

FESHM 7005: FACILITY CONSTRUCTION, MODIFICATION & INSPECTION

Revision History

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1.0 INTRODUCTION

This chapter outlines the requirements for construction, modifications, renovations, alterations, new equipment or facilities for operational use and occupancy. This chapter is consistent with Director's Policy on [Construction Modifications](#) and 10 CFR 851, "Worker Safety and Health," reinforcing Fermilab's commitment to safeguard its employees, scientists, visitors, and infrastructure. Review of design specifications and codes in conjunction with field inspections for conventional facilities are required for all Fermilab projects. For programmatic equipment and experiments, reference FESHM 2005 for Operation Readiness Reviews for Experiments. Refer to the Technical Appendix detailing flow chart of a typical construction project.

This chapter applies to Fermilab site, Leased Spaces, and Non-Leased Spaces for inspections and authorization for use and possession, as delineated in the Fermi Research Alliance subcontract Terms and Conditions.

2.0 DEFINITIONS

- **Authorization for Use and Possession (AUP)** – Authorization process that allows partial occupancy and/or use of equipment. Previously known as Beneficial Occupancy.
- **Authority Having Jurisdiction (AHJ)** - An individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure. In Department of Energy (DOE), the head of field element is the AHJ, but the responsibility can be delegated to another federal official and routine activities can be delegated to a contractor. DOE Fermi Site Office has delegated the routine AHJ activities for Fire Protection and Electrical to ESH&Q.
- **Code of Record** - Editions of required codes and standards in effect at Fermilab at the time the design subcontract or at the conceptual design phase, listing the specific codes and standards with the edition dates.
- **Construction** – Reference FESHM Chapter 7010 for definition.
- **Final Acceptance (FA)**: Issued at the completion of the project and the start of warranty that allows occupancy and/or use of equipment.
- **Fixed Price** – Reference FESHM Chapter 7010 for definition.
- **Third Party** – Typically an Architectural/Engineering consultant or commissioning firm.
- **Time and Material (T&M)** – Reference Chapter 7010 for definition.

3.0 ROLES AND RESPONSIBILITIES

3.1 Project Manager (Construction Manager) or Designee

Shall establish the AUP and/or Final Acceptance schedule.

- Coordinate with TM/CC to convene the acceptance team (SME) and other inspections, this can include third party inspectors.

3.2 Subject Matter Experts (SME)

Subject Matter Experts are FRA employees with demonstrated expertise, including education and professional licensing in the assigned field that will be responsible for the following:

- Independent third-party inspection of construction projects for compliance to model building codes.
- Working closely with Task Managers and Construction Coordinators to provide oversight of progress inspections during various phases of construction for compliance to applicable building codes and standards;
- Providing recommendations and interpretations of codes and standards.

3.3 Authority Having Jurisdiction for Electrical (AHJ-E)

Subject Matter Expert with demonstrated expertise, including education, professional licensing, and/or meeting various state or federal requirements in the electrical field that will be responsible for the following:

- Third party code inspection of construction projects for compliance with applicable electrical code requirements;
- Third party inspection of construction project “shop” drawing submittals related to electrical;
- Progress inspection during various phases of construction for compliance with electrical criteria.
- AUP and Final Acceptance inspection related to building features to advise of status of occupancy approval.

3.4 Authority Having Jurisdiction for Fire Protection (AHJ-FP)

Subject Matter Expert with demonstrated expertise, including education, professional licensing, certification, and/or meeting various state or federal requirements in the fire protection/life safety field that will be responsible for the following:

- Third party code inspection of construction projects for compliance with applicable fire and life safety code requirements and highly protected risk guidelines;
- Third party inspection of construction project “shop” drawing submittals related to fire and life safety, including fire alarm and fire protection (suppression) systems;
- Progress inspection during various phases of construction for compliance with applicable fire and life safety criteria.
- AUP and Final Acceptance inspection related to building features to advise of status of occupancy approval.

