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Our annual conference coincides with NC Primary Voting Day. Please make arrangements to vote early or absentee.



2012 NCAAFPM Annual Conference



NCAAFPM
ANNUAL CONFERENCE

**New Shores in
Floodplain Management**

May 6-9, 2012
Hilton New Bern Riverfront Hotel
New Bern, NC

Registration is open until Monday, April 30. Visit www.ncaafpm.org for detailed information and online registration. If you have any questions, feel free to contact conference chair, John Fullerton at john.fullerton@wilmingtonnc.gov or 910-341-3247 or any NCAAFPM Board member.

2012 Annual Conference Golf Tournament: Sunday, May 6

Captain's Choice - \$55/ player includes lunch at noon, cart, greens fee, and prizes. Tee time is 1pm at The Emerald Golf Club. Sign up when you register online for the conference or contact John Fullerton at john.fullerton@wilmingtonnc.gov or 910-341-3247 if interested.



Featured Speakers

Dr. Stanley R. Riggs, East Carolina University research professor, N.C. coast's preeminent marine geologist, and co-author of *The Battle for North Carolina's Coast*, will be our keynote speaker.

John Dorman, CFM, Director and IHRM Lead NC Office of Geospatial and Technology, will provide updates to current flood mapping issues and will be available for questions.

J. Chris Crew, CFM, State Hazard Mitigation Officer, will give an update on the pending removal of the PDM grant program from the president's current budget.

Tim Russo, CFM, FEMA Natural Hazards Program Specialist, will update the conference on specific FEMA related topics.



Stan Riggs



John Dorman



Chris Crew



Tim Russo

More conference information on page 18.

From the Chairman's Desk



ROBERT BILLINGS, PE, CFM
NCAFPM CHAIRMAN

What a remarkable organization we have! We have grown and prospered when other associations have struggled. NCAFPM has been blessed with talented and trustworthy people. I've been thinking about the Association quite a bit as we are preparing for our annual conference in New Bern. I will step down from the Chair position at the conference. I have been the Chair for three years and served as the Vice Chair prior to that. I have enjoyed my time on the board and hope that I have positively contributed

to the Association. As I reflect back on the past few years, I believe the Association has been strengthened in several ways:

- We updated the by-laws creating new board positions and requiring all board members to be Certified Floodplain Managers in good standing.
- We are a fiscally sound association. Our revenues have exceeded expenses during the economic down turn allowing us to offer scholarships and travel assistance to conferences.
- The Association and the board are covered by insurance policies.
- Registration for the conference with a credit card may be one of the best changes to the program.
- New people coming into leadership roles in our Association with new ideas and new energy are crucial to our continued growth. People wanting to serve on the board and people volunteering to help with projects is a testament to the strength and vitality of our organization.

We have made significant progress over the last few years but there is still plenty of work to go around. We are in need of a website overhaul. Our website is outdated and needs to work better with our ftp site. We need to keep our focus on training and double our efforts to work with the NC NFIP coordinator and his staff on training opportunities.

Our joint conference with SC last year in North Charleston was a success. The NC and the SC associations work well together. We should extend our hand to the new Tennessee Chapter and invite delegates to our next Fall Floodplain Institute in Asheville this October (see page 15 for more information on the 2012 FFI). Seeds need to be planted for a possible three state conference (NC, SC, TN) in 2014.

Thank you all for allowing me the opportunity to serve as Chair. It has been a great experience.

Robert Billings, PE, PH, CFM
Chair - NCAFPM



CFM® Corner

New CFM Prep Guide

As of January 1, 2012, an updated CFM exam is being used. The updated exam preparation guide is now available on the CFM page of the NCAFPM website (www.ncafpm.org/cfm.htm).

NCAFPM & CFM

Our CFM Program is administered by ASFPM and is a separate fee from your NCAFPM membership fees. Remember that keeping your membership renewed annually with NCAFPM will lower your CFM renewal (every 2 years) costs significantly.

Keep us updated

Notify Anita at cfm@floods.org if you move. CFM renewals and other certification related mailed material is sent to your HOME ADDRESS. Also, make sure we always have your current employment information with correct email address. ▲



Kelly Keesling
Creative Director
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The next generation of flood hazard communication is happening first in North Carolina

BECKY PEER, PhD, URS CORPORATION

Ever since its inception at the beginning of this century, the North Carolina Floodplain Mapping Program (NCFMP) has been an innovator. As a partner in FEMA's Map

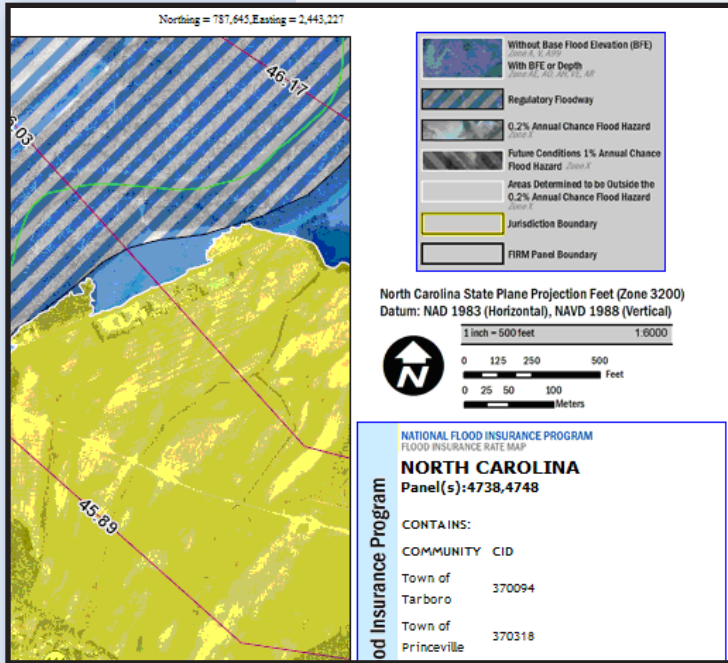
Modernization (Map Mod), NCFMP has taken the digital FIRM well beyond FEMA's original concept. North Carolina was the first state to disseminate DFIRMs, imagery and flood hazard data using an interactive web-based mapping system (the Floodplain Management Information System, FMIS). FMIS has received several upgrades and enhancements since it was first launched in 2002, but soon FMIS will give way to the next generation - the Flood Risk Information System (FRIS).

FRIS introduces two innovations. The first is the digital display environment (D2E) which eliminates the need for labor-intensive production of hard copy maps that conform to FEMA's cartographic standards. With D2E, users will generate regulatory maps (similar to FEMA's FIRMette) dynamically and save to a PDF file. Users will not be restricted to a static panel with predefined map extents.

Instead, users can enter an address or browse to a location, center it in the map frame and print a regulatory map tailored to fit their needs. The map collar will record the panel IDs (if more than one) and other information required for regulatory compliance.

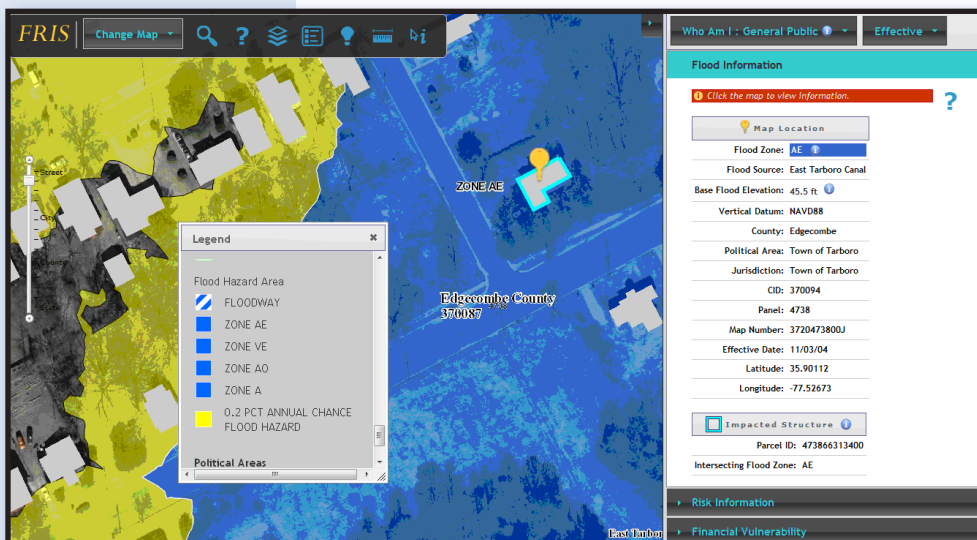
The second innovation is the addition of flood risk information to the website. FMIS made it possible for users to see the regulatory flood hazards overlaid on imagery and geospatial features (such as roads). However, the depth of flooding for different return periods, the potential impact to structures, and the risk reduction options and their costs

were not readily available. FRIS includes a buildings layer that contains first floor elevations (FFE) and other building attributes needed to perform a Hazus-based risk assessment. Users will be able to click anywhere within the 1% chance flood hazard area to see the depth of flooding and other information about the location. If a building is clicked, the flood zone intersected by the building is displayed.



Example of Dynamic FIRMette Map Spanning Two Panels

FRIS shows depth of flooding and impacted structures



FRIS, from page 3

The users can dig even deeper by clicking the Risk Information tab. The tab expands to show a flood risk assessment for the selected building. The building attributes used to calculate the damages are shown and users can change the attributes to recalculate the risk results. The damages table shows depth of flooding in the building, modeled damages, and estimated losses (replacement value) for each of five return periods. The site also includes a risk reduction tool that gives users information about risk reduction options and estimates cost effectiveness. Users can accept defaults or enter new data to recalculate the results. Finally, they can print a mitigation plan that includes a map, the building characteristics, the risk reduction options and the values they have calculated.

