

[1]	00:00:14:12	00:00:19:00	Construction is a very important stage in a safer school project.
[2]	00:00:20:07	00:00:25:24	All the work from the previous stages — prepare, plan, and design —
[3]	00:00:26:03	00:00:28:22	is undermined if the construction work is poor
[4]	00:00:29:01	00:00:31:06	or the materials are weak.
[5]	00:00:31:10	00:00:33:15	There are three steps in this stage.
[6]	00:00:34:04	00:00:36:21	Step 1. Build local skills.
[7]	00:00:37:00	00:00:39:22	Step 2. Monitor construction.
[8]	00:00:40:01	00:00:43:15	Step 3. Practise and communicate safety.
[9]	00:00:44:16	00:00:47:15	These steps often happen at the same time.
[10]	00:00:47:19	00:00:50:07	Steps 1 and 2 are needed to make sure
[11]	00:00:50:11	00:00:53:12	the school will be strong enough to withstand hazards.
[12]	00:00:53:16	00:00:57:24	Step 3 creates a culture of safety at the school and in the community.
[13]	00:00:58:13	00:01:02:04	The first step is building local skills.
[14]	00:01:02:08	00:01:03:18	Safer school buildings
[15]	00:01:03:22	00:01:07:03	must be built with hazard-resistant construction techniques.
[16]	00:01:07:07	00:01:10:12	These techniques are ways of putting a building together.
[17]	00:01:10:16	00:01:12:16	They are tested techniques,
[18]	00:01:12:20	00:01:16:20	based on buildings that have used them and survived disasters.
[19]	00:01:17:22	00:01:20:20	For example, engineers now know
[20]	00:01:20:24	00:01:23:18	lintel and sill bands can hold brick walls together
[21]	00:01:23:22	00:01:26:07	when earthquakes shake.
[22]	00:01:26:11	00:01:28:02	

In high-wind areas,
[23] 00:01:28:06 00:01:30:18 engineers know to turn the short side of a school
[24] 00:01:30:22 00:01:33:07 towards the prevailing wind
[25] 00:01:33:11 00:01:36:10 and to securely tie the roof to the walls.
[26] 00:01:36:22 00:01:41:10 Even something as simple as a tiny bend in a piece of rebar matters.
[27] 00:01:41:14 00:01:43:23 In an earthquake, that little bend
[28] 00:01:44:02 00:01:47:07 can keep a concrete column from crumbling.
[29] 00:01:47:11 00:01:49:21 Local builders need training programs
[30] 00:01:50:00 00:01:53:20 to teach them about what happens to buildings in disasters.
[31] 00:01:53:24 00:01:55:12 And they need to know
[32] 00:01:55:16 00:01:57:21 what hazard-resistant construction techniques work
[33] 00:01:58:00 00:01:59:08 to keep buildings standing.
[34] 00:01:59:12 00:02:02:08 The best way for local builders to remember
[35] 00:02:02:12 00:02:06:24 is to first learn the technique, then practise it at a demonstration site
[36] 00:02:07:03 00:02:11:05 with builders who are already skilled in using the techniques.
[37] 00:02:11:09 00:02:13:07 It is best practice for training programs
[38] 00:02:13:11 00:02:17:18 to value and include local knowledge and building practice.
[39] 00:02:19:07 00:02:21:08 Trying to get local artisans
[40] 00:02:21:12 00:02:25:12 like plumbers, masons, carpenters -
[41] 00:02:25:16 00:02:28:03 they are really scarce to come by.
[42] 00:02:28:07 00:02:30:08 So when we get into the community,
[43] 00:02:30:12 00:02:35:08 we try to make all those labourers