3.5 Authority Having Jurisdiction for Structural (AHJ-S)

Subject Matter Expert with demonstrated expertise, including education, professional licensing, and/or meeting various state or federal requirements in Structural Engineering field that will be responsible for the following:

- Third party code inspection of construction projects for compliance with applicable building code requirements.

3.6 Construction Coordinator / Task Manager (TM/CC)

The TM/CC is the primary contact in the field, as well as the quality control and field technical representative to the laboratory:

- Organize and conduct AUP and/or FA inspections and signatures.
- Develop and complete the punch list, as necessary.
- Submit AUP and/or FA along with punch list to Procurement Administrator.
- Distribute the AUP and/or FA to signatures of participants.

3.7 Procurement Administrator

The Procurement Administrator is the primary contact for administrating, negotiating, and modify the subcontract. All modifications to the subcontract will come from the Procurement Administrator:

- Will obtain the AUP and/or FA, and punch list as part of the subcontract files.
- Will administer and negotiate as necessary any disputes between the punch list with project team and subcontractor.

4.0 PROGRAM REQUIREMENTS

Any new construct, enlarge, alter, move, decommission, demolish, or change the occupancy of a building or structure, or to erect, install, enlarge, alter, remove, convert or replace any electrical, fire protection, gas, mechanical or plumbing systems, the installation of which is regulated by the Directorate's Policy related to [Construction Modification](#), must comply with this chapter.

4.1 Inspections

- Construction or work for which an inspection is required will be subject to inspection. The Building Manager, Project Manager, or TM/CC is to ensure that the work remains accessible and exposed for inspection purposes.
- The TM/CC shall coordinate the appropriate inspections with the SME, found in 4.2.
 - *In some cases, the TM/CC may also act as the SME for the discipline being inspected and work may proceed per the TM/CC authorization.*
- The Building Inspection can be performed by other outside Certified Inspectors either by International Code Council (ICC), qualified building inspector, Licensed Professional Engineers, or other nationally recognized agencies.
- It is expected that each element of the construction activities will be inspected and documented.

- Footing and foundation inspection. Footing and foundation inspections will be made after excavations for footings are complete, and any required reinforcing steel is in place. For concrete foundations, any required forms will be in place prior to inspection. Materials for the foundation will be on the job, except where concrete is ready mixed in accordance with ASTM C 94, the concrete need not be on the job.
- Underground Utilities Inspection of underground utilities, i.e.: electrical, plumbing, fire sprinkler, HVAC, etc. will occur prior to covering up with dirt, slurry, etc. Slurry covering electrical conduits will be marked red in color. Pressure testing of completed underground systems will be observed and approved by a pressure system qualified inspector.
- Concrete slab and under-floor inspection. Concrete slab and under-floor inspections will be made after all in-slab or under-floor reinforcing steel and building service equipment, conduit, piping accessories and other ancillary equipment items are in place, but before any concrete is placed or floor sheathing installed, including the sub-floor.
- Frame inspection. Framing inspections will be made after the roof deck or sheathing, all framing, fire- blocking, and bracing are in place and pipes, chimneys, and vents to be concealed, are complete.
- Electrical, plumbing and mechanical inspections. Construction site temporary power will be inspected prior to first energization. Inspections will be made when the rough and final electrical, plumbing, heating wires, pipes, and ducts are complete.
- Compressed gases and air. Inspection will be made when all piping, valves, etc. are roughed in and when complete. Pressure testing of completed systems will be observed and approved by a pressure system qualified inspector and conform to the requirements found in FEHSM Chapter 5031.1.
- Fire protection systems. Inspections will be made periodically as the fire suppression piping, fire alarm panels and wiring, and detection (such as air sampling smoke detection (VESDA), systems are roughed in, and prior to any components being concealed. A final inspection and testing will be made when systems are complete.
- Lath and gypsum board inspection. Lath and gypsum board inspections will be made after lathing and gypsum board, interior and exterior, is in place, but before any plastering is applied or gypsum board joints and fasteners are taped and finished.
- Fire-resistant penetrations. Protection of joints and penetrations in fire-resistance-rated assemblies will not be concealed from view until inspected and approved.
- Energy efficiency. Inspection of insulation in walls, process, and heat carrying piping, ducts, etc.
- Other inspections. Environmental inspections such as Spill Prevention Control and Countermeasure (SPCC) and/or Storm Water Pollution Prevention (SWPPP).
- Final inspection. The final inspection will be made after all work required by the