Risk Information

Click a building to view information. ?

405 Wagner St
Tarboro, NC 27886

Google Street View [iRISK](#)

Property

Building Value (\$): 75423

Stories: 2

Square Feet (ft): 884

Foundation: Crawl Space

Recalculate

Annual Chance of Flood	Depth Above Finished Floor (in Feet)	Damage	Building Losses
10 %	-1.6	1%	\$754
4 %	1.6	13%	\$9,503
2 %	3.2	19%	\$14,119
1 %	4.8	25%	\$18,516
.2 %	9.3	35%	\$26,157

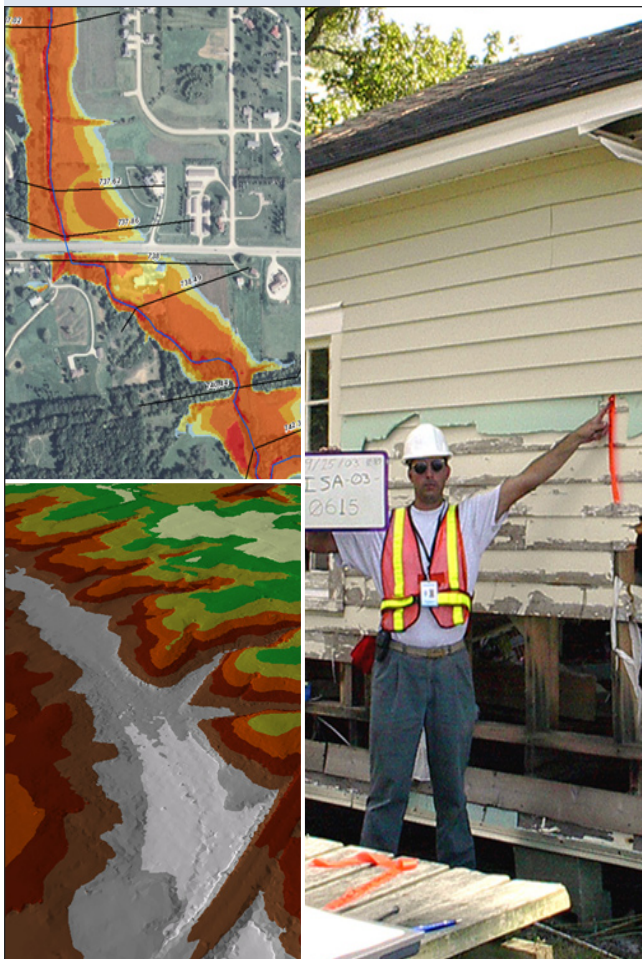
Reduce My Risk

The site links to iRISK which is the source of the risk information. iRISK is a multi-hazard risk management site also being developed by NCFMP under the Integrated Hazards Risk Management (IRHM) grant from FEMA.

These innovations will allow the state to do more with less, benefiting the tax payers as well as the home owners and floodplain management com-

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Example of Risk Information that will be available in FRIS



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North Carolina site to become regional resource

North Carolina's unique flood risk communication approach has caught the attention of other states. In February 2012, Virginia announced it will be the first state to sign a Memorandum of Agreement (MoA) to share comprehensive flood-related information through a Regional Flood Risk Information System hosted by North Carolina. In a press release, Virginia Governor Bob McDonnell stated that "Flooding is one of our most catastrophic and costly natural disasters. Since both states share more than 400 miles of border and river basins with flooding hazards, this partnership makes economic sense ... this agreement gives Virginia and North Carolina the opportunity to realize efficiencies and improve public service through a partnership that protects lives and reduces future flood damages."

The partnership will expand North Carolina's existing website, recognized as one of the best flood mapping programs in the country. The site will soon display Virginia flood maps, models, and data on flood hazards and risk for use by citizens, floodplain managers, emergency planners and responders. The Virginia data is due to appear on the website by late-summer 2012. Similar arrangements with South Carolina and Alabama are being discussed.

FRIS, from page 4

community. The automation of the map production process is expected to reduce costs of the program by 17%. Some of the cost savings are being used to collect and maintain the additional information needed for risk assessments. Even with this additional data collection effort, the program is expected to cost 2.5% less than currently.

The D2E process is expected to yield time savings as well. It is anticipated that without the need to do the current cartographic map generation and review, the timeframe from start to preliminary map in NC will be 15 months. The current process generally takes 24 months.

The development of FRIS and iRISK has been a team effort. John Dorman, Director of NCFMP, developed the vision and has been the leading force throughout the process. URS Corporation, under subcontract to ESP Associates, Inc. developed the FRIS website. AECOM led the development of the D2E database. ESP pioneered innovative methods to collect and QA FFE and other building data. ESP, AECOM and AMEC and their subcontractors have continued to develop and improve data collection, QA/QC methods, and data migration processes.

Both FRIS and iRISK are currently in pilot mode with data populated for a few counties. However, NCFMP has already begun the work to complete the transition to a flood risk system. The process will be accomplished in two steps:

Step 1 is to enter the effective data into the D2E database so that it can be used to generate the NC FIRMette. NCFMP expects this to be completed by the end of 2012.

Step 2 is to collect the data needed for the risk assessments and complete risk assessments for all counties. This process will take longer to complete, following the map maintenance schedule.

The URL for the new site will be posted on the current FMIS site (www.ncfloodmaps.com) when it is ready for the public. Meanwhile, plans are already started to expand to a regional site (see sidebar). ▲



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Regional Hazard Mitigation

The North Carolina Division of Emergency Management (NCEM) is in the process of pursuing a new idea concerning Hazard Mitigation Planning throughout the state. This concept is called regionalization and involved the incorporation of several county-level hazard mitigation plans into a single regional plan. Typically these regional plans consist of 3-4 counties and their incorporated municipalities who come together to build a plan that is based on the similar risks that all of the jurisdictions face.

Regional planning is a concept that makes sense from the state-level because it allows NCEM to make the most of the limited funding that it has available for hazard mitigation planning. In short, NCEM is able to get the most 'bang for its buck' by covering more jurisdictions with the same amount of funding. For example, it might cost a county between \$20,000 and \$25,000 to hire a contractor to write a single county level plan. However, a regional plan that includes four counties has been done for around \$50-60K in the past, which means per capita savings of about \$5K.

Many local governments have also been eager to pursue regional planning because it allows them to coordinate with one another and share the burden of work that is involved in developing and updating a hazard mitigation plan. Local governments can benefit not only from sharing resources, but also from taking a more comprehensive approach to addressing the hazards that affect them. Since the effects of natural hazards often occur across local jurisdictional lines, most events affect more than one county or municipality at a time. A regional approach is practical in this sense because it allows local governments to more accurately address the area that will likely be affected by any given hazard. Contact at NCEM is Callion Maddox, Risk Assessment and Planning Branch Manager (cmaddox@ncem.org). ▲

A Man For All Seasons

NCAFPM has been very fortunate to have many dedicated and interested people take an active part in helping the organization grow, prosper, and be relevant to today's floodplain management issues. One such individual is Robert Billings. At our Annual Conference, Robert will step down as Chair of our association after three years in that position and eight years on the Board. The time spent is significant in itself but much less than the attitude, openness, calmness, and respect that Robert has shown for the organization and people within it. Whether thoughtfully involved in a HEC-RAS discussion, strumming his guitar, or giving a presentation, Robert has been a steady and persuasive guide for NCAFPM. This can-do, U.S. Marine is truly a man for all seasons and a friend and mentor for many individuals. We are a better organization thanks to Robert and many of us have benefitted from his friendship. When you see Robert in New Bern, remember to give him a big "Thank you!" ▲

Fall Floodplain Institute

NORTH CAROLINA ASSOCIATION OF FLOODPLAIN MANAGERS

October 24-26, 2012

**Doubletree Biltmore Hotel
Asheville, NC**

(see page 16 - Region F Update - for details)

North Carolina Association of
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Board of Directors
2011-2012

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nberry@hendersoncountync.org

National Flood Insurance Program

At • a • Glance

Currently there are 145,081 flood insurance policies in North Carolina. Of those, 84,198 are in an A-Zone and 8,190 are in a V-Zone, with the remainder in an X-Zone. \$103,978,548 in premium is paid to provide \$33,614,034,200 of total coverage. Over a billion dollars in claims have been paid since 1978.

Four towns joined the NFIP in the first quarter of 2012.

Flood insurance is now available in the towns of Pink Hill (Lenoir County), Richfield (Stanly County), Mount Pleasant (Cabarrus County), and Polkville (Cleveland County). This brings the number of total Participating North Carolina Communities to 556. For the complete listing of all Participating Communities in North Carolina, visit www.fema.gov/cis/NC.html.



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Other locations nationwide



Targeting NFIP Trainings

The North Carolina Floodplain Management program is developing an outreach initiative to establish contact with and provide basic NFIP training opportunities to floodplain administrators (FPAs) for communities who participate in the National Flood Insurance Program (NFIP) but have not been able to attend any of the yearly offerings of Summer Workshops or Spring and Fall Conferences over the past four years. The purpose is to target more training opportunities close to those communities that may have been hampered by reduced travel and training budgets. Our goal is to reestablish a connection with these communities to assure that the NFIP minimum standards are understood, and they are comfortable in contacting us to support their floodplain management program to assure continued good standing within the NFIP program.

During these trainings we try to address a wide variety of case-specific issues and address questions from local floodplain administrators, as well as provide other general information about updates to risk mapping, new laws that affect their communities, and BMPs and higher standards. The trainings also present a great opportunity for communities to network among local floodplain administrators to discuss standards, practices and procedures which work/don't work for them.

