

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 Fermilab ES&H Manual (FESHM) chapter is in accordance with Director’s Policy on [Construction Modifications](#) and 10 CFR 851 “Worker Safety and Health”; thereby, reinforcing Fermilab’s commitment to safeguard its employees, scientists, visitors, and the 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 Chapter 2005 for Operation Readiness Reviews for Experiments. Reference 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.
- **Final Acceptance (FA)**: Issued at the completion of the project and the start of warranty that allows occupancy and/or use of equipment.

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:

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- 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.

51 **3.3 Authority Having Jurisdiction for Electrical (AHJ-E)**

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

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- 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.

65 **3.4 Authority Having Jurisdiction for Fire Protection (AHJ-FP)**

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

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- 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.

79 **3.5 Authority Having Jurisdiction for Structural (AHJ-S)**

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

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- 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), Illinois 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

- 131 concrete is ready mixed in accordance with ASTM C 94, the concrete need not be
 132 on the job.
- 133 ○ Underground Utilities Inspection of underground utilities, i.e.: electrical,
 134 plumbing, fire sprinkler, HVAC, etc. will occur prior to covering up with dirt,
 135 slurry, etc. Slurry covering electrical conduits will be marked red in color.
 136 Pressure testing of completed underground systems will be observed and
 137 approved by a pressure system qualified inspector.
 - 138 ○ Concrete slab and under-floor inspection. Concrete slab and under-floor inspections
 139 will be made after all in-slab or under-floor reinforcing steel and building service
 140 equipment, conduit, piping accessories and other ancillary equipment items are in
 141 place, but before any concrete is placed or floor sheathing installed, including the
 142 sub-floor.
 - 143 ○ Frame inspection. Framing inspections will be made after the roof deck or
 144 sheathing, all framing, fire- blocking, and bracing are in place and pipes,
 145 chimneys, and vents to be concealed, are complete.
 - 146 ○ Electrical, plumbing and mechanical inspections. Construction site temporary
 147 power will be inspected prior to first energization. Inspections will be made
 148 when the rough and final electrical, plumbing, heating wires, pipes, and ducts
 149 are complete.
 - 150 ○ Compressed gases and air. Inspection will be made when all piping, valves, etc.
 151 are roughed in and when complete. Pressure testing of completed systems will be
 152 observed and approved by a pressure system qualified inspector and conform to
 153 the requirements found in FEHSM Chapter 5031.1.
 - 154 ○ Fire protection systems. Inspections will be made periodically as the fire
 155 suppression piping, fire alarm panels and wiring, and detection (such as air
 156 sampling smoke detection (VESDA)), systems are roughed in, and prior to any
 157 components being concealed. A final inspection and testing will be made when
 158 systems are complete.
 - 159 ○ Lath and gypsum board inspection. Lath and gypsum board inspections will be
 160 made after lathing and gypsum board, interior and exterior, is in place, but
 161 before any plastering is applied or gypsum board joints and fasteners are taped
 162 and finished.
 - 163 ○ Fire-resistant penetrations. Protection of joints and penetrations in fire-
 164 resistance-rated assemblies will not be concealed from view until inspected and
 165 approved.
 - 166 ○ Energy efficiency. Inspection of insulation in walls, process, and heat carrying
 167 piping, ducts, etc.
 - 168 ○ Other inspections. Environmental inspections such as Spill Prevention Control
 169 and Countermeasure (SPCC) and/or Storm Water Pollution Prevention (SWPPP).
 - 170 ○ Final inspection. The final inspection will be made after all work required by the
 171 construction authorization is completed. Final inspection includes, but is not
 172 limited to, Fire Protection, Electrical, and Facilities & Operations.
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174 **4.2 Authorization of Use and Possession (AUP)**