construction authorization is completed. Final inspection includes, but is not limited to, Fire Protection, Electrical, and Facilities & Operations.

4.2 Authorization of Use and Possession (AUP)

Per Subcontract Terms and Conditions, FRA shall have the right to take possession of or use any completed or partially completed part of the work. This is accomplished when an Authorization for Use and Possession prior to completion (AUP) is issued. This is done provided that such portion or portions will be occupied safely.

- AUP is required when defined in the subcontract general requirements milestones or at the discretion of the Project Manager.
- The project team will assemble the AUP inspection team.
- This team should be, at a minimum, the signatures found on the AUP form and reference appendix for additional SMEs.
- Compile the Punch List.
- At completion of the AUP and Punch list, send original to the Procurement Administrator and distribute as indicated on form.

4.3 Final Acceptance (FA)

FRA will issue a Final Acceptance (similar to a certificate of occupancy) upon completion of the entire work scope.

- Final Acceptance is required at the completion of the project.
- The project team will assemble the Final Acceptance inspection team.
- This team should be, at a minimum, the signatures found on the Final Acceptance form.
- At the completion of the Final Acceptance form, send original to the Procurement Administrator and distribute as indicated on form.

4.4 Other Agency Reports

- Specific projects may require additional inspections from outside agencies, such as the state Environment Protection Agency. Reference the applicable Fermilab ES&H Manual Chapters, such as 8012, for further guidance and information.

4.5 Use and Occupancy

Prior to use or change to the existing occupancy classification of a facility, an Authorization for Use or Final Acceptance must be issued.