We have identified 23 County FPA's (out of the 99 participating counties and 1 tribal government) and another 284 municipal government FPA's (out of 456) who participate, for a total outreach of 307 out of the 556 who participate in the NFIP statewide but haven't been to any NFIP training recently. The State NFIP Planners will be in contact with these communities according to their region over the next year to coordinate on firming up logistics for a training opportunity near them. The Western Branch NFIP planner is Terry Foxx and he can be reached at terry.foxx@ncdps.gov or (828)228-8526. The Central Branch NFIP Planner is Milton Carpenter and can be reached at Milton.carpenter@ncdps.gov or (919)715-5711 ext. 103. The Eastern Branch NFIP planner is Maureen O'Shea and she can be reached at Maureen.oshea@ncdps.gov or (252)565-3206. ▲

The Bridges are Coming! MOA Update

Over the next few years, NC DOT will be replacing or modifying 400, possibly more, small to medium bridges across the state. Many of these structures encroach into and/or cross mapped flooding sources with special flood hazard areas, and will require analyses to determine the impact on the base flood elevations. The coordination between NCFMP and NC DOT through the Memorandum of Agreement (MOA) has increased DOT's awareness of NFIP requirements. Therefore, we anticipate that most structures crossing studied streams will be evaluated through the MOA process, and will result in "no-rise" or decreases in BFE. If you have questions about any active bridge replacement projects in your community, you may contact Steve Garrett with the NCFMP at 919-715-5711 extension 118 or Steve.Garrett@ncdps.gov.

For more information on the Memorandum of Agreement between NCFMP and NC DOT, visit www.ncdot.org/doh/preconstruct/highway/hydro/FEMA/default.html. ▲

North Carolina GTM No-Rise Guidance

JOHN D. BRUBAKER, PE, CFM
NFIP ENGINEER, NC DEPT OF PUBLIC SAFETY, NC FLOODPLAIN MAPPING PROGRAM

The North Carolina Department of Public Safety Office of Geospatial and Technology Management (GTM) will, upon request from a North Carolina community, review No-Rise certifications for projects within their jurisdictions. In order to make clear the requirements for a No-Rise or No-Impact submission, engineers should be familiar with the *Procedures for “No-Impact” Certification for Proposed Developments in Regulatory Floodways* prepared by FEMA Region IV.

44 CFR Section 60.3(d)(3) states that a community shall **“prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base (100-year) flood discharge.”** In order to comply with this regulation, local communities must obtain, review, and approve a certification to that effect prepared by a professional engineer and supported by hydraulic modeling. In North Carolina, our Limited Detail Study streams include a “Non-Encroachment Area” (NEA), which is regulated as a floodway.

For projects that have an impact on the water surface elevation, a “No-Rise” certification would be appropriate. A “No-Rise” certification states that there is no increase in the base flood elevations, floodway elevations, or floodway widths due to the proposed changes as compared to existing conditions.

Letter of Map Revision May Be Required Following Construction

Just because a project does not cause a rise does not mean that a follow-up Letter of Map Revision (LOMR) is not required under 44 CFR 65.3 GTM generally does not require a LOMR if the reduction in water surface elevation is less than 0.10', but reductions greater than 0.10' or changes in the floodway or non-encroachment width on either side of the stream, or changes in the location of the stream as shown on the Flood Insurance Rate Maps, will require a LOMR from the community within six months of completion of the project.

When a community receives a No-Rise submittal, they can complete a technical review if they have the staff and expertise to do so, or they can request assistance from GTM. Either way, the community still has the obligation to review the submittal for accuracy and approve or deny the No-Rise and issue the appropriate permits. Sometimes local ordinance requirements exceed the NFIP requirements. In these cases, GTM needs to know the local requirements if they are expected to comment on them. GTM will not “approve” a No-Rise, but will note whether the submission meets the requirements of 44 CFR 60.3(d)(3) and the Region IV guidance.

Hydraulic Models Required

In order to establish a “No-Rise”, an engineer will perform hydraulic modeling in accordance with standard engineering practice to determine the impacts on the stream. The majority of these models are performed in HEC-RAS, since that is the original modeling software for most streams in North Carolina. Other models meeting the minimum requirement of the NFIP are also acceptable. An electronic copy of the hydraulic modeling must be provided. It is preferred that each geometry file is contained within a single HEC-RAS project, but this is not required. A paper copy is not needed for review by GTM.

— continued on next page

No-Rise, from page 7

The **Effective** model is simply the model used to develop the Flood Insurance Study. Recent studies, and some older studies, are available from GTM. If GTM does not have the study on file, the requestor should contact FEMA. If the model is not available, the requestor will need to create an effective model that duplicates the results in the Flood Insurance Study.

The **Duplicate Effective** model is the Effective model run using the modeler's hardware and software. For HEC-RAS models, the software is preferably the current version of HEC-RAS (currently 4.1), although any version 3.1.1 or later is currently acceptable. The Duplicate version should not be an earlier version than the Effective version. Occasionally floodway or NEA widths are set using Method 4 in the Effective model. In these cases, the Duplicate Effective floodway width should be changed to Method 1 to match the Effective model.

The **Corrected Effective** model may or may not be required. If there are errors in the Effective model, these can be fixed in Corrected Effective model. Errors include:

- Inappropriate expansion and contraction coefficients;
- Datum adjustments;
- Bridge modeling errors (appropriate loss calculations, weir coefficients, pier coefficients, bridge rails);
- Culvert modeling errors (size, materials, entrance and exit losses);
- Ineffective flow limits;
- Manning's roughness coefficients (supporting documentation is required);
- Updated topography at existing sections;
- Eliminate negative surcharges and surcharges over 1.00'.

The **Existing Conditions** model inserts cross-sections and/or modifies effective cross-sections to accurately portray the existing conditions at the project site. These cross-sections should not be duplicated or interpolated, but should be based on field surveys at the project site and field surveys and/or other available topographic data away from the project site. Enough sections should be added in order to accurately model the proposed changes. Encroachment stations shall be added to new cross-sections, based on the FIRM or interpolated from the NEA tables. The encroachment stations should then be adjusted so that the floodway water surface elevations match the Corrected Effective (or Duplicate Effective, if the Corrected Effective is not required) and do not exceed 1.00' surcharge. Non-permitted floodway encroachments at the project site (current violations) should not be included in the Existing Conditions model.

The Existing Conditions model may also need to include additional cross-sections upstream or downstream of the existing model. This will be necessary if the boundary water surface elevations do not match between the Existing Conditions model and the Proposed Conditions model. Sometimes, this may not be possible, or the effect is so large that the models simply will not match. In these cases, Region IV recommends running the model a minimum of one mile past the project limits.

The **Proposed Conditions** model is a modification of the Existing Conditions model. All revisions associated with the project should be included, even if those revisions are not within the floodway itself. For example, changes outside of the floodway that are integral to the project should be included, such as approach fill for bridges or "conveyance easements." There should be no increase in the water surface elevations for both the base flood and the floodway/NEA runs. There should be no change in the floodway widths on either side of the stream compared to the Existing Conditions model. Unless they are going to be removed, non-permitted floodway encroachments should be included in the Proposed Conditions model.

— continued on next page

No-Rise, from page 8

Submittal Requirements

In addition to the hydraulic models, there are other submittal requirements. These include:

- Project narrative;
- Topographic work map;
- Cross-section plots;
- Property survey;
- No-Rise Certification statement

The submittal shall include a **narrative of the project** and the modeling methodology. Document all modifications to the Effective model integrated into the Corrected Effective and Existing Conditions models. Provide the source of additional cross-section topographic data. Provide copies of the floodway data tables and flood profiles or LDS tables, the current FIRM, supporting calculations and documentation, and photographs. Also, be sure to include any special conditions of the No-Rise, including establishing “conveyance easements” or specific landscaping allowances or restrictions.

Include a **topographic work map** of the project site, to include floodplain and floodway Limits, topography, locations and labels on effective and new cross-sections, vicinity map, existing and proposed features and structures.

Provide **cross-section plots** of all cross-sections within the project boundary. Features, structures, and changes should be labeled. Grid squares or elevations should also be noted on the cross-sections.

A certified **property survey** is also required. A scaled plat is acceptable, provided the local floodplain administrator considers it current and accurate for the purposes of the No-Rise Certification.

The **No-Rise Certification** is contained in the NC Quick Guide available at www.ncflood-maps.com. The certification should be sealed by the design engineer. The certification shall address base flood elevations, floodway or NEA elevations, and floodway widths. The community may sign off on the form itself, or provide other written response (approval or denial) following the review. If GTM is asked to review the No-Rise, a cover letter should be included with the No-Rise Certification from the local floodplain administrator formally requesting a technical review of the submittal.

Other Considerations

There should be no changes to the hydrology in the model unless there is an obvious and significant error in the original model. Changes to hydrology based just on the methodology should not be considered, but should be only based on gross errors in drainage area or land cover. Changes in hydrology will be rare.

Local administrators may need to consider the modeling parameters. If a “conveyance easement” is defined in the model, does a deeded easement need to be recorded? If there are conditions regarding plant types, mowing height, or landscaping fill, how will those conditions be checked and, if necessary, enforced? Failure to enforce conditions of a No-Rise approval could cause a floodway violation which could lead to possible probation or suspension of the community from the NFIP.

Finally, the hydraulic modeler should understand that the modeling effort in a No-Rise study is at least as comprehensive as the effort in a Map Revision. Clients should be made to understand that a No-Rise is by no means guaranteed. Because of the life-safety, property impact, and legal implications of a No-Rise Certification, hydraulic modeling should only be performed by knowledgeable and experienced engineers with a strong understanding of the modeling software. ▲

LP Tanks: To Anchor or Not to Anchor? That is the question.