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

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- 180 • AUP is required when defined in the subcontract general requirements milestones or at the
181 discretion of the Project Manager.
 - 182 • The project team will assemble the AUP inspection team.
 - 183 • This team should be, at a minimum, the signatures found on the AUP form and reference
184 appendix for additional SMEs.
 - 185 • Compile the Punch List.
 - 186 • At completion of the AUP and Punch list, send original to the Procurement Administrator and
187 distribute as indicated on form.
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189 **4.3 Final Acceptance (FA)**

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

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- 193 • Final Acceptance is required at the completion of the project.
 - 194 • The project team will assemble the Final Acceptance inspection team.
 - 195 • This team should be, at a minimum, the signatures found on the Final Acceptance form.
 - 196 • At the completion of the Final Acceptance form, send original to the Procurement
197 Administrator and distribute as indicated on form.
- 198

199 **4.4 Other Agency Reports**

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- 201 • Specific projects may require additional inspections from outside agencies, such as Illinois
202 Environment Protection Agency. Reference the applicable Fermilab ES&H Manual
203 Chapters, such as 8012, for further guidance and information.
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205 **4.5 Use and Occupancy**

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

208 The minimum signature requirements are as follows:

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	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	

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212 5.0 REFERENCES

213

214 • Fermilab ES&H Manual (FEHSM) Chapter, 1010 Laboratory Environment, Safety, and

215 Health Management System and its Implementation

216 • FESHM Chapter 1070, Fermilab Work Smart Set

217 • FESHM Chapter 2001, Environment, Safety, & Health for Projects

218 • FESHM Chapter 2005, Operational Readiness Clearance

219 • FESHM Chapter 2020, Work Permit and Notification

220 • FESHM Chapter 2050, Building Manager Program

221 • FESHM Chapter 5100, Structural Safety

222 • FESHM Chapter 6010, Fire Protection Program

223 • FEHSM Chapter 7010, ES&H Program for Construction

224 • FESHM Chapter 8012, Sedimentation and Erosion Control Planning

225 • FESHM Chapter 8025, Wastewater Discharge to Sanitary Sewers

226 • FESHM Chapter 8026, Surface Water Protection

227 • FESHM Chapter 8050, Domestic Water Protection

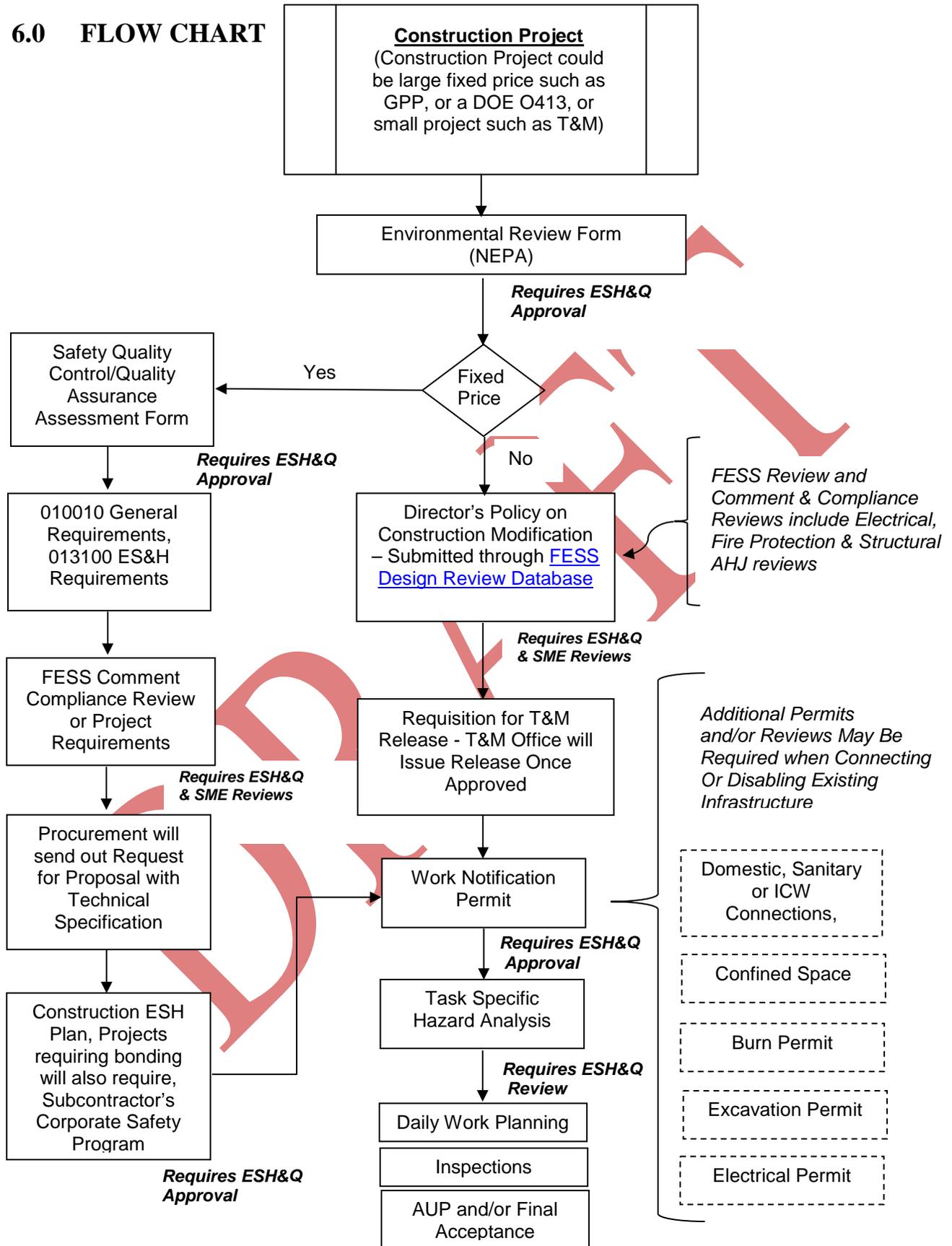
228 • FESHM Chapter 8060, National Environmental Policy Act Review Policy