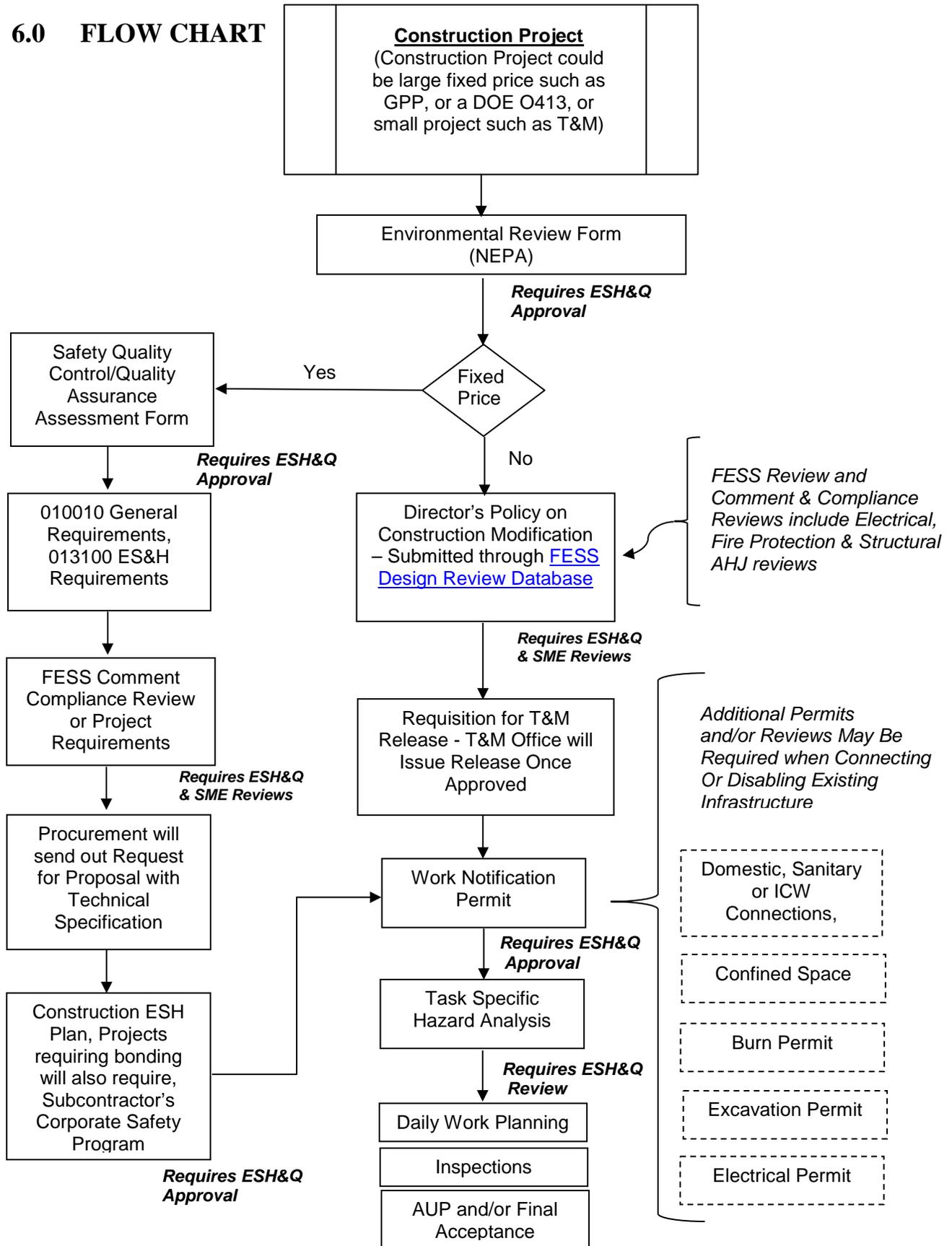
The minimum signature requirements are as follows:

| | Fermilab Site | Leased Space | Non-Leased Space | |
|---|-----------------------------------|------------------------------|--|-----------------------------------|
| Fire Protection <ul style="list-style-type: none"> • Detection • Suppression • Monitoring • Egress Communication <ul style="list-style-type: none"> • Phones • SEWS | AHJ-Fire Protection Fire Chief | AHJ-Fire Protection | Other uses will have to be negotiated with owner | FP & Electrical |
| Electrical <ul style="list-style-type: none"> • Energized • Emergency Lighting | AHJ-Electrical | AHJ-Electrical | | |
| Contractual <ul style="list-style-type: none"> • Inspection List (at AUP only) | Procurement Administrator | Procurement Administrator | Procurement Administrator | Contractual Administration |
| Project | Project Construction Manager | Project Construction Manager | Project Construction Manager | |
| Landlord | D/S Head or Designee | D/S Head or Designee | D/S Head or Designee | |
| Subcontractor | Officer or Designee | Officer or Designee | Officer or Designee | |

5.0 REFERENCES

- Fermilab ES&H Manual (FEHSM) Chapter, 1010 Laboratory Environment, Safety, and Health Management System and its Implementation
- FESHM Chapter 1070, Fermilab Work Smart Set
- FESHM Chapter 2001, Environment, Safety, & Health for Projects
- FESHM Chapter 2005, Operational Readiness Clearance
- FESHM Chapter 2020, Work Permit and Notification
- FESHM Chapter 2050, Building Manager Program
- FESHM Chapter 5100, Structural Safety
- FESHM Chapter 6010, Fire Protection Program
- FEHSM Chapter 7010, ES&H Program for Construction
- FESHM Chapter 8012, Sedimentation and Erosion Control Planning
- FESHM Chapter 8025, Wastewater Discharge to Sanitary Sewers
- FESHM Chapter 8026, Surface Water Protection
- FESHM Chapter 8050, Domestic Water Protection
- FESHM Chapter 8060, National Environmental Policy Act Review Policy
- FESHM Chapter 9100, Fermilab Electrical Safety Program