RANDY MUNDT, AICP, CFM, OFFICE OF GEOSPATIAL AND TECHNOLOGY MANAGEMENT

After Hurricane Bertha struck North Carolina, it soon became evident that many propane tanks were not in their original locations. While there is little that can be done to prevent tanks from breaking loose in a severe storm, anchoring should keep most tanks in place during most storms. Anchoring also means that the tank will not turn bottom side up; if it does, the propane line will likely break, causing a potentially hazardous gas leak and perhaps fire. After the hurricane in 1994, in a meeting between Dare County officials and several propane companies that was held, several guidelines regarding placement and anchoring of propane tanks were worked out. They are as follows:

1. For tanks installed adjacent to a structure (upright DOT or ASME tanks), the tanks would be secured to that structure by means of cable, chain, or heavy rope.
2. Horizontal containers would be secured by using two mobile home type anchors and ¼ inch stainless steel cable. The anchors are to be located at each end of the tank. The cable must be run through the tank legs and not over the tank or through the tank lifting lugs. (If a cable is looped over the tank, where the tank and cable come in contact there is risk for corrosion. Running the cable through lifting lugs or over the tank does not prevent the tank from rolling and breaking fittings and/or tubing.)
3. New installations in areas subject to high flood waters will incorporate the anchoring requirement.
4. Existing installations will be brought into compliance at a rate of ~ 25% per year.

Propane tanks are not only a problem on the coastal plain of North Carolina but are an issue statewide. Many rivers and streams flow out of their banks during sudden storms or after sustained rains. Two of the most frequent questions regarding the anchoring of propane tanks are “Does the tank placement need a floodplain development permit?” and “Who is responsible for obtaining the permit and who is responsible for anchoring the tank?” Let’s break the two questions down individually and attempt to answer both:

Does tank placement require a floodplain development permit?

YES: if the tank is being placed in a Special Flood Hazard Area (SFHA) then it meets the definition of “development” and will require a permit. To further augment this, the FEMA’s definition of a structure includes “...a gas, liquid, or liquefied gas storage tank that is principally above ground...” and “...development includes structures.” Much discussion has taken place and after lots of research a couple of articles have been located in regards to tank placement and anchoring. One such link is from the North Carolina Department of Agriculture and Consumer Services www.ncagr.gov/standard/LP/LPgasConcerns/FloodAnchoringProtection.htm, and good information can also be found in the FEMA 348 publication in Section 3.2.

Who is responsible for obtaining the permit and anchoring the tank?

It is the responsibility of the propane tank owner or the person/agency placing the tank to acquire the floodplain development permit -following the community’s floodplain management regulations for obtaining it- and properly anchoring the tank. The community floodplain administrator will then inspect the site and tank to ensure all guidelines have been followed. All community participating in the NFIP are responsible for maintaining compliance with their adopted flood ordinance, and the proper placement of propane storage tanks is guided by that document. ▲

If you have concerns about any LP tank placements in your community, contact Terry Foxx with the NCFMP at 828.228-8526 or Terry.Foxx@ncdps.gov.

To review the NC Department of Insurance newsletter announcing the code changes, go to [www.ncdoi.com/OSFM/Engineering/Documents/Newsletters/DOI_ENGINEERING_NEWSLETTER\(03-05-12\).pdf](http://www.ncdoi.com/OSFM/Engineering/Documents/Newsletters/DOI_ENGINEERING_NEWSLETTER(03-05-12).pdf)

Please review the ASCE 24 vs NFIP provisions available at the end of this document (p. 21).

2012 Building Code

JOHN GERBER, PE, CFM, NFIP STATE COORDINATOR

The 2012 NC Residential Code went into effect March 1, 2012. Significant changes include:

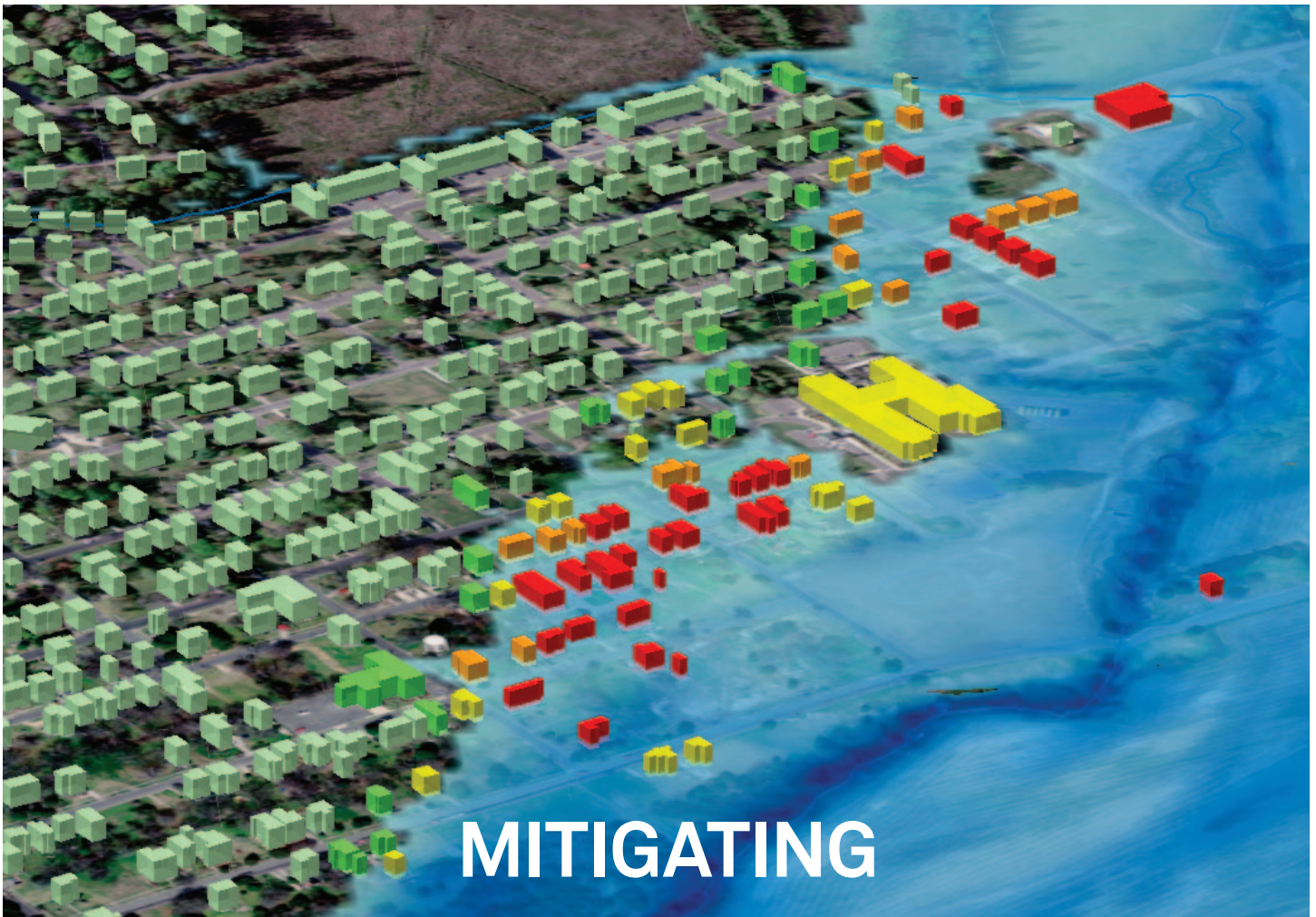
- **1 Foot Freeboard Statewide:** R322.2.1 Elevation Requirements. *1. Buildings and structures shall have the lowest floors elevated to or above the base flood elevations plus one foot, or the design elevation, whichever is higher.*
- **Floodways:** R322.1 states: *Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE-24.*
- **Protection of mechanical and electrical systems:** R322.1.6 states: *Electrical systems, equipment and components; heating ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall be located at or above the elevation required in Section R322.2 (flood hazard areas including A zones) or R322.3 (coastal high-hazard areas including V Zone). The new code also requires the above standards for substantial improvements.*
- **Coastal A Zones:** R322.2 introduces the Coastal A Zone as flood hazard areas that have been delineated as subject to wave heights between 1½ and 3 feet. The 2012 NC Residential Code however, does not require any additional constructions standards in the Coastal A Zone.
- **Elevation Requirements for coastal high hazard areas:** R322.3.2 states: *1. All buildings and structures erected within coastal high hazard areas shall be elevated so that the lowest portion of all structural members supporting the lowest floor, with the exception of mat or raft foundations, piling, pile caps, columns, grade beams and bracing, is:*
 - 1.1 Located at or above the design flood elevation, if the lowest horizontal structural member is oriented parallel to the direction of wave approach, where parallel shall mean less than or equal 20 degrees from the direction of approach, or*
 - 1.2 Located at the base flood elevation plus 1 foot, or the design flood elevation, whichever is higher, if the lowest horizontal structural member is oriented perpendicular to the direction of wave approach, where perpendicular shall mean greater than 20 degrees from the direction of approach.*

2012 NC General Code Effective June 1, 2012

Appendix G: Flood-Resistant Construction is adopted as part of the General Code and it states in **G103.1 Permit applications:** *The building official shall review all permit applications to determine whether proposed development sites will be reasonably safe from flooding. If a proposed development site is in a flood hazard area, all site development activities (including grading, filling, utility installation and drainage modification), all new construction and substantial improvements (including the placement of prefabricated buildings and manufactured homes) shall be designed and constructed with methods, practices and materials that minimize flood damage and that are in accordance with this code and ASCE 24.*

