▪ Networking ▪ Technical Training ▪ Professional Development ▪ Career Paths ▪ Licenses ▪ Memberships ▪ S.T.E.M. & Recruiting	▪ Career Growth ▪ Leadership Development ▪ Mentor/Coach ▪ Protégé ▪ Legacy Knowledge Capture ▪ Licenses ▪ Memberships ▪ S.T.E.M. & Recruiting	▪ Professional Association Lead ▪ Committee Chairs ▪ Mentor/Coach ▪ Recognized Technical Expert
Programs	▪ College Pre-hires ▪ Career ONE ▪ Interns ▪ Co-ops ▪ Amer Vets to TN Eng	▪ Technical Assistant ▪ Job Enrichment ▪ Career Coaching ▪ Hi-pot Identification ▪ Fellows	▪ Knowledge Preservation Management ▪ Mentoring/Coaching ▪ Sr. Fellows

Individual Development Plans

Succession Planning

Recognition & Reward

Optional Career Paths: ▪ Technical ▪ Line Management ▪ Program Management ▪ Project Management