6.0 FLOW CHART



7.0 APPENDIX: CODES AND STANDARDS

This section has been created as a guide to acceptable methods of complying with applicable codes and standards at Fermilab. For further information, related design, reference Facilities Engineering Services Section FESS Design Guides found at <http://fess.fnal.gov/engineering>.

The following codes and standards are the most commonly used at Fermi National Accelerator Laboratory property located in Batavia, IL. For a complete reference, see the Fermilab Work Smart Set found in FESHM Chapter 1070. This list and FESHM Chapter 1070 may not apply to the facility outside of Fermi National Accelerator Laboratory property located in Batavia, IL. For those facilities, reference the subcontract and local requirements for the applicable codes and standards.

| Common Fermilab Codes and Standards | Responsible |
|---|-------------------------|
| DOE Order 420.1, Facility Safety, Attachment II, Facility Safety Requirements, Chapter 2, Fire Protection, for reference only, not part of Work Smart Set or prime contract | ESH&Q |
| DOE Standard 1066, Fire Protection reference only, not part of Work Smart Set or prime contract | ESH&Q |
| International Building Code | ESH&Q & FESS or Project |
| Illinois Plumbing Code | FESS or Project |
| ASHRAE Mechanical Code | FESS or Project |
| Part 400 Illinois Accessibility Code (Americans with Disabilities Act Standards for Accessible Design) | FESS or Project |
| DOE Guiding Principles | FESS or Project |
| International Fire Code | ESH&Q & FESS or Project |
| National Fire Protection Association (NFPA) 1, Fire Code | ESH&Q & FESS or Project |
| NFPA 101, Life Safety Code | ESH&Q & FESS or Project |
| NFPA 70, National Electric Code | ESH&Q & FESS or Project |
| NFPA 70E, Electrical Safety in the Workplace | ESH&Q & FESS or Project |
| NFPA 13, Sprinklers | ESH&Q & FESS or Project |
| NFPA 24, Underground Piping | ESH&Q & FESS or Project |
| NFPA 30, Combustible and Flammable Liquids | ESH&Q & FESS or Project |
| NFPA 72, National Fire Alarm and Signaling Code | ESH&Q & FESS or Project |
| NFPA 80, Fire Doors | ESH&Q & FESS or Project |
| NFPA 90A, HVAC Systems | ESH&Q & FESS or Project |
| 29 CFR 1910, Occupational Safety and Health | ESH&Q & FESS or Project |
| 29 CFR 1926, Safety and Health Regulations for Construction | ESH&Q & FESS or Project |

8.0 APPENDIX: SME FIELD INSPECTIONS

| Systems | Primary | Alternate |
|--|-------------------------------|---------------------|
| Architectural | FESS or Project | SME |
| Accessibility (ADA) | FESS or Project | SME |
| Elevators & Conveyances | FESS and/or Project Expert | SME |
| Electrical | AHJ | SME |
| Fire Protection | AHJ | SME |
| Fire Department | ESH&Q | SME |
| Gas | FESS and/or Project Expert | SME |
| HVAC | FESS and/or Project Expert | SME |
| Overhead Cranes | FESS and/or Project Expert | SME |
| Plumbing (DWS & Sanitary) | FESS and/or Project Expert | SME |
| Structural | FESS and Project Expert | FESS Structural AHJ |
| Water Systems (CWS, HWS, ICW, etc.) | FESS and/or Project Expert | SME |
| Waste Water (Storm) | FESS and/or Project Expert | SME |