ASCE 24 contains provisions that are significantly different than the NFIP minimum requirements. Some of the highlights include:

- Freeboard of 1 to 3 feet above the BFE depending on the structure category.
- Coastal A Zones are treated as coastal high hazard areas (V Zones). This means V Zone construction standards apply in coastal A Zones that will be defined by the LIMWA (Limit of Moderate Wave Action) on the new Flood Insurance Rate Maps.
- Elevation certification required upon placement of lowest floor and prior to further vertical construction
- Additional foundation, geotechnical, flood load consideration, fill stability and anchoring standards.
- Broader definition of High Risk Flood Hazard Areas
- More specific standards for coastal construction ▲



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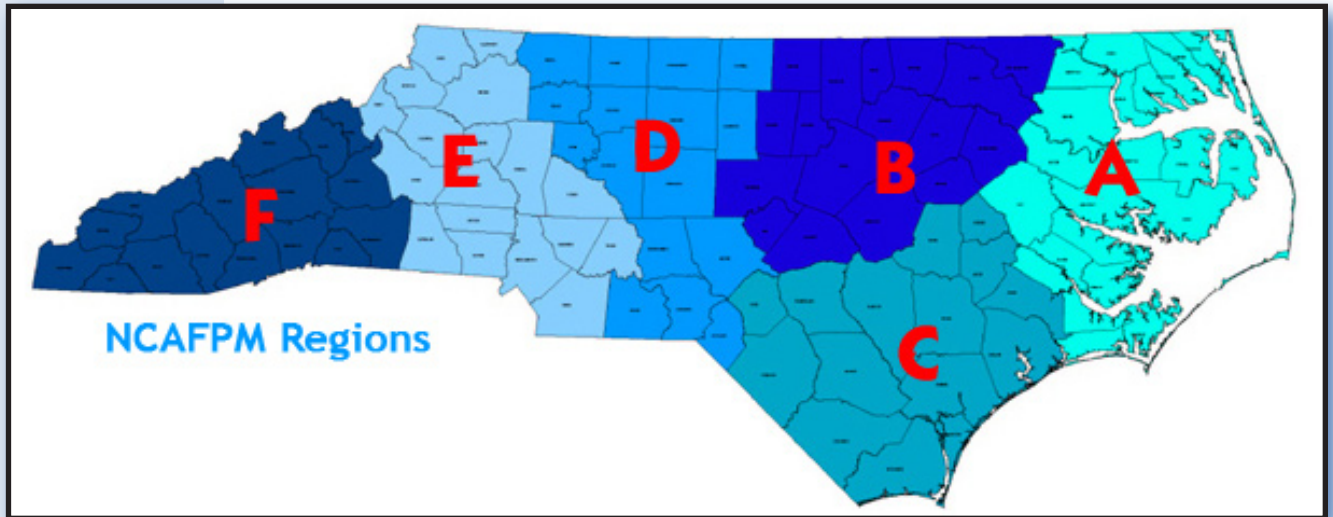
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NCAFPM Regional Reports



Region B

Randy Mundt,
AICP, CFM

The City of Raleigh is in the process of acquiring two residential properties that are repetitive loss properties; currently lining up their contractor to demolish the houses. This work is anticipated to complete by the end of summer.

In Orange County, the Orange–Alamance County line was adjusted. With the transfers of Special Flood Hazard Areas into and out of Orange County, Orange gained about eight acres of SFHA. They are in the process of developing a zoning atlas amendment to address the new SFHA transfers. Also, on May 1st Orange County will adopt the state-mandated nutrient delivery regulations into their UDO. As the County sits astride both the Cape Fear and Neuse River Basins they will have two different sets of standards that will control stormwater runoff and nutrient delivery. They will also be requiring low impact development (LID) design, when and where appropriate.

Three counties (Franklin, Nash, & Wilson) in Region B have cleared the post-preliminary process of updates to the FIS/FIRMs for their county, and await the receipt of a Letter of Final Determination (LFD) from FEMA to set an effective date for the new data. A fourth County (Edgecombe) is close to an LFD, but still must clear a revised preliminary panel, and also will go through the Provisionally-Accredited Levee (PAL) process for the Princeville levee.

Region E

Karl Dauber, CFM

The U.S. Geological Survey (USGS) has collected streamflow data in North Carolina for more than 100 years. In the Charlotte and Mecklenburg County area, a hydrologic data-collection network has been established to collect not only streamflow data but also rainfall and water-quality data. This data-collection network is cooperatively supported by Charlotte-Mecklenburg Stormwater Services. Because of the floods of August 1995 and July 1997 the network has been expanded over the last 10 years resulting in more than 70 rain gages and 50 stream gages. Other State and local agencies cooperatively support an additional 11 sites in surrounding counties.

Staff at the Mecklenburg County Flood Mitigation Program have noted that in recent years there have been frequent “100-year” flood events resulting from small, intense summer time convective storms. The currently used rainfall-frequency data used for flood

Region F

Brad L. Burton,
CFM

mapping is taken from the publication “Frequency of Annual Maximum Precipitation in the City of Charlotte and Mecklenburg County, North Carolina, through 2004, Scientific Investigations Report 2006–5017” by J. Curtis Weaver. This data was developed using approximately 8 gages at the time. There is speculation that small intense storms may have been missed by the 8 gages in the past, and that examination of the data collected by the much greater density of gages in the current network may reveal a different rainfall depth-frequency relationship. Mecklenburg County intends to investigate this issue in coordination with USGS, and may use the updated hydrologic findings in future re-mapping efforts.

Greetings to all from Region F (at the “pointy end” of the State)!

Ms. Cynthia Barcklow, my fellow NCAFP Board member, Fall Floodplain Institute Chair, and a most kind and gracious human being, has eloquently prepared the following announcement and has asked that I pass it along to our members via this forum:

The Fall Floodplain Institute will be held in Asheville at the Doubletree Biltmore Hotel October 24-26, 2012. The guest rate at the hotel will be \$130/night. Reservations can be made by calling (828) 274-1800, and referencing the N.C. Association of Floodplain Managers Fall Conference. An adjacent hotel, the Sleep Inn, has offered our group the rate of \$85/night, referencing the N.C. Association of Floodplain Managers Fall Conference. The Sleep Inn’s number is (828) 277-1800.

The Doubletree is one block from Biltmore Estate, and within walking distance of Biltmore Village. The hotel is approximately two miles from downtown Asheville. This will be our first conference held in this facility, and we are looking forward to this location.

The Fall Floodplain Institute has traditionally been held in the mountains, with our Annual Conference in the Spring held near the coast. The Fall Floodplain Institute offers training in a professional, friendly environment, while also offering another opportunity throughout the year for Floodplain Managers to earn CECs. Hope to see you in Asheville!

So, if you have any questions, Cynthia can be reached via email at: Cynthia.Barcklow@buncombecounty.org or by telephone at: 828.250.4836.

I look forward to seeing everyone in New Bern at the Spring Conference in May! -Brad



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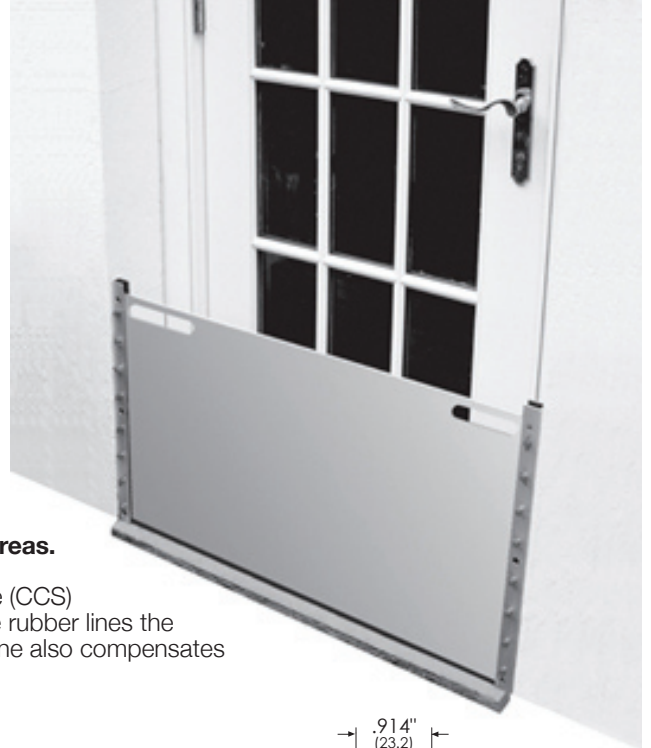
Flood Barrier Shield for Doors Helps Safeguard Building Contents

This removable barrier answers pleas from builders for help in protecting doors and building contents from water ingress in flood-prone areas. When water from heavy rains accumulates, the **#2070 Flood Barrier Shield** effectively blocks water from permeating door openings.

Available in 10, 20, 24, 30 and 36 inch high barriers (other sizes available upon request), the lightweight aluminum shield requires no tools or muscle strength for insertion into premounted vertical channels attached to either the door frame or adjacent walls.