229 • FESHM Chapter 9100, Fermilab Electrical Safety Program

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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 Fermilab. For a complete reference, see the Fermilab Work Smart Set found in FESHM Chapter 1070.

Common Fermilab Codes and Standards	Responsible	Edition
DOE Order 420.1, Facility Safety, Attachment II, Facility Safety Requirements, Chapter 2, Fire Protection, reference only, not part of Work Smart Set	ESH&Q	C
DOE Standard 1066, Fire Protection reference only, not part of Work Smart Set or prime contract	ESH&Q	2016
International Building Code	ESH&Q & FESS or Project	2015
Illinois Plumbing Code	FESS or Project	2013
ASHRAE Mechanical Code	FESS or Project	2013
Part 400 Illinois Accessibility Code (Americans with Disabilities Act Standards for Accessible Design)	FESS or Project	1997
DOE Guiding Principles	FESS or Project	2016
International Fire Code	ESH&Q & FESS or Project	2015
National Fire Protection Association (NFPA) 1, Fire Code	ESH&Q & FESS or Project	2015
NFPA 101, Life Safety Code	ESH&Q & FESS or Project	2015
NFPA 70, National Electric Code	ESH&Q & FESS or Project	2014
NFPA 70E, Electrical Safety in the Workplace	ESH&Q & FESS or Project	2009
NFPA 13, Sprinklers	ESH&Q & FESS or Project	2016
NFPA 24, Underground Piping	ESH&Q & FESS or Project	2016
NFPA 30, Combustible and Flammable	ESH&Q & FESS or Project	2016
NFPA 72, National Fire Alarm and Signaling	ESH&Q & FESS or Project	2016
NFPA 80, Fire Doors	ESH&Q & FESS or Project	2013
NFPA 90A, HVAC Systems	ESH&Q & FESS or Project	2015
29 CFR 1910, Occupational Safety and Health	ESH&Q & FESS or Project	Current
29 CFR 1926, Safety and Health Regulations for Construction	ESH&Q & FESS or Project	Current

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