			or artisans who work with us
[44]	00:02:35:12	00:02:41:08	reequip themselves and learn other skills... like the basic one
[45]	00:02:41:12	00:02:44:09	such as the sieving of the sand.
[46]	00:02:44:13	00:02:45:17	For all that they know is
[47]	00:02:45:21	00:02:47:19	we get the sand, [and] use it for construction.
[48]	00:02:47:23	00:02:52:16	At the end of the day, the beam then will rot and you end up exposing voids.
[49]	00:02:52:20	00:02:54:06	If it's the concrete that you've cast,
[50]	00:02:54:10	00:02:56:21	you end up seeing that you have lots of voids
[51]	00:02:57:00	00:03:00:05	which will now lead into cracks and stuff in the structure.
[52]	00:03:00:09	00:03:02:00	So with this basic alternative knowledge,
[53]	00:03:02:04	00:03:04:04	they are actually teaching the community members
[54]	00:03:04:08	00:03:06:00	that we need to sieve our soil
[55]	00:03:06:04	00:03:07:21	before we actually use it for construction,
[56]	00:03:08:00	00:03:10:00	so we can get the best quality.
[57]	00:03:10:15	00:03:12:14	Community members may also want to know
[58]	00:03:12:18	00:03:15:21	how to adapt hazard-resistant construction techniques
[59]	00:03:16:00	00:03:17:17	to their houses.
[60]	00:03:17:21	00:03:20:20	The more school construction resembles their housing construction,
[61]	00:03:20:24	00:03:23:12	the easier the transfer will be.
[62]	00:03:23:16	00:03:26:11	But even if the techniques used on the school project
[63]	00:03:26:15	00:03:28:11	are not easily adapted to housing,
[64]	00:03:28:15	00:03:31:08	such as when the project

is a school retrofit,
[65] 00:03:31:12 00:03:34:18 training can show local builders and interested community members
[66] 00:03:34:22 00:03:37:18 what will work to make their homes safer.
Nepalese interview 00:03:39:00
Before NSET provided the training, problems were happening
when people built houses.
It was a problem with the connection joint between the column and the beam.
They [only used a] 3 to 4 inch of the rod [for development length] to make a connection.
However, we know the length of the rod should be equal to 60 diameters to [properly] connect the beam and the column...
Our colleagues who haven't received the training still do not follow that new procedure.
But people like us who have received the training....
...we are fully using that required technology.
[67] 00:04:21:20 00:04:24:10 Local engineers, government officials,
[68] 00:04:24:14 00:04:27:04 inspectors and other specialists
[69] 00:04:27:08 00:04:29:16 may also benefit from training.
[70] 00:04:29:20 00:04:33:11 In many countries, these specialists may not know
[71] 00:04:33:15 00:04:36:21 the hard-earned lessons from disasters elsewhere.
[72] 00:04:37:00 00:04:41:06 Local inspectors and engineers may be especially interested
[73] 00:04:41:10 00:04:42:23 in what they should look for in buildings
[74] 00:04:43:02 00:04:45:17 to make sure they withstand disasters.
[75] 00:04:49:13 00:04:51:15 Step 2, monitor construction,
[76] 00:04:51:19 00:04:54:15 makes sure the materials used are strong

[77]	00:04:55:05	00:04:57:12	and match design specifications.
[78]	00:04:58:13	00:05:00:11	Monitoring is also needed
[79]	00:05:00:15	00:05:03:18	to make sure the construction is high-quality.
[80]	00:05:03:22	00:05:07:05	Engineers who study why disasters damaged schools
[81]	00:05:07:09	00:05:11:14	often find it is because of poor-quality construction.
[82]	00:05:11:18	00:05:15:14	Sometimes, bricks are so weak they can be broken by hand
[83]	00:05:15:18	00:05:19:05	and lumber arrives warped and unusable.
[84]	00:05:19:09	00:05:23:07	Other times, workers add too much water when they mix concrete,
[85]	00:05:23:11	00:05:26:14	or they leave rebar (the reinforcing steel in concrete)
[86]	00:05:26:18	00:05:31:03	exposed to rain and air, where it rusts and weakens.
[87]	00:05:31:07	00:05:35:05	To avoid problems like these, the design engineer explains
[88]	00:05:35:09	00:05:38:03	the school design and its hazard-resistant techniques
[89]	00:05:38:07	00:05:40:07	to the construction workers.
[90]	00:05:41:00	00:05:44:21	The program manager makes sure the design engineer is available
[91]	00:05:45:00	00:05:49:02	to answer questions builders may have during construction.
[92]	00:05:49:06	00:05:53:01	The design engineer also needs to approve any design changes
[93]	00:05:53:05	00:05:56:10	so these changes do not weaken the school.
[94]	00:05:57:16	00:06:01:18	The program manager also hires an independent inspector
[95]	00:06:01:22	00:06:03:15	to monitor the construction.
[96]	00:06:03:19	00:06:06:14	The design engineer may be a good option.