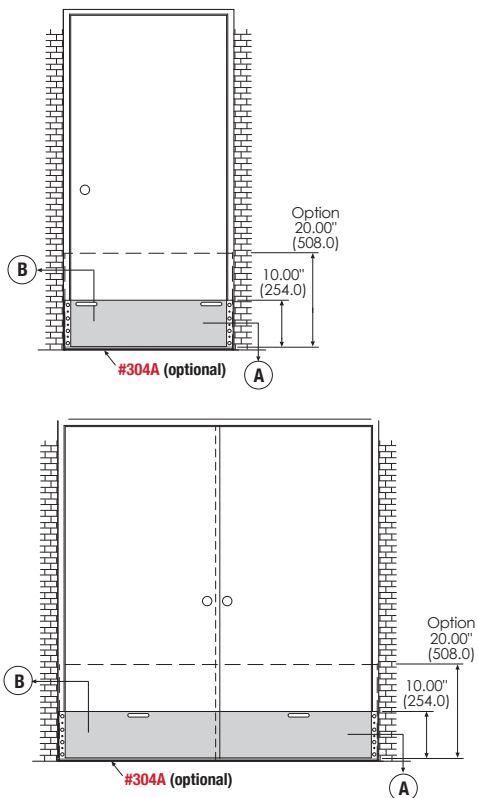
The unit complies with guidelines of the Federal Emergency Management Agency (FEMA) and Federal Insurance Administration (FIA) for use on doors in flood-prone areas.

The key to the shield's impermeability is the use of closed cell sponge (CCS) neoprene rubber engineered by Zero to ensure a water-tight seal. The rubber lines the aluminum channel brackets and the bottom of the shield. The neoprene also compensates for gaps at the threshold.

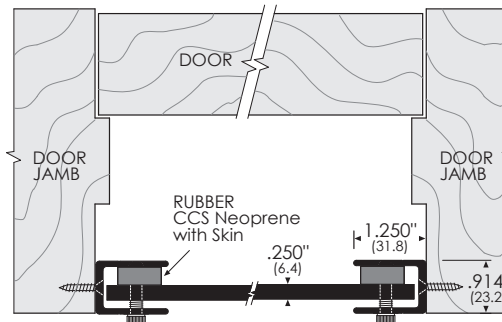


- Part# 2070A - 10 10" High**
- 2070A - 20 20" High**
- 2070A - 24 24" High**
- 2070A - 30 30" High**
- 2070A - 36 36" High**

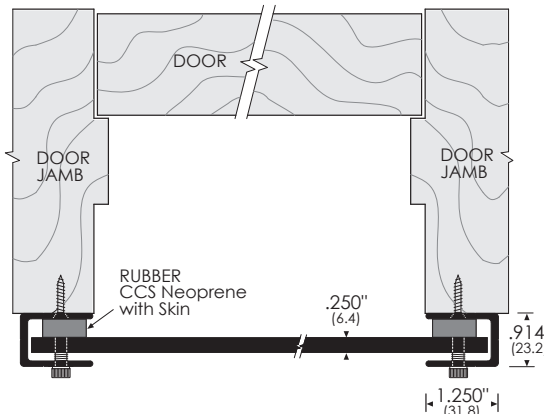
Each Flood Barrier Shield is custom fabricated
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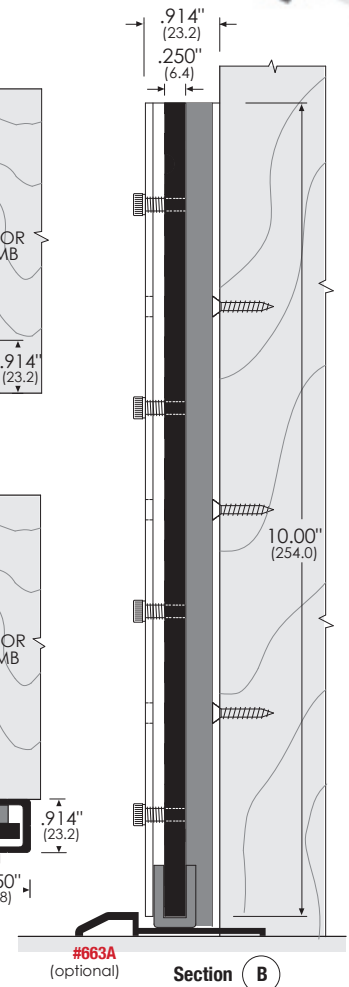
Full illustrations not to scale



Section A Installation option 1 - INSIDE MOUNT



Section A Installation option 2 - OUTSIDE MOUNT



Conferences & Annual Meetings

NCAFPM 2012 Annual Conference

After eight years, the NCAFPM Annual Conference returns to New Bern and Craven County on May 6-9. The conference will be held at the Hilton New Bern Riverfront Hotel and will offer some new programs and extra sessions. Of note is a scheduled all day Sunday (opening day) session on CRS. This session will introduce attendees to the many changes in the CRS program and will be presented by Berry Williams and Mandy Todd. On Wednesday, May 9 a special HAZUS training will be available thanks to Eric Coughlin, Project Manager, Applied Technologies. Both of these sessions will require advanced sign up due to lunches for the CRS session and limited space for the HAZUS session.

12 CEU's are available as well as golf, networking, and plenary and concurrent floodplain management sessions. In addition, the association and sponsors will provide some social time to make this learning experience a meaningful, memorable, and fun conference.

Visit www.ncafpm.org for detailed information and online registration. If you have any questions, feel free to contact conference chair, John Fullerton at john.fullerton@wilmingtonnc.gov or 910 341-3247 or any NCAFPM Board member.

ASFPM 2012 Annual National Conference

Join over 1,100 of your colleagues in San Antonio May 20-25 for six jam-packed days of outstanding presentations, training workshops, technical field tours, products and services exposition, and networking opportunities. An important thread throughout this year's sessions addresses FLOOD RISK MANAGEMENT.

Borrowing from San Antonio's five historic Spanish missions, including the Alamo, the conference is aptly named, "Mission Mitigation." Participants will be challenged to track progress, make critical decisions, and identify resources to accomplish sustainable flood mitigation and community goals.

The national conference is the world's largest and most comprehensive floodplain management conference and will feature a week of plenary and concurrent sessions covering techniques, programs, and resources to accomplish flood mitigation, watershed management, and other community goals. Field trips and training workshops will provide in depth exploration of practical situations. The networking opportunities with professional peers from around the country are numerous, lively, and always well attended.

Complete information for attendees, speakers, exhibitors, sponsors, and guests is located on the conference web page, www.asfpmconference.org. This site will be continually updated as additional information becomes available, so be sure to check back often!

Future national conferences are slated for Hartford 2013, Seattle 2014, and Atlanta 2015. Several members of NCAFPM will be in attendance.



May 6-9, 2012

New Bern, NC

www.ncafpm.org



May 20-25, 2012

San Antonio, TX

www.floods.org

Education & Training



FEMA's Emergency Management Institute (EMI) Courses

FEMA's Emergency Management Institute (EMI) conducts courses on floodplain management and other CRS-related topics. These are oriented to local building, zoning, planning, and engineering officials. Tuition is free for state and local government officials and travel stipends are available. Classes include:

- The Community Rating System (E278) August 6-9, 2012; September 17-20, 2012
- Advanced Floodplain Management Concepts I (E194) August 27-30, 2012
- Managing Floodplain Development through the NFIP (E273) April 23-26, June 11-14, and September 24-27, 2012
- Retrofitting Floodprone Residential Buildings (E279) June 25-28, 2012
- Residential Coastal Construction (E386) August 13-16, 2012

For prerequisites, registration, and other information, go to www.training.fema.gov.



2012 CRS Coordinator's Manual Webinars

The 2012 edition of the *CRS Coordinator's Manual* will take effect no sooner than July 1, 2012. A new series of one-hour webinars will be held through early May to explain the changes (including credit points). The webinars are free and are open to everyone.

You must register at least two days before the webinar you wish to attend. Remember that you need to access the site (at the URL that will be sent to you after you register) five minutes before the starting time. To get complete instructions on registration, click on "Webinar Info" at the 2012 Manual website www.crs2012.org. For questions, e-mail NFIPCRS@iso.com.



www.ncdenr.gov

Permeable Pavement Workshops

NCDENR Division of Water Quality is updating their Permeable Pavement Design Chapter. The revision will focus on two design alternatives: infiltration-based permeable pavement and detention-based permeable pavement. Permeable pavement is poised to become one of the most frequently used stormwater practices in the state.

This update will be placed on public notice in May and workshops will be offered by North Carolina State University in cooperation with the Division of Water Quality during June and July to present the updated chapter to the design community and solicit feedback. The existing Chapter 18 can be found at <http://portal.ncdenr.org/web/wq/ws/su/bmp-ch18>.

Workshop dates/locations:

- June 19, 2012 - Watauga County Ag Conference Center, Boone, NC
- July 10 - NC Botanical Gardens, Chapel Hill, NC
- July 12 - Crowne Plaza Hotel, Charlotte, NC
- July 24 - New Hanover County Extension Bldg., Wilmington, NC

For more information and to REGISTER ONLINE, visit the website at www.bae.ncsu.edu/stormwater/training/permeable_pavement.html.

Calendar

May 6-9, 2012

NCAFPM ANNUAL CONFERENCE
Hilton Riverfront Hotel
New Bern, NC
www.ncafpm.org

May 20-25, 2012

ASSOCIATION OF STATE FLOODPLAIN MANAGERS ANNUAL CONFERENCE
San Antonio, TX
www.floods.org

July 14-18, 2012

HYDROINFORMATICS CONFERENCE
Hamburg, Germany
www.hic2012.org

October 20-24, 2012

RESTORE AMERICA'S ESTUARIES NATIONAL CONFERENCE
Tampa, FL
www.estuaries.org

October 24-26, 2012

FALL FLOODPLAIN INSTITUTE
Doubletree Biltmore Hotel
Asheville, NC
www.ncafpm.org

Floodplain Management

Technical Assistance (State)

NC Emergency Management National Flood Insurance Program

NFIP State Coordinator: John Gerber, PE, CFM
jgerber@ncem.org | 919-715-5711 x 106

NFIP Planners

Central Area: Milton Carpenter, CFM
mcarpenter@ncem.org | 919-715-5711 x103

Eastern Area: Maureen O'Shea, AICP, CFM
moshea@ncem.org | 252-565-3206

Western Area: Terry Foxx
tfoxx@ncem.org | 828-228-8526

NFIP Engineer: Dan Brubaker, PE, CFM
dbrubaker@ncem.org | 919-715-5711 x110

NC CLOMR/LOMR Submittals

www.ncfloodmaps.com/mt-2_forms.htm
LOMC Manager/Community Development Planner: Steve Garrett, CFM
sgarrett@ncem.org | 919-715-5711 x118

Meck. Co. CLOMR/LOMR Submittals

David C. Love, PE, CFM..... 704-432-0006

Hazard Mitigation Grant Program & Flood Mitigation Assistance Prog

Chris Crew, Mitigation Section Chief
919-715-8000 x277

Maps & Flood Insurance Studies

FEMA Map Information eXchange (FMIX)

1-877-336-2627 (1-877-FEMA-MAP)

NC Floodplain Mapping Program

919-715-5711
www.ncfloodmaps.com

Resources

Technical Assistance (FEMA)

National Flood Insurance Program Floodplain Management and Insurance Branch: FEMA Region IV

www.fema.gov/about/regions/regioniv/

Branch Chief: Susan Wilson, CFM
susan.wilson@dhs.gov | 770-220-5414

Natural Hazards Program Specialist

Tim Russo, CFM
Timothy.Russo@dhs.gov | 770-220-5420

FEMA Region IV Insurance Specialist

Janice Mitchell
janice.mitchell@dhs.gov | 770-220-5441

Individual Lot LOMA/LOMR

FEMA LOMA DEPOT
3601 Eisenhower Avenue
Alexandria, VA 22304-6425
Attn: LOMA Manager

Flood Insurance Policy Issues

www.fema.gov/business/nfip/nfip_regions.shtm#4

Regional Manager: Lynne Magel
LMagel@ostglobal.com | 813-788-2624

Regional Liaison: David Clukie
DClukie@ostglobal.com | 813-767-5355

Websites

NCAFPM..... www.ncafpm.org
ASFPM www.floods.org
FEMA www.fema.gov
NFIP www.floodsmart.gov
NCEM www.nccrimecontrol.org/nfip
NC Maps www.ncfloodmaps.com

FlashFlood NEWS is a semi-annual publication which offers information and education on topics that are of current interest in the field of floodplain management and the National Flood Insurance Program.

Information and opinions do not necessarily reflect the views of the North Carolina Association of Floodplain Managers.

All inquiries and article ideas should be directed to: Kelly Keesling, Editor (kgkeesling@carolina.rr.com).

For more information about the North Carolina Association of Floodplain Managers, see our website at www.ncafpm.org.

SPONSORS

For information on sponsoring **FlashFlood NEWS**, see our Media Kit on the NCAFPM website at www.ncafpm.org.

MEMBERSHIP

For more information about becoming a member of NCAFPM or for a membership application, go to www.ncafpm.org.

FlashFlood NEWS

FlashFlood NEWS, Spring 2012 (2012 #1). Published by the North Carolina Association of Floodplain Managers in cooperation with the North Carolina Division of Emergency Management.

EDITOR

Kelly Keesling
kgkeesling@carolina.rr.com

**Provisions of the 2009 I-Codes and ASCE 24
that are “Higher Standards” or that are More Specific than the NFIP Requirements**

2009 I-Codes/ASCE 24-05* “Higher Standards/More Specific”	NFIP
<p>Inspections. IBC and IRC call for inspections “upon placement of the lowest floor, including basement, and prior to further vertical construction,” at which time elevation documentation shall be submitted.</p>	<p>60.3(b)(5): Requires communities to obtain the elevation to which the lowest floor (or bottom of the lowest horizontal structural member of the lowest floor) is elevated, without specifying when such information is to be obtained.</p>
<p>ASCE 24 as referenced standard. IBC refers to ASCE 24 for details [IBC 1612.4].</p> <p>IRC requires homes in floodways to be designed per IBC/ASCE 24 [IRC 301.2.4, IRC 322.1].</p> <p>IRC allows use of ASCE 24 as alternative in coastal high hazard areas (V Zones) [IRC 301.2.4.1, IRC 322.1.1].</p> <p>Foundation Requirements. ASCE 24 requires design to prevent flotation, collapse, or permanent movement under load combinations, which are specified in ASCE 7 [Sec. 1.5.3].</p> <p>Geotechnical characteristics. ASCE 24 requires foundation designs to be based on geotechnical characteristics of the soils and strata below the structure [Sec. 1.5.3.1].</p> <p>Flood loads. ASCE 24 refers to ASCE 7 for flood loads (including hydrostatic loads, hydrodynamic loads, debris impact loads, wave loads) and load combinations [Sec. 1.6].</p> <p>Stability of fill. Requires fill to be designed to be stable under conditions of flooding [Sec. 1.5.4]. Requires side slopes of structural fill to be no steeper than 1:1.5 and protected from scour and erosion; specifies lift thickness and compaction requirements for structural fill [Sec. 2.4].</p> <p>Anchorage and Connections. ASCE 24 provides some specific requirements for anchorage and connections [Sec. 1.5.5].</p>	<p>60.3(a)(3)(i): Requires review to determine that all new construction and substantial improvements are “designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.”</p>
<p>Design Flood Elevation. IBC, IRC and ASCE 24 define Design Flood/Design Flood Elevation. Definitions allows community that has more current or more extensive flood hazard mapping to adopt it, provided it shows areas that include at least the SFHAs shown on FIRMs</p>	<p>60.3: If special flood hazard areas and water surface elevations have been furnished by the Administrator, they shall be used, unless otherwise approved.</p>

* Section number references in brackets are ASCE 24, unless otherwise noted.

<p align="center">2009 I-Codes/ASCE 24-05* “Higher Standards/More Specific”</p>	<p align="center">NFIP</p>
<p>High Risk Flood Hazard Areas. ASCE 24 defines High Risk Flood Hazard Area to include flood hazard areas where one or more of the following occur: alluvial fan flooding, flash flooding, mudslides, ice jams, high velocity flows (greater than 10 ft/sec), high velocity wave action (V zones), Coastal A Zones, or erosion.</p> <p>Specific requirements for high risk flood hazard areas are in Chapter 3 and Chapter 4.</p>	<p>60.3(b): Communities are required to regulate only flood hazard areas delineated by FEMA, unless other maps are approved for use. The NFIP currently delineates and maps flood hazard areas along riverine and coastal areas. The only “high risk” areas mapped are the floodway, coastal high hazard areas (V zones), and alluvial fan flood hazard areas.</p>
<p>Elevation requirements. For elevation of buildings and structures, ASCE 24 requires the elevation of appropriate lowest element, as a function of flood hazard area and structure category, to be elevated is specified in tables. Minimum elevation is DFE; freeboard of +1 ft, +2 ft, or +3 ft in selected instances (see table below for summary of ASCE 24 elevation requirements).</p> <p>Elevation requirement (V Zone). IRC requires homes in coastal high hazard areas to be elevated as a function of the orientation of the lowest horizontal structural member relative to the direction of wave approach: at or above the DFE if parallel or at or above the BFE plus 1 ft or DFE whichever is higher, if perpendicular [IRC 322.3.2].</p> <p>Elevation requirement (CAZ). IRC requires homes in CAZ to be at or above the BFE + 1’ or the DFE, whichever is higher [IRC 322.2.1].</p>	<p>60.3: Requires buildings to be elevated to or above the BFE, as function of flood zone; reference level is lowest floor [A Zones, 60.3(c)(2)], height of floodproofing [A Zones, 60.3(c)(3)], or bottom of lowest horizontal structural member of the lowest floor [V Zones, 60,3(e)2].</p>
<p>Residential foundation wall height limitations. Unless designed according to IRC Chapter 4, foundation wall heights are limited as a function of type (plain or reinforced masonry) and wall thickness (6” and 8”).</p>	<p>60.3(a)(3)(i): Requires review to determine that all new construction and substantial improvements are “designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.”</p>
<p>High Risk Flood Hazard Areas. ASCE 24 prohibits construction of structures in certain high risk areas unless “protective works” have been determined to provide protection during the design flood; high risk areas include (alluvial fans, flash flood areas, mudslide areas, erosion-prone areas, high velocity flow areas, ice jam and debris areas [Chapter 3].</p>	<p>65.10: If engineering documentation is approved, areas protected levee systems may have the flood hazard area designation removed, thus such protected areas are no longer subject to regulation as flood hazard area.</p>
<p>Engineered openings. ASCE 24 provides specific design guidance for engineered openings in enclosures, to allow inflow/outflow of floodwaters [Sec. 2.6.2.2].</p> <p>ASCE 24 allows openings in breakaway walls [Sec. 2.6.1.1].</p>	<p>60.3(c)(5): Requires flood openings that do not meet certain minimum criteria be certified by a registered professional.</p>