[97]	00:06:06:18	00:06:10:08	Hiring an inspector is the most important ethical responsibility
[98]	00:06:10:12	00:06:13:17	a program manager has in the construction stage.
[99]	00:06:13:21	00:06:18:00	Ideally, this inspector, or the design engineer,
[100]	00:06:18:04	00:06:20:11	is at the construction site every day.
[101]	00:06:20:15	00:06:25:04	At minimum, the inspector needs to be onsite during important stages,
[102]	00:06:25:08	00:06:27:21	such as before and after the foundation is laid,
[103]	00:06:28:00	00:06:30:24	when the walls are raised, and when the roof is attached.
[104]	00:06:31:03	00:06:33:16	When construction materials are delivered to the site,
[105]	00:06:33:20	00:06:36:20	the inspector checks they are of good quality and strength.
[106]	00:06:37:20	00:06:41:08	Also, during construction, the inspector watches
[107]	00:06:41:12	00:06:46:10	to make sure workers are carefully following the school design.
[108]	00:06:49:02	00:06:53:20	The contractor did not follow the design
[109]	00:06:53:24	00:06:54:24	that we gave to them. So...
[110]	00:06:55:03	00:06:59:00	But our project engineer is very strict in terms of that.
[111]	00:06:59:04	00:07:00:05	So when she found out
[112]	00:07:00:09	00:07:06:06	that it was not the design that she gave to them,
[113]	00:07:06:10	00:07:09:16	she immediately told them that we have to stop that
[114]	00:07:09:20	00:07:13:05	and we have to, we are to work it out again.
[115]	00:07:13:09	00:07:14:23	By closely monitoring
[116]	00:07:15:02	00:07:18:22	the implementation of

	the construction of the school,
[117]	00:07:19:11 00:07:25:20 you can consider as a safe school because you check that...
[118]	00:07:25:24 00:07:28:15 you can inspect that critical period
[119]	00:07:28:19 00:07:32:03 of construction implementation in the site.
[120]	00:07:35:03 00:07:38:03 While community members don't have the expertise
[121]	00:07:38:07 00:07:41:18 to do construction monitoring and inspection themselves,
[122]	00:07:41:22 00:07:44:16 they do play an important support role.
[123]	00:07:44:20 00:07:48:20 Community members are around the construction site every day.
[124]	00:07:48:24 00:07:53:00 The program manager can give the school management committee
[125]	00:07:53:04 00:07:54:19 and parents
[126]	00:07:54:23 00:07:57:12 a checklist of good and bad construction practices
[127]	00:07:57:16 00:07:59:03 that they can review.
[128]	00:07:59:19 00:08:01:13 When potential problems are spotted,
[129]	00:08:01:17 00:08:04:08 the community can quickly let the inspector know.
[130]	00:08:04:12 00:08:07:11 Even older children can observe the construction site
[131]	00:08:07:15 00:08:09:06 from a safe distance
[132]	00:08:09:10 00:08:11:19 and identify the project's safety features.
[133]	00:08:11:23 00:08:14:10 This gives the community a sense of ownership
[134]	00:08:14:14 00:08:17:22 and strengthens the monitoring process.
[135]	00:08:18:01 00:08:22:00 It is very important, it's very essential that we must be involved.
[136]	00:08:22:04 00:08:24:06 It is because that...
[137]	00:08:24:10 00:08:27:16