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<p>Coastal A Zones. ASCE 24 defines the Coastal A Zone and specifies that such areas are treated as coastal high hazard areas (V Zones) [Sec. 4].</p>	<p>NFIP regulations do not have provisions for Coastal A Zones.</p> <p>Starting in 2008, revised FIRMs show the Limit of Moderate Wave Action (LiMWA), which delineates the landward limit of the CAZ.</p>
<p>Erosion and scour in V Zones and CAZs. ASCE 24 requires consideration of erosion and scour in coastal high hazard areas and Coastal A Zones [Sec. 4.5].</p>	<p>60.3(e): No specific requirement to evaluate or include the potential for erosion in foundation design, although certification is required that “the foundation is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components.”</p>
<p>Foundations in V Zones and CAZs. ASCE 24 allows buildings in coastal high hazard areas and Coastal A Zones to be supported on piles, columns, or walls serving as shear walls [Sec. 4.5.1].</p> <p>ASCE 24 foundation requirements include:</p> <ul style="list-style-type: none"> . Geotechnical considerations – account for instability and decreased structural capacity associated with erosion, scour, shoreline movement [Sec. 4.5.2]; . Foundation depth – sufficient to account for erosion, scour, and predicated shoreline movement [Sec. 4.5.3]; . Use of fill – minor amounts for minimal site grading, landscaping, and drainage; dune construction/reconstruction [Sec. 4.5.4]; . Pile foundations – penetration depth, attachments, pile caps, wood piles, steel piles, concrete piles [Sec. 4.5.5]; . Pile design – lateral resistance, capacity of supporting soils, minimum penetration, spacing, caps, connections, splicing [Sec. 4.5.6]; . Posts, piers and columns – minimum spacing, minimum penetration [Sec. 4.5.7]; . Footings, mats, rafts, and slabs-on-grade – at or below grade, reinforced [Sec. 4.5.8]; . Grade beams – at or below grade; independent of decks, patios, concrete pads [Sec. 4.5.9]; . Bracing – limitations based on orientation to primary direction of waves [Sec. 4.5.10]; and . Shear walls – orientation to direction of wave approach [Sec. 4.5.11]. 	<p>60.3(e)(4) and (5): In coastal high hazard areas, the regulations specify that new construction and substantial improvements be elevated on pilings and columns, and there is a requirement that the space below elevated buildings be “free of obstruction” or be enclosed by breakaway walls.</p>

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<p>Decks, concrete pads, and patios (V Zone). ASCE 24 includes specifications for decks, concrete pads, and patios that are beneath or adjacent to structures in coastal high hazard areas and Coastal A Zones, including specific requirements for concrete pads that reinforcing shall not be used and limiting pad thickness [Sec. 4.8].</p> <p>IRC requires slabs, pools, pool decks and walkways to be structurally independent of buildings, unless building foundation are designed to resist the additional flood load [IRC 322.3.3].</p>	
<p>Flood damage-resistant materials. ASCE 24 clearly specifies the elevations below which flood damage resistant materials shall be used [ASCE 24-05 Table 5-1, see below].</p> <p>IRC specifies pressure-preservative treated wood, lists specific allowable wood species, and cites a third-party standard for wood preservatives [IRC 322.1.8].</p> <p>Materials and third-party standards. ASCE 24 references third-party standards for certain materials, including metal connectors and fasteners, structural steel, concrete, masonry, wood and timber, and finishes [Sec. 5].</p>	<p>60.3(a)(3)(iii): Broad statement that all new construction and substantial improvements shall be constructed with materials resistant to flood damage.</p>
<p>Dry floodproofing. ASCE 24 lists several elements that are to be accounted for in the design of dry floodproofing measures. Some of these elements bear on the practicality of certain types of floodproofing measures, notably those that require action by the occupants [Sec. 6.2].</p> <p>ASCE 24 specifies the minimum height of dry floodproofing, which is at least BFE + 1 ft or the DFE, whichever is higher [Sec. 6.2.2].</p>	<p>60.3(c)(3)(ii) and 60.3(c)(4): Has a single statement regarding acceptable performance of floodproofing measures, without listing factors to be considered in the design of such measures. Requires designed to be developed or reviewed by a registered professional, and the design, specifications and plans are to be certified as being in accordance with accepted standards of practice.</p> <p>Requires floodproofing to or above the BFE.</p>
<p>Wet floodproofing. ASCE 24 includes specifications for wet floodproofing and limits its use to certain structures [Sec. 6.3].</p>	<p>Does not use the term “wet floodproofing;” such measures are allowed for enclosures below elevated buildings (and, by policy, certain accessory structures that meet the use limitations).</p>

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<p>Manufactured homes. IRC requires all manufactured homes to meet the elevation requirements, regardless of location or loss history [IRC 322.1.9].</p> <p>IBC Appendix G requires all manufactured homes to meet the elevation requirements, regardless of location or loss history [IBC G501.1].</p> <p>IBC Appendix G requires all manufactured homes to be placed on a permanent, reinforced foundation that is designed in accordance with Section 1612 [IBC G501.2].</p>	<p>60.3(b)(8) and (c)(6): Specify elevation and anchoring to adequately anchored foundation systems to resist flood loads.</p> <p>60.3(c)(12): Allows replacement units or substantially improved units in existing manufactured home parks and subdivisions to be no less than 35 inches above grade and anchored to adequately anchored foundation systems.</p>
<p>Platforms for utility equipment. ASCE 24 requires that exterior elevated platforms be supported on piles or columns, or cantilevered from or knee braced to the structure; if piles or columns are used, they shall be adequately embedded to account for erosion and local scour [Sec. 7.1].</p> <p>Utilities and breakaway walls. ASCE 24, IMC, IPC, and IRC specify that utilities and attendant equipment shall not be mounted on or pass through breakaway walls [Sec. 7.1; M301.13.1, P309.3; IRC 322.3.4].</p> <p>Electric components required to meet life safety requirements. ASCE 24 has specifications for exposed conduits and cables, electric meters, disconnect switches and circuit breakers, and other electric elements below the minimum elevations, including a statement that electric elements required to meet life safety provisions may be permitted within certain limitations [Sec. 7.2].</p> <p>Duct systems. ASCE 24, IMC, and IRC specifically require ductwork/duct systems to be above the required elevations [Sec. 7.4; M602.4, M603.13; IRC 322.1.6; IRC1601.4.9].</p>	<p>60.3(a)(3)(iv): The only provision specific to utilities requires new construction and substantial improvements to “be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.”</p>
<p>Fuel supply lines. ASCE 24, IMC, and IRC specify that fuel supply lines below the required elevation shall be equipped with a float-operated automatic control valve [Sec. 7.4; M1305.2.1; G2404.7].</p>	<p>60.3(a)(3)(iv): The provision specific to utilities requires new construction and substantial improvements to “be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.”</p>

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<p>Underground plumbing system elements. ASCE 24 specifies that if installed under-ground, piping and plumbing systems shall be buried to a depth sufficient to prevent movement, separation or loss due to flooding and erosion [Sec. 7.3.1].</p>	<p>60.3(a)(3)(iii) and (4): Require construction with methods and practices that minimize flood damages and determination that proposed development will be reasonably safe from flooding.</p> <p>60.3(a)(6): Requires new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters in the systems and discharges from the systems, and onsite waste disposal systems are required to be located to avoid impairment.</p>
<p>Tanks. ASCE 24 requires tanks to be elevated or installed to resist flood loads, and have fill openings and vents elevated. Designs shall assume 1.5 times the potential buoyant and other flood forces acting on an empty tank [Sec. 7.4.1].</p> <p>IBC Appendix G requires tanks to be anchored to prevent flotation, collapse or lateral movement (underground and above-ground) or elevated; requires tank inlets and vents to be at or above DFE or fitted with covers to prevent inflow of floodwaters and outflow of contents [IBC G701].</p>	<p>60.3(a)(3)(i): The general performance requirement addresses stability of all development under flood loads. .</p>
<p>Elevators. ASCE 24 has specifications for elevators that require use of flood damage resistant materials. For hydraulic elevators, electric control panels and hydraulic pumps and tanks shall be elevated. For traction elevators, machine rooms shall be elevated. In certain circumstances, controls shall prevent elevator cabs from descending into floodwaters [Sec. 7.5].</p>	<p>60.3(a)(3)(iv): The provision specific to utilities requires new construction and substantial improvements to “be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.”</p>
<p>Pools. ASCE 24 requires pools in coastal high hazard areas and Coastal A Zones to be elevated, designed to breakaway, or to remain in the ground without obstructing flow [Sec. 9.5].</p>	<p>60.3(a)(3)(i): The general performance requirement addresses stability of all development under flood loads.</p>
<p>Subdivisions. IBC Appendix G requires residential building lots to be provided with buildable area outside of the floodway [IBC G301.2(3)].</p>	<p>60.3(b)(3); Requires all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, to include within such proposals base flood elevation data.</p>

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<p>Recreational vehicles. IBC Appendix G prohibits placement of recreational vehicles in flood hazard areas subject to high velocity wave action (V zones) and in floodways [G601.1].</p>	<p>60.3(c)(14): Has no limitations on location.</p>
<p>Fences. IBC Appendix G requires fences in floodways that may block the passage of floodwaters, such as stockade fences and wire mesh fences, to meet the requirements for floodway encroachments in G103.5 [IBC G801.2].</p>	<p>No specific provisions for fences; however, fences are development and subject to the general performance requirements.</p>
<p>Prefabricated swimming pools. IBC Appendix G requires that prefabricated swimming pools in floodways meet the requirements for floodway encroachments in G103.5 [IBC G801.5].</p>	<p>No specific provisions for prefabricated swimming pools; however, swimming pools are development and subject to the general performance requirements.</p>
<p>Temporary structures and temporary storage. IBC Appendix G requires temporary structures to be anchored to prevent flotation, collapse, or lateral movement; stored materials shall not include hazardous materials; and temporary structures and temporary storage in floodways meet the requirements for floodway encroachments in G103.5 [IBC G901].</p>	<p>No specific provisions for temporary structures and temporary storage; however, such activities are development and subject to the general performance requirements. NFIP guidance includes recommendations for temporary structures and temporary storage.</p>