	the building itself is not anyone's possession,
[138]	00:08:27:20 00:08:29:06 but it is really the children's.
[139]	00:08:29:10 00:08:31:18 It's really the school's. The school will be occupying it
[140]	00:08:31:22 00:08:33:10 and therefore it is very important
[141]	00:08:33:14 00:08:37:12 that they must know the essentials of being safety.
[142]	00:08:37:16 00:08:43:10 The building itself must really be of good standard materials,
[143]	00:08:43:14 00:08:45:23 must be used, and therefore monitoring is essential
[144]	00:08:46:02 00:08:47:04 and beneficial.
[145]	00:08:47:08 00:08:53:22 I learned many stuffs like the building construction itself,
[146]	00:08:54:01 00:08:59:11 the primary roofing, like that,
[147]	00:08:59:15 00:09:03:05 and we should know our safety
[148]	00:09:03:09 00:09:07:02 and we should consider everything
[149]	00:09:07:06 00:09:11:04 around and inside the building itself.
[150]	00:09:11:08 00:09:14:00 Safety first, safety first!
[151]	00:09:14:04 00:09:18:20 The last step, Step 3, is practise and communicate safety.
[152]	00:09:20:03 00:09:22:12 Safer school projects are an opportunity
[153]	00:09:22:16 00:09:26:02 to create and practise a culture of safety
[154]	00:09:26:06 00:09:28:21 that continues after the end of the project.
[155]	00:09:29:00 00:09:32:13 During construction, the contractor puts up fences and other barriers
[156]	00:09:32:17 00:09:35:23 to keep curious children from getting into trouble.
[157]	00:09:37:04 00:09:40:21 The program manager or engineer also explains to everyone
[158]	00:09:41:00 00:09:45:00

what tasks need to be done and how to do them safely.
[159] 00:09:45:24 00:09:48:08 The program manager gives special attention
[160] 00:09:48:12 00:09:50:13 to making sure community volunteers,
[161] 00:09:50:17 00:09:53:09 who may not know much about construction conditions,
[162] 00:09:53:13 00:09:55:13 learn the safety rules.
[163] 00:09:56:19 00:10:00:13 Even for onlookers, the project should promote safety.
[164] 00:10:00:17 00:10:03:07 Signs or posters can be a great way
[165] 00:10:03:11 00:10:06:00 to explain how the school is being built
[166] 00:10:06:04 00:10:09:03 to protect workers and future students.
[167] 00:10:09:07 00:10:12:09 Construction tours for curious community members
[168] 00:10:12:13 00:10:14:01 can also create opportunities
[169] 00:10:14:05 00:10:17:04 to show the new hazard-resistant construction techniques
[170] 00:10:17:08 00:10:19:00 the workers are using.
[171] 00:10:19:04 00:10:22:16 Creating a safety culture in the community can continue
[172] 00:10:22:20 00:10:27:00 even after the last nail is hammered and the last wall is painted.
[173] 00:10:28:05 00:10:30:16 When program managers invest in this step,
[174] 00:10:30:20 00:10:32:13 it can make a real difference
[175] 00:10:32:17 00:10:35:02 to the future safety of the community.
[176] 00:10:35:13 00:10:37:18 Everyone can think of creative ways
[177] 00:10:37:22 00:10:41:12 for the school building to demonstrate a culture of safety.
[178] 00:10:41:16 00:10:45:16 School evacuation routes can be prominently displayed.
[179] 00:10:45:20 00:10:48:02

A lintel beam can be painted with a label
[180] 00:10:48:06 00:10:49:21 saying "earthquake band",
[181] 00:10:50:00 00:10:52:24 and a sign can point to the school's elevated foundation
[182] 00:10:53:03 00:10:54:08 in a flood plain.
[183] 00:10:54:12 00:10:55:12 It may be possible
[184] 00:10:55:16 00:10:58:10 to leave a cyclone strap painted a bright colour
[185] 00:10:58:14 00:11:02:08 to show how to stop a roof being blown off in high winds.
[186] 00:11:03:19 00:11:09:06 During Stage 4, construction, training workshops build local skills
[187] 00:11:09:10 00:11:11:17 and the program manager ensures an inspector,
[188] 00:11:11:21 00:11:14:24 and even the community, monitor construction.
[189] 00:11:15:03 00:11:18:10 Everyone practises and communicates safety.
[190] 00:11:20:02 00:11:22:12 With the school construction winding down,
[191] 00:11:22:16 00:11:25:01 and the community aware of its safety features,
[192] 00:11:25:05 00:11:26:17 it's time to celebrate.
[193] 00:11:26:21 00:11:29:16 As the project moves into the post-construction stage,
[194] 00:11:29:20 00:11:33:12 everyone will need to make sure the school remains safe.